

**ENVIRONMENTAL
EDUCATION IN THE SCHOOL
CURRICULUM DEVELOPED BY
THE NCERT**

ENVIRONMENTAL EDUCATION IN THE SCHOOL CURRICULUM DEVELOPED BY THE NCERT

Compiled by

J.S. GILL

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राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

July 1995
Bhadra 1917

P.D. 10T—RA

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National Institute of Educational
Planning and Administration.
17-B, Sri Aurobindo Marg,
New Delhi-110016

DOC, No D-9225
Date 25-7-96

Published at the Publication Department by the Secretary,
National Council of Educational Research and Training, Sri Aurobindo
Marg, New Delhi 110 016, lasertypeset by Global Computers,
0-39, Srinivas Puri, New Delhi 110 065 and printed at J.K.Offset PPrinters,
315, Jama Masjid, Delhi-110006

Foreword

Environmental Education (EE) has gradually become an integral component of our school education in view of global perceptions and demands of our environmental concerns. We have been receiving requests from different quarters regarding the scope of coverage of EE in the curricula developed by the National Council of Educational Research and Training (NCERT) for various stages of school education. Keeping this in view, the present document has been developed to list specific environmental topics/concepts that should be included in the curricular materials for different stages. Besides, it includes the list of environmental education materials useful for teacher educators and teachers. The document also provides list and summary of materials on environmental concerns expressed in Agenda 21 of the UN Conference, and specially Chapter 36 are also included in the document to familiarise the educators about the wide ranging dimensions of EE.

Meanwhile, the Department of Education in Science and Mathematics (DESM), NCERT, has undertaken a project for detailing concept wise analysis of NCERT Curricula vis-a-vis EE objectives. The project aims at identifying the strengths and weaknesses of the curriculum in terms of EE components. It would facilitate further modification in EE content in the light of the UN Conference on Environment and Development — Agenda 21, held at Rio in 1992 and the National Environmental Action Plan (1993) launched by the Government of India.

The document has been compiled by Dr. J.S.Gill, Reader, DESM and is an outcome of discussions with the faculty members of his department and the Department of Education in Social Sciences and Humanities of the NCERT and the guidance and encourage given by Prof. K.V.Rao, Head, DESM.

Suggestions for strengthening of EE components at the school level are welcome. It is hoped that this document will serve as a reference for curriculum developers and teachers.

A.K. SHARMA
Director

National Council of Educational Research
and Training

Preface

Environmental Education has received greater attention in school education with the implementation of the National Policy on Education (NPE) 1986. The curricular materials developed as a follow up of the policy have given due weightage to environmental concepts and related problems. There have been several requests to the National Council of Educational Research and Training (NCERT) seeking coverage of Environmental Education (EE) components like forests, wildlife, pollution and conservation of natural resources, etc. at the school level. It was decided to compile a list of specific environmental concepts and topics included in NCERT's instructional materials for different stages of school education. This document also includes the list of EE materials useful for teachers and teacher educators as teacher's guides. The list of enrichment materials on environment and its problems mentioned in the document would help the school teachers to emphasize on various aspects of environment.

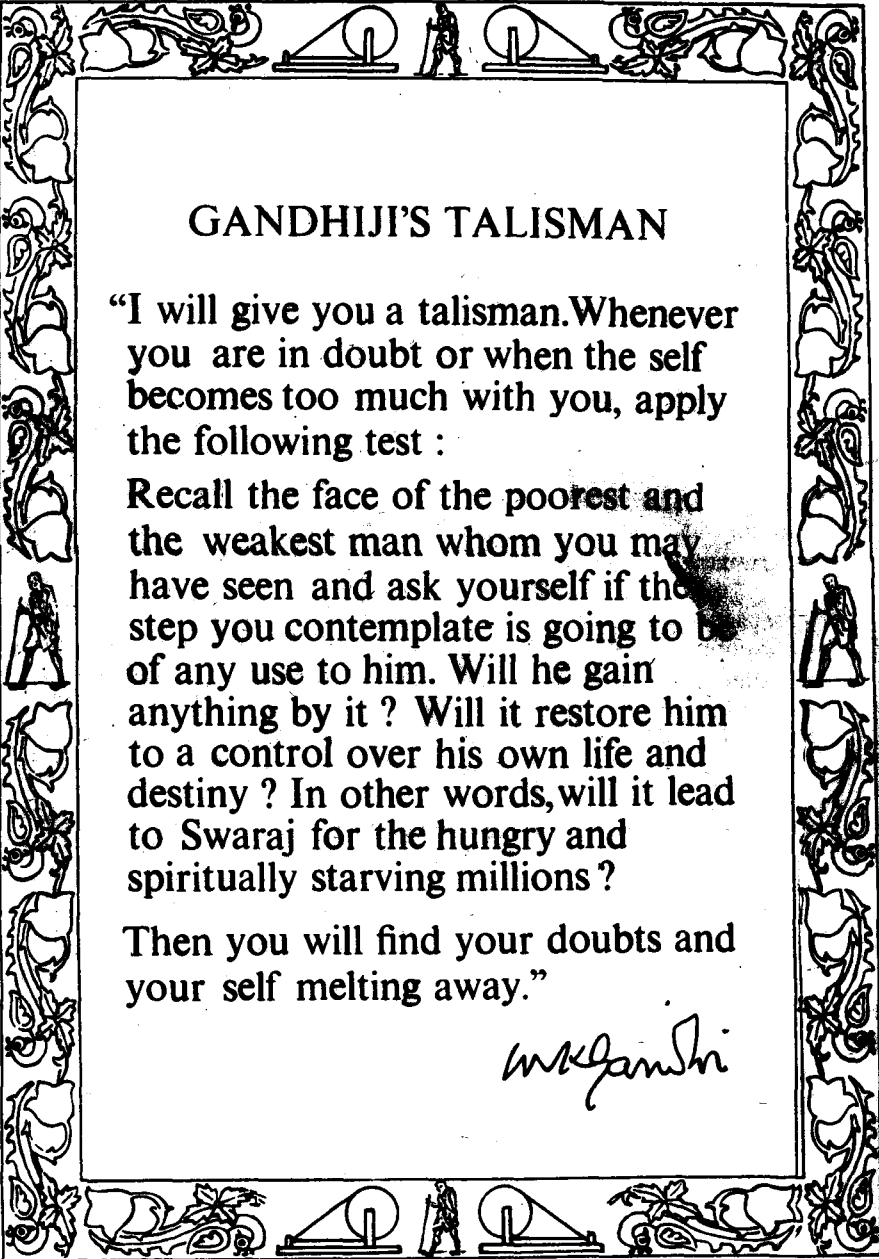
This document has been compiled by Dr. J.S. Gill, Reader, Department of Education in Science and Mathematics (DESM) through discussions with faculty members of DESM and the Department of Education in Social Sciences and Humanities, NCERT, New Delhi. The exercise aims at highlighting the contribution of NCERT to the promotion of Environmental Education at the school level. The efforts of Dr. J.S. Gill and other faculty members are gratefully acknowledged.

Suggestions for strengthening Environmental Education components in school education are welcome.

K.V. RAO

Head

Department of Education in Science and Mathematics
National Council of Educational
Research and Training



GANDHIJI'S TALISMAN

“I will give you a talisman. Whenever you are in doubt or when the self becomes too much with you, apply the following test :

Recall the face of the poorest and the weakest man whom you may have seen and ask yourself if the step you contemplate is going to be of any use to him. Will he gain anything by it ? Will it restore him to a control over his own life and destiny ? In other words, will it lead to Swaraj for the hungry and spiritually starving millions ?

Then you will find your doubts and your self melting away.”

M.K. Gandhi

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Introduction

Environmental concepts and related topics have been included in the instructional materials developed by the NCERT for different stages of school education. In the sixties conservation concepts were introduced with the ideas promoted by the International Union for Conservation of Nature and Natural Resources (IUCN) at present known as World Conservation Union. Later on, the information on environment was updated in the school curricula in the light of the international inputs through the Stockholm Conference (1972) and the Tbilisi Inter-Governmental Conference (1977).

The National Policy on Education (NPE) 1986 has envisaged protection of the environment as the core element of education at all levels. It should be developed as one of values among the children. The policy has also recommended the creation of environmental consciousness among all ages starting with school education. The section in the policy document States: "There is paramount need to create a consciousness of the environment. It must permeate all ages and all sections of society beginning with the child. Environmental consciousness should inform teaching in schools and colleges. This aspect will be integrated in the entire educational process."

The coverage of environmental concepts in the curricular materials developed by the NCERT as part of the implementation of the NPE (1986), has been considered to be adequate by the National and International experts in Environmental Education (EE). However, further strengthening of EE components would continue. The instructional materials would enable the children to understand the structure and functioning of the environment and its problems and prepare them to contribute to its protection and improvement.

The compilation of environmental topics/concepts in this document provides a coverage at different school stages. The document would help the teachers to emphasize the concepts and encourage the children to work for the betterment of the environment. This analysis would also familiarize the educationists in general, and environmentalists in particular, with the EE inputs at the school level. Their suggestions would help in further strengthening the environmental dimension in school curricula.

Part I gives an analysis of the environmental coverage both stage wise and subject wise. Science and social studies are the two main subject areas with intensive coverage of environmental concepts. Several concepts covered in science, geography, biology, chemistry and economics would

help in understanding the structure and functioning of the environment. Environmental problems and issues are also included at appropriate places. There are several poems and stories on trees, insects, animals, in language subjects like Hindi and English to create interest and motivate the children to contribute to the protection of the environment.

Part II of the document provides a list of supplementary materials brought out by the NCERT. These can serve as enrichment materials for students, teachers and teacher educators.

In Part III the enrichment materials on environment meant specifically for teachers and teacher educators are given with a brief summary of the content covered in the materials. These materials have been widely used by teachers and teacher educators.

Part IV provides glimpse of recent developments in EE and the activities of NCERT. Agenda 21 adopted at United Nations Conference on Environment and Development, Rio, Brazil during June 1992 is also briefly introduced. The areas of environmental concerns along with the Chapter 36 of Agenda - 21 are provided as the Annexures. This information will be useful to the curriculum developers, teachers and others concerned with EE.

Part I

List of Environmental Topics/Concepts covered in NCERT Instructional Materials for Various School Stages

Environment, forests, wild life, natural resources and their conservation and other areas like health, environmental sanitation have been incorporated in the school curriculum at various stages keeping in view the age group of the children, teachers and resources available in the schools. Efforts have been aimed at encouraging children to become aware of their environment, understand its structure and functioning and work for environmental protection and conservation. Activities on studies of components of environment have been included to strengthen the teaching/learning process. The topics/concepts covered in the syllabus and textbooks are given class wise and subject wise for various stages—primary, upper primary, secondary and senior secondary stages. It would help the teachers to emphasize the need for understanding the environmental components and motivate the children to contribute towards the improvement of our environment.

PRIMARY STAGE

At the primary stage (Classes I-V) a subject titled Environmental Studies (EVS) has been introduced to develop interest in the environment. The approach is to use the environment as a laboratory or teaching source for various concepts or happenings in the immediate environment. The course have two major components: EVS — Science and EVS — Social Studies.

Environmental Studies — Science (Class III)

1. *Things around us* : Living and non-living things around us; categorization into natural and man-made things; plants and animals around us; observation and study of a few common plants and animals in the vicinity. Plants and animals are natural resources and need protection.
2. *Animals and Their Way of Life* : Familiarity with parts of common animals, (feet, teeth, beaks, mouth parts of a butterfly); shelters like nests of birds, ant hills, beehives, etc.
3. *Our Body* : Parts of the human body; functions of each part; the food our body requires; kinds of food items.
4. *Cleanliness of Surrounding* : Personal hygiene; environmental sanitation in the locality.
5. *Water* : Properties and uses of water.
6. *Weather* : General observation of weather; water evaporation; water cycle; effect of weather on our activities.
7. *The Seasons* : Winter, summer, monsoon; observing plants and animals in different seasons.

Environmental Studies — Social Studies (Class III)

8. *The Earth — Our Home* : Idea of oceans and continents; studying the globe, maps; early man and food gathering and food production; invention of the wheel.

Environmental Studies — Science (Class IV)

1. *Uses of Plants and Animals* : Elementary ideas about food, timber and other products from plants and farm animals.
2. *Care and Protection of Plants and Animals* : Role of plants in exchange of oxygen and carbon dioxide; use of pesticides; forests, *Van mahotsava*, social forestry for afforestation, protection of forests from indiscriminate felling, fire and diseases; idea of national parks and wild-life sanctuaries; important sanctuaries in India.

3. *Food and Food Sanitation* : Food items and their constituents; role of constituents of food; food preservation and storage.
4. *Safe Water* : Water in living organisms; uses of water (washing, bathing); contamination or pollution of water; spread of diseases through water; prevention of pollution of water; simple methods of purification of water.
5. *Sanitation and Diseases* : Disposal of waste water; checking disease carrier insects like mosquitoes; garbage dumping; steps for prevention of spread of diseases through water and food contamination.
6. *Weather and Its Influence on Life* : Water, air, temperature as factors of weather; rainfall; evaporation; idea of smoke fog, hail; effects of weather changes.
7. *Soils and Crops* : Soil study—sand, clay, loam, humus; crop rotation; use of manure.

Environmental Studies — Social Studies (Class IV)

1. *The Face and Climate of Our Country* : The northern mountain wall; the northern plains; the western desert; the southern plateaus; the coastal plains and islands; the climate in our country.
2. *Our Soils* : Idea of weathering, types of soil (alluvial, black), soil erosion.
3. *Our Forests and Wild-life* : Importance of forests; variety of forests (evergreen, deciduous, alpine, thorn scrub and common trees of each type); *Vanamahotsav*; wild life and its variety; idea of sanctuary, and sanctuaries and wild animals in India.
4. *Water Resources* : Uses of water; river and idea of dams.
5. *Our Mineral Wealth*; Minerals (iron, copper, mineral oil); conservation
6. *Livestock* : Useful animals and their products.

Environmental Studies — Science (Class V)

1. *How Living Things Adapt Themselves* : Living organisms on land and in water and air; habitat; aquatic plants and animals; amphibious organisms; adaptation in fish, frog, camel, cactus, waterlily, evergreen trees in cold climate.
2. *Deficiency Diseases and Communicable Diseases* : Food requirement of different age-groups; symptoms of protein-carbohydrate deficiency; vitamins and their deficiency diseases; role of bacteria in spreading common diseases; vaccination.
3. *Community Sanitation* : Waste materials; open dumping and burning of wastes; land-fill, proper disposal of wastes.

4. *Soil Conservation* : Soil erosion by wind and water; prevention of soil erosion; terrace cultivation.
5. *Air - Its Uses and Pollution* : Air composition; exchange of oxygen and carbon dioxide; role of oxygen and nitrogen in plant growth; air pollution — smoke from industries, automobile exhausts, fuel burning, prevention of air pollution.
6. *Energy* : Fossil fuels (coal, petrol); wind energy; solar energy; biogas.
7. *Science and Environment* : Progress of science and technology; production of consumer goods; over-use of natural resources.

Environmental Studies — Social Studies (Class V)

1. *The Globe* : Model of our earth (oceans, continents); maps, (directions and distances, scale, colour scheme, signs and symbols).
2. *Varied Climates*: Dense forests; ice and snow; desert; the grassland.

UPPER PRIMARY STAGE

The environment components at the upper primary stage (Classes VI-VIII) are integrated in science and social sciences. The teaching of science is linked to the daily life experiences of the children.

Science (Class VI)

1. *Components of Environment*
 - i) *Air* : Composition and usefulness to human beings.
 - ii) *Water* : Sources; properties of water; uses of water; water cycle; conservation of water.
 - iii) *Energy* : Sources (solar, wind, hydel); biomass energy.
2. *Balance in Nature* : Interdependence of organisms; food chains; human interference in nature; pollution; need of balance in nature.

Science (Class VII)

1. *Energy* : forms of energy; transformation of energy; conservation of energy; renewable and non-renewable sources of energy.
2. *Water* : Salinity; sources of pollution; prevention of water pollution.
3. *Air* : Composition; uses; air pollution — its sources and prevention.
4. *Health and Diseases* : Deficiency diseases, balanced diet, food contamination.
5. *Soil* : Composition, types, soil formation, soil pollution, soil as a natural resource.

Science (Class VIII)

1. *Carbon and its Compounds* : Carbon in living organisms, carbon cycle, fuels, combustion, minerals and water, man-made materials from nature.
2. *Microbial World* : Microbes around us, various kinds of microbes and their role in diseases and decomposition of dead organisms.
3. *Agricultural Practices* : Practices, crops, use of soil, pesticides and fertilisers.
4. *Useful Plants and Animals* : Interdependence between plants and animals, useful and harmful plants and animals.
5. *Evolution* : Past environment, origin of life, evolution of life.
6. *Conservation of Natural Resources* : Natural resources (renewable and non-renewable and their examples); limits of natural resources; soil;

water; air; nitrogen cycle; forest resources; forest conservation; habitat conservation; recycling of renewable resources; repair and use economy; destruction of natural resources.

Geography (Class VI)

1. *The Earth — Our Planet* : The earth in the solar system; use of maps and globes; latitudes and longitudes; earth's rotation and revolution; cycle of seasons.
2. *Realms of the Earth* — Lithosphere; continents; land forms—mountains, plateaus, plains; hydrosphere (Oceans); atmosphere; biosphere; balance in nature.
3. *Resources — Land, Climate* : Resources and their utilization in different regions (Africa, South America, Australia, Antarctica).

Geography (Class VII)

1. *Local Phenomena — Weather* : Sunrise, sunset; constellation; local weather (air, temperature, wind direction and speed, humidity, rainfall, snow/hail).
2. *Atmosphere and Hydrosphere* : Air and its temperature; atmosphere heating; temperature and its distribution; factors influencing temperature (latitude, altitude, distance from the sea); wind, wind systems; air and its humidity; evaporation; condensation — its types (clouds, dew, frost, fog); types of precipitation (rain, snowfall, hail); types of rainfall (relief rainfall, conventional rainfall, cyclonic rainfall).
3. *Ocean Waters* : Movements of ocean water (waves, tides, ocean currents); influence of ocean currents.
4. *Land, Climate and Resources* : Land, climate, people and resources of Europe, North America.

Geography (Class VIII)

1. *Lithosphere and Landforms* : Rocks and their kinds (igneous, sedimentary, metamorphic); landforms, volcanoes; earthquakes.
2. *Agents of Degradation* : Gradation and aggradation; weathering of rocks (agents — running water, river water, occurrence of ice, moving ice, wind, sea waves); formation of soil; conservation of soil.
3. *Land, Climate, Resources and People* : Various aspects of land, climate, people and resources in Asia and specifically in India.

Civics (Class VIII)

1. *Population, Growth and Development* : Population and resources balance; population growth factors (birth, illiteracy and poverty).
2. *Agricultural Development* : Agricultural production; agricultural practices.
3. *Industrial Development* : Production and use of inputs; fertilizer production.

Language — Hindi (Class VI)

1. *Pahali Boond (Rain)*
2. *Girivan Ke Sinh (Wild life)*

Hindi (Class VII)

1. *Shinghan (Importance of land and agriculture)*
2. *Pardooshan (Pollution)*
3. *Ban Hamari Amulaya Sampati*

Hindi (Class VIII)

1. *Prakriti ka Sanat*
2. *O-nag ke Mandrate Badal*

English (Class VI)

1. *The Sun is Rising*
2. *I Will Make a Shirt (about plants)*
3. *The Story of Honey*
4. *Birds and Animals Play*

English (Class VII)

1. *Tiny Teacher (about insects)*
2. *A Great Puzzle (about birds)*
3. *Our Nearest Neighbour (Idea about Earth, Moon, Sun, Seasons)*

English (Class VIII)

1. *Trees* : Various terms; names of trees; story-telling about how trees support life by supplying oxygen and starch; trees' influence on climate and soil; value of trees; need to plant trees; some interesting facts about trees.
2. *The Universe* : Terms used for explaining the universe; the solar system; our galaxy—the milky way; the emptiness of space; other galaxies; how galaxies move; the expanding universe; the origin and age of the

universe; man and the universe.

3. *The Story of Life in the Sea* : The earliest living things; life differentiates into plant and animal cells; learn to live together; the differentiation of sexes; the backboneed creatures.
4. *The Story of Life on the Land* : Why migration to land was a great success; life still has roots in water; the great invasion; how the tides came to the help of life; the amphibians; ice age and amphibians; the age of reptiles; the first birds; mammals, another ice age; the age of the mammals; the unfolding of the mind; the birth of social life; the coming of man; man—a maker of tools; man the seeker.

SECONDARY STAGE

The environmental concepts at the secondary stage (Classes IX-X) are mainly covered in science and social sciences (geography). The language course also includes poems and essays on trees, insects, seasons, etc. The science concepts are included from the daily life experiences of the children. The integration with environment has also been done in science.

Science (Class IX)

1. *Ways of Living — Living Places and Organisms* : Habitat; microhabitat; interdependence; land, water and air as habitats; adaptation to land, water and arboreal habitats; man's manipulation of habitats.
2. *Ways of Living Birds* : Our common birds — their habits and habitats.
3. *Levels of Organization in the Living World* : Hierarchy of levels and basis of organization.
4. *Human Beings* : Structure of the human body and its uniqueness, exploitation of environment by man.

Science (Class X)

1. *Energy* : Man and energy; heat as a source of energy; heat and mechanical energy; accounting energy.
2. *Fuels* : Biomass as a fuel; fossil fuels (Classification of fuels); characteristics of fuels; ideal fuel.
3. *The Sun and Nuclear Energy* : What powers the sun; composition of sunlight; sources of sun's energy; nuclear fission; chain reaction; nuclear reactor; pollution; energy crisis.
4. *Nutrition* : Balanced diet; components of food; deficiency diseases and factors; food adulteration.
5. *Health* : Community and personal health; factors affecting health; food poisoning; pollution related diseases; diseases related to habit forming thereby affecting social environment; preventive measures and health education.
6. *Food Production and Management* : Agricultural practices (soil preparation, irrigation, use of fertilizers and pesticides); trends in food production and pre-post harvest practices (food storage, preservation, processing); control of pests; wastage of food resources.
7. *Universe and Earth System* : Formation of earth; beginning of the universe; organization of earth system; coal deposits; atmosphere; oceans.

8. *Metals and Non-Metals* : Occurrence; extraction and uses of non-living resources in the environment.
9. *Carbon and Its Compounds* : Sources of carbon compounds; man-made materials; recycling.
10. *Biosphere* : Structure and functioning of the ecosystem; biosphere; food chains; flow of energy; pyramids; cycling of materials (carbon, nitrogen, water, phosphorous, sulphur).
11. *Man and His Environment* : Human activities; the earth's atmosphere; inter-relationships; living sources and their management; effects of over-exploitation and industrialization; recycling of waste materials; ecological balance; role of recycling.
12. *Energy* : Harnessing solar energy; solar heating devices(solar cooker, solar water heater, solar cells); wind energy (wind mill); hydroelectricity; energy from the oceans.
13. *Water* : Occurrence; sources of water; origin of life in water: water for activities of living; water as a solvent, sea water as habitat of organisms, uses of water.
14. *Air* : Atmosphere protects the living from radiation; composition of air; water and particulate matter in air; carbon dioxide and its affects on living organisms; effects of acidic gases on historical monuments; harmful effects of carbon monoxide; harmful effects of metallic particles in the atmosphere; air pollution; radio-activity and sources of pollution; noise pollution.

Geography (Class IX)

1. *Our Environment* : Components and processes—elements of environment (atmosphere, lithosphere, hydrosphere); the biosphere—composition, structure, soil formation and degradation; volcanoes; earthquakes; realms of water; water in the biosphere; hydrological cycle; global water balance; air around us — pressure and winds, distribution of precipitation; weather and climate; factors affecting climate; climate and humans.
2. *Biosphere* : Components of ecosystem; food chain and food webs; energy flow; nutrient cycling; trophic levels; ecological efficiency; food pyramids; major ecosystems of the earth — aquatic, terrestrial; global distribution of biomes (tropical evergreen forests, mid-latitude evergreen forests, coniferous forests, deciduous forests, grassland); desertification, animals.
3. *Maps as an Aid to Understanding the Environment* : Atlas; maps; conventional signs and symbols in maps; study of local environment through maps.

4. *Human Population* : Distribution; factors affecting distribution of population; growth of population; population and food supply.
5. *Human Occupations* : Agriculture; animal rearing; lumbering; fishing; mining.
6. *Our Resources* : Classification of resources — renewable and non-renewable; land resources; soil resources; water resources; crop resources; forest resources; wildlife; animal resources—fisheries; mineral resources; mineral fuels — coal, oil; non-conventional sources of energy — solar, wind, geothermal; conservation of resources.
7. *Human Response to Environment* : Natural environment and human response in different regions (Equatorial, tropical mountain; tropical grassland; tropical desert; mediterranean; cold and hot deserts; taiga; polar region).
8. *Human Impact on Environment* : Soil erosion; air pollution; acid rains; ozone depletion; water pollution; land degradation; human impact on Biosphere; depletion of resources.

Geography (Class X)

1. *Climate* : Physical features of India; temperature and rainfall distribution; mechanism of monsoons; hot and cold seasons; distribution of precipitation.
2. *Flora, Fauna and Soils* : Natural ecosystem — diversity of plants vegetation regions, (tropical rain forests, tropical deciduous forests, tidal forests, variety of fauna); wildlife of India; soil types (alluvial, red, laterite desert and mountain soils); land use pattern : water resources; water budget.
3. *Mineral and Power Resources* : Iron, manganese; bauxite mica; copper; coal, oil; thermal and nuclear power; non-conventional sources of energy (wind, tidal, geothermal energy plantations, energy from urban waste) solar energy.
4. *Human Resources* : Population growth; distribution of population; rural-urban divide; age composition; cultural composition of population; reasons for growing population.

Economics (Class IX-X)

1. Population situation in India; social infrastructure (health and family welfare), urbanization; poverty. Health, education, environment — indicators of economic development.
2. Meeting food requirements; food problems; new technologies in agriculture; future outlook of industrial development.

Language English (Class IX)

- 1.. *Oil* : Role of oil in our lives; main groups of oils; origin of motor car oil (fuels) areas of oil deposits in seas.
- 2.. Plants also breathe and feel.

English (Class X)

- 1.. Cherry Tree (Poem on a tree).

SENIOR SECONDARY STAGE (+2 STAGE)

Environmental components are intensively covered in subjects like Biology, Geography, Chemistry, Economics and Sociology.

Biology (Class XI)

1. *Species and Population* : Origin of species; interaction ; population factors affecting population; human population.
2. *Biotic Community* : Interaction within and among the species; relationships like predation, scavenging, parasitism, commensalism; symbiosis, competition; biotic stability; changes in a community (succession and different series); primary and secondary succession; dominance of species.
3. *The Ecosystem* : Organization of the ecosystem; biotic components, food chains; producers, consumers and decomposers; food web; pyramids of numbers; biomass and energy; abiotic components (temperature, water, light, humidity, wind Ph, mineral elements topography); habitat niche major ecosystems biomes (tundra, taiga, deciduous forests, tropical rain forests chapparal, tropical savannah, grassland (prairies, steppes) desert altitudinal biomes; aquatic ecosystems marine environments (the open sea coastal region) fresh water environment (lakes, ponds, streams, rivers) man-made ecosystems; agro ecosystems; boundaries of ecosystems; biosphere.
4. *Biosphere* : Hydrosphere; lithosphere; atmosphere; biosphere; space ship (open and close system); matter and energy recycling of materials (carbon cycle, oxygen cycle, nitrogen cycle, water cycle, phosphorus cycle, sulphur cycle and cycle of other materials); flow of energy; primary productivity and secondary productivity.
5. *Natural Resources and Their Utilization* : Natural resources (inorganic, organic mixtures) : renewable and non-renewable; exhaustible and inexhaustible; energy sources — plants and animals; atmosphere (ozone, layer, ionosphere); water resources; land resources (soil—types and properties, humus, soil erosion) mineral resources (important minerals both metallic and non-metallic and their utilization); living resources (plants, animals, micro-organisms); alterations in the environment (physical conditions, biological communities); depletion and degradation of resources; consequences of alteration — environmental imbalance.
6. *Environmental Pollution* : Atmospheric pollution — pollutants: sources of air pollution; mobile combustion sources; industrial processing and other sources; effects of air pollution (human health, damage to

vegetation, injury to animals aesthetic insults deterioration of materials) changes in climate, global warming, green house effect, control of air pollution emissions, conversion of pollutants.

- 7.. *Water Pollution* : Pollution of medium, habitat and type of pollutant; sources of man-made pollution; community waste waters; industrial pollution; agricultural pollution sources; marine pollution; effects of water pollutants; thermal pollution; control of water pollution.
- 8.. *Soil Pollution and Land Degradation* : Pesticides; salination of soil; control of soil pollution; recycling and recovery; land degradation, soil erosion, floods, deforestation; shifting cultivation; desertification; development activities; control of land degradation; land and water management in India; wasteland development.
- 9.. *Radioactive Pollution* : Nuclear weapons: reactors and nuclear fuels; other sources (radioactive isotopes, X-ray, and radiation therapy); effects of radiation pollution; control of radiation; pollution problems of radioactive waste disposal.
10. *Noise Pollution* : Sources of noise pollution, effects of noise pollution, especially on human health; control of noise pollution.
11. *Wildlife and Forest Conservation* : Importance of wildlife, causes of extinction of species; concept of threatened species (endangered, vulnerable, rare, threatened) conservation of wildlife; conservation strategies; protected areas in India, forests (importance, forests in India, deforestation, conservation of forests).

Chemistry (Class XI)

Earth as a source of elements, elements in the living system; elements in sea.

Sources of Energy : Fossil fuels (coal, hydrocarbons); hydroelectric power; nuclear power; wind, tidal waves; ocean currents; geothermal; conservation of energy sources; alternative sources of energy; pollution associated with conservation of fuels.

Chemistry (Class XII)

Application of radioactivity; age of minerals and rocks; radio-carbon dating; hazards of nuclear radiations.

Geography (Class XI)

- 1.. *Earth and Its Origin* : Origin and evolution of the earth; major surface features of the earth.
- 2.. *Lithosphere* : Earth's interior and evidences about it temperature and

- pressure; density and composition; rocks and minerals (types); movements of the earth (volcanoes forms causes and affects earthquakes); landforms (mountains plateaus and plains); soils (profile properties, factors of soil formation); soil classification—zonal groups (pedalfers pedocals); the underground water (water table, wells, springs); degradation and aggradation; types of weathering; cycle of erosion, drainage patterns, glaciers; wind; sea waves; coast and coastlines.
3. *Atmosphere* : Composition (water vapour, dust particles, other gases); structure (troposphere, stratosphere, mesosphere, ionosphere, exosphere); insolation; heating and cooling system (radiation, conduction, convection) heat budget; latitudinal heat balance; temperature and factors controlling temperature; horizontal distribution of temperature; atmospheric pressure (seasonal distribution); winds; periodic winds; moisture in the atmosphere (evaporation and condensations); forms of condensation (dew, frost, fog, mist); precipitation (snowfall, sleet): distribution of precipitation.
 4. *Classification of Climates* : Climatic groups; climatic types (humid, dry or desert, steppe); humid climate (taiga, cool coast and continental); the polar climate (tundra, ice-cap); climates of highlands; climate and man.
 5. *Hydrosphere* : Division of ocean floor (continental shelf, continental slope, continental rise, abyssal plain); ocean waters (temperature, distribution of temperature in ocean, sub-surface temperature, salinity and its distribution, movements in oceans, waves and currents; currents in the Pacific, Atlantic and Indian oceans).
 6. *Marine Life and Deposits* : Modes of marine life; types of marine life (Plankton, Benthos, Nekton); marine vegetation; marine animals; marine deposits; organic deposits; pelagic deposits.
 7. *Man and Oceans* : Oceans and climate; oceans and food resources; oceans and mineral resources; oceans and petroleum; oceans and energy.
 8. *Biosphere* : Ecosystem : cycling of matter and flow of energy; food pyramids of numbers; human impact on the ecosystem.
 9. *Natural Resources* : Types; classification of resources based on their renewability, origin and utility renewable resources—forests (types—tropical hardwood forests, equatorial forests monsoon forests; temperate deciduous forests; taiga): forest products and economic activities like lumbering, conservation of forests and wildlife; fish types and distribution of fisheries; pollution of oceans; grasslands and animal rearing; non-renewable mineral resources— iron, copper, bauxite.
 10. *Energy Sources* : Coal; mineral oil; water energy; non conventional

- energy sources; biogas: solar energy; wind energy.
11. *Conservation of Natural Resources*: Need for conservation; conserving resources (soil, water, forests, wildlife and fish, mineral resources).
 12. *Utilization of Natural Resources* : Agriculture (shifting cultivation, intensive and extensive cultivation, mixed farming).
 13. *Population* : Density of population and distribution; factors affecting distribution of population (physical accessibility, relief measures, climate, natural vegetation, soils availability of water, social and cultural factors) : urban and rural population; population growth and economic development; urban settlements.

Geography (Class XII)

The following aspects of geography and environment are covered with respect to India.

1. *Relief and Drainage* : Evaluation of relief features; three physio-graphic regions (The Himalayan Mountain chain, the North Indian plain, the peninsular plateau); drainage evolution of drainage river systems.
2. *Climate* : Unifying role of weather factors; mechanisms of weather pressure and winds; Indian monsoonal regime; rain bearing system and rainfall distribution; annual rainfall and its variability; incidence of drought; climatic regions of India.
3. *Soils and Natural Vegetation* : Soils formation (parent material, relief, climate natural vegetation); major soil types (alluvial black, red, laterite; soil erosion and soil conservation natural vegetation—vegetation types (moist tropical evergreen, tropical moist deciduous, dry tropical deciduous); use and misuse of vegetal cover; state of the ecosystem.
4. *Population of India* : General demographic scene; distribution; spatial distribution; density of population; growth of population; trends in population growth; migration trends in India.
5. *Population Composition in India* : Rural - Urban composition; urbanization; age structure age — sex pyramid, ethnic and socio-cultural attributes.
6. *Human Settlements* : Rural and urban settlements; settlement patterns; house types and climate.
7. *Natural Resources of India* : Survey of India's resources—land (pattern of land utilization); water resources forest, resources; livestock and grasslands; fisheries and marine resources; energy resources—coal, oil hydroelectric power, nuclear power; conservation of natural resources.

Economics (Class XI)

1. *Population Explosion* : Basic causes of population explosion; factors responsible for high birth rate urgency for lower birth rate; measures for lower birth rate; family planning programme.
2. *Agricultural Development* : Growth factors; production of principal crops and area under their cultivation irrigation; fertilizers; crop rotation: plant protection;(pesticides); improvement in food yield; food problem; food policy; food management.
3. *Health as Indicator of Human Resource Development* : Health development since 1950; health care system in the rural areas; primary health centres; community health centers; subsidiary health centres; housing—urbanization; water supply; sanitation.

Sociology (Class XI)

1. *Ecology — Rural and Urban Communities* : Community; environment and community; ideal type of community; primitive community (hunting stage, food-gathering stage, pastoral stage, stage of agriculture); pre-industrial cities; industrial cities; the concept of urbanism; urbanization and its social implications; urban ecology; internal urban ecological processes; development and balanced environment.

Sociology (Class XII)

1. *Population Problem and Society in India* : Overpopulation and socio-economic problems; population and economic development; theories of population; pre-Malthusian views; Malthusian theory of population; neo-classical theories; theory of demographic transition; composition of India's problem; National Population Policy and Development.
2. *Factors of Social Change* : Economic factors; cultural factors; legal factors; political factors.

Language (Hindi) (Class XII)

1. *Uttri Swapon Pari — Harit Kranti*
2. *Rasyan aur Hamara Parayavaran.*

Part II

Enrichment Materials on Environment for Students and Teachers

1. Printed Supplementary Materials

The supplementary materials listed below on environment and related topics have been developed for teachers to enhance their knowledge and make the teaching of environment more effective.

1. Our Tree Neighbours
2. Investigating Air and Water Pollution
3. Energy and You
4. Rocks and Soils
5. Discovery of Oceans
6. Our Agriculture
7. The Microbes
8. Fight Against Disease

2. Audio-Visual

A. Educational Films on Environment

- (i) Understanding Animals
- (ii) Teaching Science through Environment (Rocks and Soils)
- (iii) Learning through Environment
- (iv) The Eternal Sands
- (v) Desert Gold
- (vi) Malabar Coast
- (vii) The Great Shores
- (viii) Changing Winds

B. Educational Television Programme on Environment

- (i) *Hawa Hamare Charon Ore*
- (ii) *Pani (water)*
- (iii) *Tarak Pakshi*
- (iv) *Air Supports Life*
- (v) *What is Rain*
- (vi) *Air Pollution*

- (vii) *Avalokan aur Paryavaran*
- (viii) **Story of Drought**
- (ix) **Eco-system (*Jheel Ke Kinare Ek Din*)**
- (x) **Valley of Doon**
- (xi) **Castles in the Air**
- (xii) **Delhi Metropolis**
- (xiii) **The Great Thirst**
- (xiv) *Pyasi Dharti*
- (xv) **Learning through Environment**
- (xvi) **National Environment Awareness Campaign**
- (xvii) **Malabar Coast**
- (xviii) **Eternal Sands**
- (xix) **Desert Gold**
- (xx) **Population Education — series**

3. Video Programme for Teachers of all Stages Population Growth and Environment

Impact of unplanned growth of population on various life supporting components of environment. The visuals on land degradation, air pollution, Chipko and Apico movements have been used to highlight environmental aspects and the efforts for environmental protection and improvement; several questions and issues are mentioned to generate discussion among viewers.

Part III

Teacher Enrichment Materials

Environmental Education Enrichment Materials (guides) for Teachers

The following teacher education modules on environmental education have also been developed by the NCERT for Unesco. These are useful guides to teachers and teacher educators on various aspects of teaching learning of environment. These modules provide guidelines for environmentalizing the teaching of environmental concepts along with activities and evaluation tools.

I. ENVIRONMENTAL EDUCATION: MODULE FOR IN-SERVICE TRAINING OF TEACHERS AND SUPERVISORS FOR PRIMARY SCHOOLS (EE SERIES NO. 6 UNESCO, PARIS)

1. **Need and Basis for EE in In-service Training**
 - Need for and justification of EE
 - History of EE
 - Philosophy, goals, general objectives and guiding principles of EE
 - In-service training of teachers
2. **Essential knowledge about the Environment**
 - (i) *Environment — Its Origin and Nature*
 - Natural and socio-cultural environment
 - Key concepts determining the environment
 - Organisms and environment
 - The manmade environment
 - Earth as the home of life
 - Try yourself
 - (ii) *Pathway of Matter and Flow of Energy*
 - Recycling of matter
 - Flow of energy
 - Man alters nature
 - Resources
 - Try-yourself

(iii) *Ecological System*

- Ecosystem
- Abiotic factors
- Biotic factors
- Man and ecosystems
- Try-yourself

3. Environmental Problems and Their Solutions

(i) *Environmental Resources — Their Deterioration and Solutions*

- Our energy resources
- Our air resources
- Our water resources
- Our soil resources
- Our mineral resources
- Our plant and animal resources

(ii) *Social-cultural Factors Behind Environmental Problems*

- Population explosion
- Consequences of application of Science and Technology
- Differing socio-economic system

(iii) *Strategy for Environmental Action*

- Meeting basic human needs
- Population control
- EE
- Community action in ecological restoration
- Living in harmony with nature

4. Teaching Methodologies

- Determinants of teaching methodologies
- Inquiry training and problem solving
- Clarifying teaching strategies
- Simulation and gaming
- Beyond-the-school-wall experiences
- Case Study

5. Experiments and Activities to Facilitate Teaching/Learning of EE

- Studying local environment
- Understanding environment and environmental problems
- Environmental action
- Environmental games and other follow-up activities

6. Evaluation in EE Teaching

- Evaluation focus
- Evaluation mode

- Utilization of evaluation
- Try-yourself
- 7. Curriculum development, implementation and management
- 8. Bibliography and Glossary
- II. ENVIRONMENTAL EDUCATION: A PROCESS FOR PRE-SERVICE TEACHING-TRAINING CURRICULUM DEVELOPMENT (EE SERIES NO. 26 UNESCO, PARIS)

The module provides quite useful information on various aspects of EE.

- Development of Environmental Education
- Goals, objectives and guiding principles of EE
- Need for EE training of teachers
- Essential element of EE in teachers training
- Process for curriculum development in EE for teacher training
- Teaching methodologies and strategies
- Foundation education and its environmentalization
- Evaluation in the context of EE learning
- Mechanisms of development
- An outline of teacher training courses in EE
- For elementary and secondary stages
- Suggested activities
- A check-list of priority requirements, national and international actions as suggested in world conservation Strategy
- Bibliography

III. ENVIRONMENTAL EDUCATIONS MODULE FOR PRE-SERVICE TRAINING OF SOCIAL SCIENCE TEACHERS AND SUPERVISOR FOR SECONDARY SCHOOLS (EE SERIES NO. 9 UNESCO, PARIS)

The module deals with various aspects of EE and some of these listed below are quite useful for teachers and teacher trainers.

1. Need and basis of EE for pre-service training of social science teachers
 - What is EE?
 - History and Philosophy of EE
 - Unesco UNEP - IEEP
 - EE in Secondary Schools
 - Pre-service training in EE
2. Essential knowledge about the environment for secondary school
 - Natural environment
 - Man-made of socio-cultural environment
 - Environmental ethics

- Environmental decisions
- 3. **Problems of the environment and means and ways of solving them**
- Environmental problems of physical, social and economic consequences
- Environmental problems on geographical scale and time scale
- Environmental problems of developed and developing countries
- Solutions of environmental problems
- 4. **Teaching Methodologies**
- Determinants of teaching methodology
- Investigatory approach — scientific inquiry
- Study guide sheet — simulation and gaming
- Study guide sheet — clarifying strategies
- Study guide sheet — beyond the school wall experiences
- 5. **Activities and Experiments for Teaching / Learning the environmental dimension in social science**
- Suggested activities and experiments for essential knowledge about the environment and its problems and their solutions.
- Project work
- 6. **Evaluation**
- Study guide sheet — evaluation in EE
- Study guide sheet — evaluation in EE teaching
- Try-yourself.
- 7. **Strategies for Planning, Development, Implementation, Management and Evaluation of the EE Dimension of Secondary School Social Studies Curriculum**

IV. POPULATION EDUCATION — A NATIONAL SOURCE BOOK (VOL. I, NCERT)

The source book has been developed to provide a comprehensive information on population education including important aspect of environment and development. It would help the teachers and teacher educators and the students of Secondary and Senior Secondary schools to acquire information and understand the complexities of population. The contents of the source book deal with various aspects of population which are given below.

1. Population dynamics
2. Population and development
3. Population, environment and resources
4. Population and health
5. Population and nutrition
6. Family life education
7. Population change and education in India

The chapter on population environment and resources deals with the

status of environment vis-a-vis population explosion. The topics discussed are :

- Sustainable development
- Deforestation
- Soil erosion
- Flooding
- Excessive ground water explosion
- Threat to wild life
- Use of chemical fertilizers and pesticides
- Unimaginative mining
- Water pollution
- Ocean pollution
- Air pollution
- Acid rain
- Green-house effect
- Ozone depletion
- Efforts to improve the quality of environment
- Countering deforestation
- People's participation
- Protection of wild plants and animals
- Recycling of resources
- Innovative waste utilization
- Cleaning up the Ganges
- Natural resources — rational utilization
- Mineral resources (coal, petroleum, energy)
- Non-conventional sources of energy (solar energy, wind, biomass, biogas, geothermal energy, ocean energy).

V. HEALTH AND POPULATION EDUCATION EXPERIMENTAL PACKAGE (HINDI)

ENRICHMENT MATERIALS FOR YOUTH AND SCHOOLS

1. Population education
2. Growing pollution — a new danger
3. Personal hygiene
4. Communicable diseases
5. Teaching/learning activities and resources

VI. INDIA — MY CHILDREN, MY FUTURE

The volume contains paintings of children reflecting their feelings and expression about population and environmental issues. The broad categories are on topics like population and space, population and environment, population and pollution, population and poverty, population and basic needs like food, transport, etc.

VII. INDIA — YOUTH'S THUNDERING VOICES

Essays by children on population and environment.

TEXTBOOKS PUBLISHED BY THE NCERT AND USED FOR IDENTIFICATION OF THE EE COMPONENTS**CLASS III**

1. We and Our Country (social studies)
2. Exploring Environment Book - I (science)

CLASS IV

1. Our Country India
2. Exploring Environment Book - II (science)

CLASS V

1. Our Country and the World (social studies)
2. Exploring Environment Book-III (science)

CLASS VI

1. Kishore Bharti Bhag - I
2. Read for Pleasure - III (English supplementary reader for Class VI)
3. Lands and Peoples Part - I
4. Our Civic life
5. Science Book - I

CLASS VII

1. Kishore Bharati Bhag - II
2. Read for Pleasure - IV (English supplementary reader for Class VII)
3. How we Govern Ourselves
4. Medieval India
5. Lands and Peoples Part - II
6. Science Book - II

CLASS VIII

1. Kishore Bharti Bhag - III
2. Read for Pleasure - V (English supplementary reader for Class VIII)
3. Our Country Today — Problems and Challenges (civics)
4. Modern India (history)
5. Lands and Peoples Part- III (geography)
6. Science Book - III

CLASS IX —

1. Parag Bhag - I (Hindi textbook 'A' Course, prose)
2. Manasi Bhag - I (Hindi textbook 'B' Course)
3. Science

4. The Story of Civilization Volume I (history)
5. Understanding Environment (geography)
6. A New Introduction to Our Economy

CLASS X

1. Swati Bhag - II (Hindi textbook 'A' Course, poetry)
2. Parag Bhag - II (Hindi textbook 'A' Course, prose)
3. Science
4. The Story of Civilization Volume II (history)
5. India — Economic Geography (geography)
6. Our Government — How it Functions (civics)

CLASS XI

1. Niharika Bhag- I (Hindi textbook, Core, poetry)
2. Pallav Bhag - I (Hindi textbook, Core, prose)
3. I—The People (English supplementary reader, Core)
4. Stories, Plays and Tales of Adventure (English, supplementary reader, Core)
5. Ancient India (history)
6. Principles of Geography Part - I
7. Principles of Geography Part - II
8. An Introduction to Sociology
9. Medieval India (history)
10. Evolution of Indian Economy
11. Field Work and Laboratory Techniques in Geography
12. Chemistry Part - I
13. Chemistry Part - II
14. Biology Part - I
15. Biology Part - II

CLASS XII

1. The Web of Our Life (Core)
2. Biology Part- I
3. Biology Part - II
4. Chemistry Part - I
5. Chemistry Part - II
6. India—General Geography (geography)
7. General Geography of Indian Resources and Regional Development (second semester)
8. An Introduction to Economic Theory
9. Social Change

Part IV

Environmental Education — Recent Developments and NCERT

The Department of Education in Science and Mathematics of NCERT has undertaken a project (1993) to analyse the School Curricula developed by the Council as part of the implementation of National Policy on Education (1986). The analysis was done to identify the EE concepts and activities vis-a-vis the universal objectives of EE (Awareness, Knowledge, Skills, Attitudes, Participation) as agreed at the Tbilisi Conference (1977). This exercise also helped in the identification of the strengths and weaknesses of NCERT curricula in terms of expectations of EE.

The Department of Science and Mathematics, on behalf of the NCERT, also undertook a Unesco sponsored Case Study on Environmental Education in India. This opportunity provided insight into the present status of EE Concepts and training at the school level, higher education and technical education. This would help in strengthening EE components at the school level.

The recent developments such as, launching of World Conservation Strategy (1984), report of the World Commission on Environment and Development—Our Common Future—culminated into Agenda 21 agreed upon by 170 nations and adopted at the United Nations Conference on Environment and Development held at Rio, Brazil during June 1992. The concept of sustainable development has become an integral component of EE activities. In fact, EE is rechristened as Environmental and Development Education in Agenda 21.

Agenda 21 takes into account all areas/subjects with bearing on global environment. It also covers different areas which could be employed to promote environmentally sound development. Some of the subjects are poverty, consumption patterns, demographic dynamics, deforestation, desertification and so on (Annexure I).

Each section on the various subjects suggests analysis of the specific problem concerning each subject and also gives possibilities for procuring resources to initiate and sustain suitable action.

Chapter 36 of Agenda 21 (Annexure II) is titled promoting Education, Public Awareness and Training. The three programme areas described are:

- Reorienting education towards sustainable development
- Increasing public awareness

Promoting training

Education has been considered as "critical for promoting sustainable development and improving the capacity of the people to address environment and development issues. While basic education provides the underpinning for any environmental and development education, the latter needs to be incorporated as an essential part of learning" (details in Annexure II).

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Annexure I

Agenda 21—United Nations Conference on Environment and Development (UNCED) Rio, Brazil, 1992

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Annexure II

Agenda 21—United Nations Conference on Environmental Development (UNCED) Rio, Brazil, 1992

CHAPTER 36

PROMOTING EDUCATION, PUBLIC AWARENESS AND TRAINING

INTRODUCTION

36.1 Education, raising of public awareness and training are linked to virtually all areas in Agenda 21, and even more closely to the ones on meeting basic needs, capacity-building, data and information, science, and the role of major groups. This chapter sets out broad proposals, while specific suggestions related to sectoral issues are contained in other chapters. The Declaration and Recommendations of the Tbilisi Intergovernmental Conference on Environmental Education organized by UNESCO and UNEP and held in 1977, have provided the fundamental principles for the proposals in this document.

36.2 Programme areas described in the present chapter are :

- (a) Reorienting education towards sustainable development;
- (b) Increasing public awareness;
- (c) Promoting training.

PROGRAMME AREAS

A. REORIENTING EDUCATION TOWARDS SUSTAINABLE DEVELOPMENT

Basis for action

36.3 Education, including formal education, public awareness and training should be recognized as a process by which human beings and societies can reach their fullest potential. Education is critical for promoting sustainable development and improving the capacity of the people to address environment and development issues. While basic education provides the underpinning for any environmental and development education, the latter needs to be incorporated as an essential part of learning. Both formal and non-formal education are indispensable to changing people's attitudes so that they have the capacity to assess and address their sustainable development concerns. It is also critical for achieving environmental and ethical awareness, values and attitudes, skills and behaviour consistent with sustainable development and for effective public participation in decision-making. To be effective, environment and development education should deal with the dynamics of both the physical/biological and socio-economic environment and human (which may include spiritual) development, should be integrated in all disciplines, and should employ formal and non-formal methods and effective means of communication.

Objectives

36.4 Recognizing that countries, regional and international organizations will develop their own priorities and schedules for implementation in accordance with their needs, policies and programmes, the following objectives are proposed :

- (a) To endorse the recommendations arising from the World Conference on Education for All Meeting Basic Learning Needs (Bamien, Thailand, 5-9 March 1990) and to strive to ensure universal access to basic education, and to achieve primary education for at least 80 per cent of girls and 80 per cent of boys of primary school age through formal schooling or non-formal education and to reduce the adult illiteracy rate to at least half of its 1990 level. Efforts should focus on reducing the high illiteracy levels and redressing the lack of basic education among women and should bring their literacy levels into line with those of men;
- (b) To achieve environmental and development awareness in all sectors of society on a worldwide scale as soon as possible;
- (c) To strive to achieve the accessibility of environmental and development education, linked to social education, from primary school age through adulthood to all groups of people;
- (d) To promote integration of environment and development concepts, including demography, in all educational programmes, in particular the analysis of the causes of major environment and development issues in a local context, drawing on the best available scientific evidence and other appropriate sources of knowledge, and giving special emphasis to the further training of decision makers at all levels.

Activities

36.5. Recognizing that countries and regional and international organizations will develop their own priorities and schedules for implementation in accordance with their needs, policies and programmes, the following activities are proposed :

- (a) All countries are encouraged to endorse the recommendations of the Jomtien Conference and strive to ensure its Framework for Action. This would encompass the preparation of national strategies and actions for meeting basic learning needs, universalizing access and promoting equity, broadening the means and scope of education, developing a supporting policy context, mobilizing resources and strengthening international cooperation to redress existing economic, social and gender disparities which interfere with these aims. Non-governmental organizations can make an important contribution in designing and implementing educational programmes and should be recognized;
- (b) Governments should strive to update or prepare strategies aimed at integrating environment and development as a cross-cutting issue into education at all levels within the next three years. This should be done in cooperation with all sectors of society. The strategies should set out policies and activities, and identify needs, cost, means and schedules for their implementation, evaluation and review. A thorough review of curricula should be undertaken to ensure a multidisciplinary approach, with environment and development issues and their socio-cultural and demographic aspects and linkages. Due respect should be given to community-defined needs and diverse knowledge systems, including science, cultural and social sensitivities;
- (c) Countries are encouraged to set up national advisory environmental education coordinating bodies or round tables representative of various environmental, developmental, educational, gender and other interest, including non-governmental organizations, to encourage partnerships, help mobilize resources and provide a source of information and focal point for international ties. These bodies would help mobilize and facilitate different population groups and communities to assess their own needs and to develop the necessary skills to create and implement their own environment and development initiatives;

- (d) Educational authorities, with the appropriate assistance from community groups or non-governmental organizations, are recommended to assist or set up pre-service and in-service training programmes for all teachers, administrators, and educational planners, as well as non-formal educators in all sectors, addressing the nature and methods of environmental and development education and making use of relevant experience of non-governmental organizations;
- (e) Relevant authorities should ensure that every school is assisted in designing environmental activity work plans, with the participation of students and staff. Schools should involve school children in local and regional studies on environmental health, including safe drinking water, sanitation and food and ecosystems and in relevant activities, linking these studies with services and research in national parks, wildlife reserves, ecological heritage sites, etc;
- (f) Educational authorities should promote proven educational methods and the development of innovative teaching methods for educational settings. They should also recognize appropriate traditional education systems in local communities;
- (g) Within two years the United Nations system should undertake a comprehensive review of its educational programmes, encompassing training and public awareness, to reassess priorities and reallocate resources. The UNESCO/UNEP International Environmental Education Programme should, in cooperation with the appropriate bodies of the United Nations system, Governments, non-governmental organizations and others, establish a programme within two years to integrate the decisions of the conference into the existing United Nations framework adapted to the needs of educators at different levels and circumstances. Regional organizations and national authorities should be encouraged to elaborate similar parallel programmes and opportunities by conducting an analysis of how to mobilize different sectors of the population in order to assess and address their environmental and development education needs;
- (h) There is a need to strengthen, within five years, information exchange by enhancing technologies and capacities necessary to promote environment and development education and public awareness. Countries should cooperate with each other and with the various social sectors and population groups to prepare educational tools that include regional environment and development issues and initiatives, using learning materials and resources suited to their own requirements;
- (i) Countries could support university and other tertiary activities and networks for environmental and development education. Cross-disciplinary courses could be made available to all students. Existing regional networks and activities and national university actions which promote research and common teaching approaches on sustainable development should be built upon and new partnerships and bridges created with the business and other independent sectors, as well as with all countries for technology, know-how and knowledge exchange.
- (j) Countries assisted by international organizations, non-governmental organizations and other sectors, could strengthen or establish national or regional centres of excellence in interdisciplinary research and education in environmental and developmental sciences, law and the management of specific environmental problems. Such centres could be universities or existing networks in each country or region, promoting cooperative research and information sharing and dissemination. At the global level these functions should be performed by appropriate institutions;
- (k) Countries should facilitate and promote non-formal education activities as the local, regional and national levels by cooperating with and supporting the efforts of non-formal educators and other community-based organizations. The appropriate bodies of the United Nations system in cooperation with non-governmental organizations should encourage the development of an international network for the achievement of global educational aims. At the national and local levels, public and scholastic forums should discuss environmental and development issues, and suggest sustainable alternatives to policy makers;

- (l) Educational authorities, with appropriate assistance of non-governmental organizations, including women's and indigenous peoples' organizations should promote all kinds of adult education programmes for continuing education in environment and development, basing activities around elementary/secondary schools and local problems. These authorities and industry should encourage business, industrial and agricultural schools to include such topics in their curricula. The corporate sector could include sustainable development in their education and training programmes. Programmes at a post-graduate level should include specific courses aiming at the further training of decision makers;
- (m) Governments and educational authorities should foster opportunities for women in non-traditional fields and eliminate gender stereotyping in curricula. This could be done by improving employment opportunities, including females in advanced programmes as students and instructors, reforming entrance and teacher staffing policies and providing incentives for establishing child-care facilities as appropriate. Priority should be given to the education of young females and to programmes promoting literacy among women;
- (n) Governments should affirm the rights of indigenous peoples, by legislation if necessary, to use their experience and understanding of sustainable development to play a part in education and training;
- (o) The United Nations could maintain a monitoring and evaluative role regarding decisions of the United Nations Conference on Environment and Development on education and awareness, through the relevant United Nations Agencies. With Governments and non-governmental organizations, as appropriate, it should present and disseminate decisions in a variety of forms, and should ensure the continuous implementation and review of the educational implications of Conference decisions, in particular through relevant events and conferences.

Means of Implementation

36.6. The Conference secretariat has estimated the average total annual cost (1993-2000) of implementing the activities of this programme to be about \$8 billion to \$9 billion, including about \$ 3.5 billion to \$4.5 billion from the international community on grant or concessional terms. These are indicative and order of magnitude estimates only and have not been reviewed by Governments. Actual costs and financial terms, including any that are non-concessional, will depend upon, inter alia, the specific strategies and programmes Governments decide upon for implementation.

36.7. In the light of country specific situations, more support for education, training and public awareness activities related to environment and development could be provided in appropriate cases, through measures such as the following:

- (a) Giving higher priority to those sectors in budget allocations, protecting them from structural cutting requirements;
- (b) Shifting allocations within existing education budgets in favour of primary education, with focus on environment and development;
- (c) Promoting conditions where a larger share of the cost is borne by local communities, with rich communities assisting poorer ones;
- (d) Obtaining additional funds from private donors concentrating on the poorest countries, and those with rates of literacy below 40 per cent.
- (e) Encouraging debt for education swaps;
- (f) Lifting restrictions on private schooling and increasing the flow of funds from and to non-governmental organizations, including small-scale grass roots organizations;
- (g) Promoting the effective use of existing facilities, for example, multiple school shifts, fuller development of open universities and other long-distance teaching;
- (h) Facilitating low-cost or no-cost use of mass media for the purposes of education;
- (i) Encouraging twinning of universities in developed and developing countries.

B. INCREASING PUBLIC AWARENESS

Basis for action

36.8. There is still a considerable lack of awareness of the interrelated nature of all human activity and the environment, due to inaccurate or insufficient information. Developing countries in particular lack relevant technologies and expertise. There is a need to increase public sensitivity to environment and development problems and involvement in their solutions and foster a sense of personal environment responsibility and greater motivation and commitment towards sustainable development.

Objective

36.9. The objective is to promote broad public awareness as an essential part of a global education effort to strengthen attitudes, values and actions which are compatible with sustainable development. It is important to stress the principle of devolving authority, accountability and resources to the appropriate level with preference given to local responsibility and control over awareness build activities.

Activities

36.10. Recognizing that countries, regional and international organizations will develop their priorities and schedules for implementation in accordance with their needs, policies and programme the following activities are proposed :

- (a) Countries should strengthen existing advisory bodies or establish new ones for public environmental and development information, and should coordinate activities with among others the United Nations, non-governmental in discussions of environmental policies and assessments. Governments should also facilitate and support national to local networking of information through existing networks.
- (b) The United Nations system should improve its outreach in the course of a review of education and public awareness activities to promote greater involvement and coordination of all parts of the system, especially its information bodies and regional and country Operatic Systematic surveys of the impact of awareness programmes should be conducted recognized the needs and contributions of specific community groups
- (c) Countries and regional organizations should be encouraged, as appropriate to proved published environmental and development information services for raising the awareness of all group, the private sector and particularly decision makers;
- (d) Countries should stimulate educational establishments in all sectors, especially the tertiary sector, to contribute more to awareness building. Educational materials of all kinds and for all audiences should be based on the best available scientific information, including the natural behavioural and social sciences and taking into account aesthetic and ethical dimensions.
- (e) Countries and the United Nations system should promote a cooperative relationship with the media, popular theatre groups, and entertainment and advertising industries by initiating discussions to mobilize their experience in shaping public behaviour and consumption patterns and making wide use of their methods. Such cooperation would also increase active public participation in the debate on the environment. UNICEF should make child-oriented material available to the media as an educational tool, ensuring close cooperation between the out of school public information sector and the school curriculum, for the primary level. UNESCO, UNEP and universities should enrich pre-service curricula for journalists on environment and development topics;
- (f) Countries, in cooperation with the scientific community, should establish ways of employing modern communication technologies for effective public outreach. National and local educational authorities and relevant United Nations agencies should expand, as appropriate, the use of audio-visual methods, especially in rural

- areas in mobile units, by producing television and radio programmes for developing countries, involving local participation, employing interactive multimedia methods, and integrating advanced methods with folk media;
- (g) Countries should promote, as appropriate, environmentally sound leisure and tourism activities building on the Hague Declaration of Tourism (1989) and the current programmes of the World Tourism Organization and UNEP, making suitable use of museums, heritage sites, zoos, botanical gardens, national parks, and other protected areas;
 - (h) Countries should encourage non-governmental organizations to increase their involvement in environmental and development problems, through joint awareness initiatives and improved interchange with other constituencies in society;
 - (i) Countries and the United Nations system should increase their interaction with and include, as appropriate, indigenous people in the management, planning and development of their local environment, and should promote dissemination of traditional and socially learned knowledge through means based on local customs, especially in rural areas, integrating these efforts with the electronic media, whenever appropriate;
 - (j) UNICEF, UNESCO, UNDP and non-governmental organizations should develop support programmes to involve young people and children in environment and development issues, such as children's and youth hearing, building on decisions of the World Summit for Children;
 - (k) Countries, the United Nations and non-governmental organizations should encourage mobilization of both men and women in awareness campaigns, stressing the role of the family in environmental activities, women's contribution to transmission of knowledge and social values and the development of human resources;
 - (l) Public awareness should be heightened regarding the impact of violence in society.

Means of Implementation

36.11 The Conference secretariat has estimated the average total annual cost (1993-2000) of implementing the activities of this programme to be about \$1.2 billion including about \$110 million from the international community on grant or concessional terms. These are indicative and order of magnitude estimates only and have not been reviewed by Governments. Actual costs and financial terms, including any that are non-concessional, will depend upon, inter alia, the specific strategies and programmes Governments decide upon for implementation.

C. PROMOTING TRAINING

Basis for action

36.12 Training is one of the most important tools to develop human resources and facilitate the transition to a more sustainable world. It should have a job-specific focus, aimed at filling gaps in knowledge and skill that would help individuals find employment and be involved in environmental and development work. At the same time, training programmes should promote a greater awareness of environment and development issues as a two-way learning process.

Objectives

36.13 The following objectives are proposed :

- (a) To establish strengthen vocational training programmes that meet the needs of environment and development with ensured access to training opportunities, regardless of social status, age, gender, race or religion;
- (b) To promote a flexible and adaptable workforce of various ages equipped to meet growing environment and development problems and changes arising from the transition to a sustainable society;
- (c) To strengthen national capacities, particularly in scientific education and training,

- to enable Governments, employers and workers to meet their environmental and development objectives and to facilitate the transfer and assimilation of new environmentally sound, socially acceptable and appropriate technology and know-how;
- (dd) To ensure that environmental and human ecological considerations are integrated at all managerial levels and in all functional management areas, such as marketing, production and finance.

Activities

- 36.14 Countries with the support of the United Nations system should identify workforce training needs and assess measures to be taken to meet those needs. A review of progress in this area could be undertaken by the United Nations system in 1995.
- 36.15 National professional associations are encouraged to develop and review their codes of ethics and conduct to strengthen environmental connections and commitment. The training and personal development components of programmes sponsored by professional bodies should ensure incorporation of skills and information on the implementation of sustainable development at all points of policy and decision-making.
- 36.16 Countries and educational institutions should integrate environmental and developmental issues into existing training curricula and promote the exchange of their methodologies and evaluations.
- 36.17 Countries should encourage all sectors of society, such as industry, universities, government officials and employees, non-governmental organizations and community organizations, to include an environmental management component in all relevant training activities, with emphasis on meeting immediate skill requirements through short-term formal and in-plant vocational and management training. Environmental management training capacities should be strengthened and specialized training of trainers programmes should be established to support training at the national and enterprise levels. New training approaches for existing environmentally sound practices should be developed that create employment opportunities and make maximum use of local resource-based methods.
- 36.18 Countries should strengthen or establish practical training programmes for graduates from vocational schools, high schools and universities in all countries, to enable them to meet labour market requirements and to achieve sustainable livelihoods. Training and retraining programmes should be established to meet structural adjustments which have an impact on employment and skill qualifications.
- 36.19 Governments are encouraged to consult with people in isolated situations, whether geographically, culturally or socially, to ascertain their needs for training to enable them to contribute more fully to developing sustainable work practices and lifestyles.
- 36.20 Governments, industry, trade unions, and consumers should promote an understanding of the interrelationship between good environment and good business practices.
- 36.21 Countries should develop a service of locally trained and recruited environmental technicians able to provide local people and communities, particularly in deprived urban and rural areas, with the services they require, starting from primary environmental care.
- 36.22 Countries should enhance the ability to gain access to, analyse and effectively use information and knowledge available on environment and development. Existing or established special training programmes should be strengthened to support information needs of special groups. The impact of these programmes on productivity, health safety and employment should be evaluated. National and regional environmental labour market information systems should be developed that would supply, on a continuing basis, data on environmental job and training opportunities. Environment and development training resource-guides should be prepared and updated, with information on training programmes, curricula, methodologies and evaluation results at the local, national, regional and international levels.
- 36.23 Aid agencies should strengthen the training component in all development projects, emphasizing a multidisciplinary approach, promoting awareness and providing the necessary skills for transition to a sustainable society. The environmental management guidelines of UNDP for operational activities of the United Nations system may contribute to this end.

36.24 Existing networks of employer's and workers organizations, industry associations and non-governmental organizations should facilitate the exchange of experience concerning training and awareness programmes.

36.25 Governments, in cooperation with relevant international organizations, should develop and implement strategies to deal with national, regional and local environmental threats and emergencies, emphasizing urgent practical training and awareness programmes for increasing public preparedness.

36.26 The United Nation's system, as appropriate, should extend its training programmes, particularly its environmental training and support activities for employers and workers organizations.

Means of implementation

The conference secretariat has estimated the average total annual cost (1993-2000) of implementing the activities of this programme to be about \$5 billion, including about \$2 billion from the international community on grant or concessional terms. These are indicative and order of magnitude estimates only and have not been reviewed by Governments. Actual costs and financial terms, including any that are non concessional will depend upon, inter alia, the specific strategies and programmes Governments decide upon for implementation.

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