

**University of Rajasthan  
Jaipur**

**SYLLABUS**

**M.Sc.**

**(ENVIRONMENTAL SCIENCE)**

**2015-2016 (I & II SEMESTER)**

**2016-2017 (III & IV SEMESTER)**

Appendix - I ✓

**INDIRA GANDHI CENTRE FOR HUMAN ECOLOGY,  
ENVIRONMENTAL AND POPULATION STUDIES,  
UNIVERSITY OF RAJASTHAN, JAIPUR-302004.**

**M.Sc ENVIRONMENTAL SCIENCE (SEMESTER SCHEME) 2015-2016  
2016-2017.**

**Eligibility for Admission**

Bachelor Degree in Science, Medicine, Engineering, Technology and Agriculture with minimum 50% (45% for SC and ST) in aggregate.

**Scheme of Examination** - Grade System

M.Sc will include Four Semester with five papers in each semester including practicals.

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**M.Sc Environmental Science**  
**1<sup>st</sup> Semester**

S. N.	Subject code	Course Title	Course category	Credit	Contact Hours Per Week		
					L	T	P
1.	ENV 101	Fundamentals of Ecology and Environmental Science	CCC	6	4	2	0
2.	ENV 102	Ecosystem Diversity	CCC	6	4	2	0
3.	ENV 103	Environmental Pollution and Human Health	CCC	6	4	2	0
4.	ENV 104	Biodiversity Conservation and Remote Sensing	CCC	6	4	2	0
5	ENV 111	Practicals	CCC	12	-	-	18
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**M.Sc Environmental Science**  
**2<sup>nd</sup> Semester**

S. N.	Subject code	Course Title	Course category	Credit	Contact Hours Per Week		
					L	T	P
1.	ENV 201	Environmental Biotechnology	CCC	6	4	2	0
2.	ENV 202	Municipal, Toxic and Hazardous Waste Management	CCC	6	4	2	0
3.	ENV 203	Environmental Laws	CCC	6	4	2	0
4.	ENV 204	Environmental Impact Assessment(EIA)	CCC	6	4	2	0
5	ENV 211	Practicals	CCC	12	-	-	18
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**M.Sc Environmental Science**  
**3<sup>rd</sup> Semester**

S. N.	Subject code	Course Title	Course category	Credit	Contact Hours Per Week		
					L	T	P
1.	ENV 301	Environmental Policies, Conventions and Protocols	CCC	6	4	2	0
2.	ENV 302	Environmental Modeling and Biostatistics	CCC	6	4	2	0
3.	ENV 303	Air Pollution Monitoring, Control Technology and Management	CCC	6	4	2	0
4.	ENV 304	Water Pollution Monitoring, Control Technology and Management	CCC	6	4	2	0
5	ENV 311	Practicals	CCC	12	-	-	18
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**M.Sc Environmental Science**  
**4<sup>th</sup> Semester**

S. No	Subject code	Course Title	Course category	Credit	Contact Hours Per Week		
					L	T	P
1.	ENV 401	Climate Change and Atmospheric Issues	CCC	6	4	2	0
2.	ENV 402	Disaster Management	CCC	6	4	2	0
3.	ENV 403	Environmental Chemistry	CCC	6	4	2	0
4.	ENV 404	Natural Resources and Alternative Sources of Energy	CCC	6	4	2	0
5	ENV 411	Practicals	CCC	12	-	-	18
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## Semester - I

*Note: Each paper will have five questions. Questions No.1 containing short answer type questions from the entire syllabus and will be compulsory.*

### **ENV 101 : Fundamentals of Ecology and Environmental Science**

History and scope of Ecology and Environmental Science, structure and Functional aspects of Ecosystem (Food Chain, Food Web, Energy flows, Pyramids of Energy number and biomass, productivity and Biogeochemical cycling.

Definition and components of environment, structure and Composition of atmosphere, hydrosphere, Lithosphere and Biosphere, Mass and energy transfer across the various interfaces, materials balance. First law and second law of thermodynamics heat transfer process, scale of meteorology Pressure, temperature, Precipitation, humidity radiation and wind.

Human Ecology and Human settlement, evolution, origin of life and specification.

Population ecology- density, distribution, fertility, mortality, survivorship curves, age distribution, growth curves and models, r & k selection, population interactions- Mutualism, Parasitism, Predator- Prey relations, System Theory.

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*Note: Each paper will have five questions. Questions No.1 containing short answer type questions from the entire syllabus and will be compulsory.*

### **ENV 102: Ecosystem Diversity**

The ecological principles and factors determining survival of life on earth, The global ecosystem and the place of man in it; human food chain and the energy requirements for the maintenance of human ecosystems on earth, The concept of global "ecological balance" and the threats of its imbalances due to rising human population, mathematical modeling of ecosystem.

Forest ecosystem- Forest as an ecosystem, distribution of forests, types of forests, economics and ecology of forest, role of forests in protection of speices, regulation of climate and production of various produce, Depletion of biodiversity from forest and the world forest conservation policies.

Grassland ecosystem - Distribution and types of grasslands, rangelands and biodiversity in grassland, and productivity in grasslands, Wetland Ecosystem- Distribution, energetic and productivity in wetlands, Biodiversity and economic importance of wetlands.

Desert Ecosystem and Wastelands-Desert as ecosystems, hot and cold deserts, productivity, characteristics and global distribution of deserts, Desertification process, Ecological, Geological, Geographical and Geomorphological aspects of Thar desert, adaption in desert, fauna and flora, Vegetation types of Thar Desert, change in land use pattern due to introduction of canals and environmental consequences, Types and distribution of wastelands in India, Aquatic Ecosystem: Lentic and lotic ecosystem, structure, energy flow and productivity in eusturies, marine ecosystem, structure biodiversity and productivity in marine ecosystem.



*Note: Each paper will have five questions. Questions No.1 containing short answer type questions from the entire syllabus and will be compulsory.*

### **ENV 103 :Environmental Pollution and Human Health**

Air Pollution and Human Health, Atmospheric composition and stratification, types of air pollutants, sources of emissions of air pollutants, air pollution and impacts on plants, air pollution and impacts on animals, air pollution and impacts on buildings and monuments.

Types of water Resources and water Pollutants, sources of water pollutants, adverse impacts of water pollution on plants and animals, water standards for different kinds of uses. Economics of water, management of water Resources. Water Borne, Water washed, water based and water related diseases. Diseases caused due to fluoride, nitrate and different metals. Control of water (borne, based, washed and related) diseases.

Noise Pollution, Source, causes and biochemical aspects of noise pollution, Sources and impacts of radiations on Environment and human beings. Causes of thermal pollution and related adverse impacts.

Soil and land pollution, causes, sources and adverse impacts on human health and Solid Waste Management.

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*Note: Each paper will have five questions. Questions No.1 containing short answer type questions from the entire syllabus and will be compulsory.*

### **ENV104: Biodiversity Conservation and Remote Sensing**

Concepts of Biodiversity, Economics of Biodiversity, causes of losses of Biodiversity, Endangered and threatened species, Red data book, Hot spots of Biodiversity, modern techniques of Measurements and monitoring and biodiversity, Alpha, Beta, and Gamma diversity, shanon Index.

In-situ biodiversity and conservation, conservation of biodiversity in biosphere reserves, Reserve Forests, National Parks, Tiger Projects, Sanctuaries, places around shrines, sacred grooves etc., Biotechnology and its application in biodiversity, conservation, Ex-situ conservation of biodiversity, gene bank, germ plasm storage, live museum etc.

Wildlife; Distribution of Wildlife at National and Global level, Wildlife trade, , Elephant Projects, Crocodile Project, Protected Area Networks, Traditional and modern tools of Identification of plants, animals and microbes.

Remote sensing; Tools, Techniques and applications of remote sensing in monitoring of terrestrial and aquatic ecosystems, mining, deforestation, desertification and deterioration of marine ecosystem.

**ENV111: Practicals** -Based on theory papers.

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## Semester-II

*Note: Each paper will have five questions. Questions No.1 containing short answer type questions from the entire syllabus and will be compulsory.*

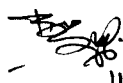
### **ENV201 : Environmental Biotechnology**

Genetic engineering for Environmental Conservation, Plasmids, isolation of plasmids, cloning of DNA.

Recombinant DNA technology and development of Genetically engineered microorganisms (GEMS), Polymerase Chain Reaction (PCR) and development of Gene probes for environmental remediation, use of GEM in bioremediation.

Emerging technology for environmental bioremediation, Microbial interactions with xenobiotic and inorganic pollutants, microbial accumulation of heavy metals and radionuclides, Biodegradability and ecological side effect testing and monitoring in the bioremediation of genobiotic pollutants, biotechnological production of hydrogen to reverse global warming.

Microelectromechanical systems (MEMs), Genosensor technology. Integrated Treatment System, PCB treatment process, Enzymes contributing to sustainable industrial development.

  
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*Note: Each paper will have five questions. Questions No.1 containing short answer type questions from the entire syllabus and will be compulsory.*

**ENV 202 :      Municipal, Toxic and Hazardous Waste  
   Management**

Systematic generation of Municipal Solid Waste, methods of collection, treatment and disposal. Sanitary land filling techniques.

Classification and treatment of chemical, Industrial and Toxic waste, safe disposal techniques.

Reprocessing of Nuclear Waste, recovery of nuclear fueling material for reuse, treatment and safe disposal of Nuclear Waste.

Classification, nature and characteristics of hazardous waste, techniques of hazardous waste treatment and safe disposal.

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*Note: Each paper will have five questions. Questions No.1 containing short answer type questions from the entire syllabus and will be compulsory*

**ENV 203 : Environmental Laws**

Environmental ethics, Religion and Environment, Eco-Imperialism with regard to global distribution of resources, eco-fund, Chipko movement, Appiko movement, KSSP, etc., Scheme of labeling of environmentally friendly products (Ecomark), Current environmental issues in India; Narmada Dam, Tehri Dam, Almetti Dam, Silent valley, Doon Valley, Sariska and Narayan Sarovar etc.

Provisions of Environment in Indian Constitution, International organizations for Conservations of Environment; UNEP, WWF, UNESCO, IGBP, IUCN, GEF, ETF etc.

Indian Forest Act, 1927, Indian Forest Act (Revised 1982), Forest (Conservation) Act, 1980, Wildlife (Protection) Act, 1972, amended in 1991 and Biological Diversity Act, 2002, Water (Prevention and Control of Pollution) Act, 1974, as amended up to 1988 and rules 1975.

Air (Prevention and Control of Pollution) Act 1981, as amended by amendment Act 1987 and rules 1982, Hazardous and waste management and handling rules 1989, Motor Vehicle Act 1988, Public Liability Insurance Act 1991 and rules 1991, Environmental (Protection) Act, 1986, National Environment Tribunal Act, 1995. National Environment Appellate Authority Act, 1997.

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Note: Each paper will have five questions. Questions No.1 containing short answer type questions from the entire syllabus and will be compulsory.

**ENV 204 : Environmental Impact Assessment (EIA)**

Procedure and methodologies of EIA, Cost-benefit analysis, Environmental clearance procedure with particular reference to India.ISO, sustainable Development.

Environmental Impact Assessment, Environmental Auditing and Monitoring of Thermal Power projects.

Environmental Impact Assessment, Environmental Auditing and Monitoring of Nuclear Power Projects, siting and Mitigation of adverse impacts of Nuclear Power Projects

Environmental Impact Assessment, Environmental Auditing and Monitoring of mining projects, River Valley Projects, Tourism, Irrigation and Dams.

**ENV 211: Practicals** -Based on theory papers.

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### Semester-III

*Note: Each paper will have five questions. Questions No.1 containing short answer type questions from the entire syllabus and will be compulsory.*

#### **ENV 301 :Environmental Policies, Conventions and Protocols**

National Environment Policy (NEP): Key environmental challenges, causes and impacts, Principles, Objectives of NEP, Strategies and actions: Regulatory reforms, Enhancing and conserving environmental resources, environmental standards- EMS, Ecolabelling and certification, Environmental Awareness and education, Partnership and stakeholder involvement, International Cooperation, Environment and development Policies: Industrial policies, Land use policies, Land and agricultural policies, resettlement and rehabilitation policies..

National forest policy, National water policy, National Action Plan on Climate Change: Overview, Principles and approach, Mission for Solar, water enhanced efficiency, Sustainable habit and green India.

Rajasthan State Environmental Policy: Objectives and Principles of the State environmental policies, Conserving and enhancing environmental resources- Water resources, air, desertification and land degradation, forest and biodiversity. Assuring environmental sustainability of key economic sectors- Mining, Industry, Tourism, Energy etc.

International Environmental Policies, Stockholm Conference 1972, UNCED and Earth Summits, World Summit on Sustainable Development (WSSD) 2002, International Conventions: CITES, Ramsar Convention on Wetlands, World Heritage Convention 1972, London Convention 1972, Vienna Convention 1985, Basel Convention 1989, Convention on Biological Diversity 1992, United Nations Framework Convention on Climate Change 1992, Stockholm Convention on POP 2001, Protocols: Kyoto Protocol, Montreal Protocol, Cartagena Protocol on Biosafety.

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*Note: Each paper will have five questions. Questions No.1 containing short answer type questions from the entire syllabus and will be compulsory.*

### **ENV 302: Environmental Modeling and Biostatistics**

Introduction to environmental system analysis; approach to development of model, Linear simple and multiple regression model, validation and forecasting. Models of population growth and interaction- Lotka volterra model, Leslie's matrix model, Point source stream Pollution model, box model, Gaussian Plume model.

Basic elements and tools of statistical analysis; Diagrammatic and Graphical Presentation of Data, Sampling, Probability,

Measures of central tendency (mean, median and mode), Measures of Dispersion: Mean deviation, standard deviation, variance, Standard error.

Test of significance: Null hypothesis and alternate hypothesis; student t test; chi square test, analysis of variance.

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*Note: Each paper will have five questions. Questions No.1 containing short answer type questions from the entire syllabus and will be compulsory.*

**ENV 303: Air Pollution monitoring, Control Technology and Management**

Meteorological aspects of Air Pollutants dispersion, Temperature lapse rate and stability, wind roses, plume behaviour, Dispersion of air pollutants, solution to the atmospheric dispersion equation; Air Pollution management.

Air sampling and monitoring (Ambient) collection of gaseous pollutants, collection of particulate pollutants, stack sampling monitoring and analysis of air pollutants.

Air pollution control techniques and equipments, particulate emission control by gravitational settling chambers, cyclone separators, fabric filters, electrostatic precipitator, wet scrubbers.

Control of specific gaseous pollutants; control of SO<sub>x</sub>, control of NO<sub>x</sub>, control of hydrocarbons, and controls of carbon mono-oxide.

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*Note: Each paper will have five questions. Questions No.1 containing short answer type questions from the entire syllabus and will be compulsory.*

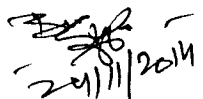
**ENV 304 : Water Pollution Monitoring, Control Technology and Management**

Generation of waste water, Categories of waste water and their characteristics, water resource management.

Waste water sampling and monitoring; methods of analysis, determination of organic matter, inorganic substances, physical characteristics and bacterial measurements.

Waste water treatment, Basic processes of primary treatments; Pre treatment, sedimentation and floatation. Secondary treatments; Activated sludge process, Trickling filter, Rotating biological contractors, sludge treatment and disposal. Advanced waste water treatment, N-removal, P-removal, Advanced Biological Systems, Chemical oxidation, Removal of suspended solids, dissolved solids.

**ENV 311: Practicals** -Based on theory papers.

  
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## Semester –IV

*Note: Each paper will have five questions. Questions No.1 containing short answer type questions from the entire syllabus and will be compulsory.*

### **ENV401 : Climate Change and Atmospheric Issues**

Greenhouse gases, Chemistry and Physics of Global warming, Climatic Models.

Climatic Change, Climate Change factors, carbon foot prints, carbon credits, carbon sequestration process.

Chemistry of upper ,lower and middle stratosphere, Chemicals responsible for ozone depletion, process of ozone depletion at different latitudes, impacts of ozone depletion, Alternative chemicals.

Chemistry of Acid rain, global quantum of acid rain, adverse impacts of acid rain, mitigation methods against acid rain.

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*Note: Each paper will have five questions. Questions No.1 containing short answer type questions from the entire syllabus and will be compulsory.*

**ENV 402 : Disaster Management**

Concept, definition, causes and classification of disasters, Earth's process and disaster, Concept of Residence time and rates of natural cycles, Catastrophic geological hazards: Floods- Causes, nature and frequency of flooding, flood hazards, urbanization and flooding, Flood control, Integrated Flood Management and Information System (IFMIS), Landslides and Avalanche- Nature, causes, impacts and mitigation.

Earth quakes- Causes and characteristics of ground-motion, seismic waves, earthquake scales, magnitude and intensity, earthquake hazards and risks, nature of destruction, quake resistant buildings and dams, Tsunami: causes and physical characteristics, disturbance in sea floor and release of energy, travel time and impact on fragile coastal environment, mitigation of risks.

Volcanism: Causes of volcanism, types of volcanoes, volcanic materials, Hazardous effects of volcanism, Droughts: Causes, Impacts and mitigation, Cyclones: Structure and nature of tropical cyclone, mitigation, preparedness and Impacts, Indian monsoon, El Nino phenomenon and Western disturbances, Hurricane Hazards, Tornado etc.

Prediction and perception of the hazards and adjustments to hazardous activities. Disaster management, pre-disaster phase, actual disaster phase, post-disaster phase. International Decade for Natural Disaster Reduction (IDNDR), Policy for disaster reduction, Training for emergency, Regulation/guidelines for disaster tolerance building structures.

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Note: Each paper will have five questions. Questions No.1 containing short answer type questions from the entire syllabus and will be compulsory.

### ENV 403 : Environmental Chemistry

Concept and scope of Environmental chemistry; acid base reactions, chemical equilibrium, pH and pOH, ionic product of water, common ion effect, buffer solutions, hydrolysis, chemical equilibrium, oxidation and reduction, chemical speciation, Stoichiometry, Gibb's energy, Chemical potential, solubility products, solubility of gases in water, carbonate system, unsaturated and saturated hydrocarbons, radionuclides.

Atmospheric Chemistry: Chemical composition of the atmosphere; Chemical process for formation of inorganic and organic particulate matter, Thermo-chemical and Photochemical reaction in the atmosphere, Oxygen and Ozone chemistry, Chemistry of Air, Green house gases, acid rain.

Water Chemistry: Physical and chemical properties of water and their environmental significance; Water quality parameters – physical, chemical and biological; Concept of DO, BOD, COD, Sedimentation, Coagulation, Filtration, Soil Chemistry: Inorganic and Organic components of soil; Nitrogen pathways and NPK in soil; Physical properties of soil – texture, bulk density, permeability etc.

Chemistry of Environmental Trace Elements: Pb, As, Hg and Cd, concept of green chemistry, Principles of Analytical Methods: Titrimetry, Gravimetry, Colourmetry, Spectrophotometry, Chromatography, Gas chromatography Atomic Absorption Spectrophotometry, GLC, HPLC, Electrophoresis, X-ray diffraction, Flame photometry.

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Note: Each paper will have five questions. Questions No.1 containing short answer type questions from the entire syllabus and will be compulsory.

#### **ENV 404 : Natural Resources and Alternative Sources of Energy**

Classification of resources: renewable resources, non renewable resources, classes of earth resources, resources regions: Definition and criteria, resource conservation.

Natural resources-non mineral resources, land, soil, water, inland water, plants, animals, microorganisms, the forest produce and the marine resources ,Agricultural Resources.

Natural resources-mineral resources and fuel resources. Minerals and metals, fossil fuel, coal, petroleum, natural gas.

Alternatives of resources and non-conventional energy sources, solar, wind, hydel, tidal and geothermal energy resources, the nuclear fuels, biomass energy, hydrogen as fuel etc.

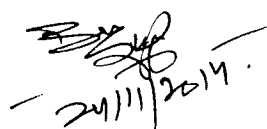
**ENV 411: Practicals** -Based on theory papers.

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**List of Experiments in M.Sc Environmental Science (Semester Scheme)**

- Frequency density, IVI, leaf area estimation of vegetation in forest, desert and aquatic ecosystem.
- Estimation of Biomass
- Soil, texture, physical and chemical characteristics
- Air monitoring; SPM and gaseous estimation
- Water, physico-chemical and Biological parameters.
- Study of (a) Forest and wildlife (b) Soil types and erosion, (c) ground water potential (d) Meteorological studies, wind velocity, wind direction and wind roses (e) pond, streams and Rivers System Studies.
- Study of microbes.
- Biodiversity Studies, Knowledge about Rare, threatened, endangered, vulnerable and endemic plant and animals of different ecosystems, Forest, desert, wetland, Aquatic ecosystem.
- Wastes, characterization, chemical and physical characteristics treatment and disposal of liquid, solid and gaseous wastes.
- Preliminary Study of Equipments used in Biotechnology study.
- Plant and animal identification.

**Field visits to National Parks, Wildlife Sanctuaries, Reserve Forests, Mining Sites and Various Industries and Power Plants are mandatory.**

  
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**Suggested Readings : List of Books**

1. Ecology and our Endangered Life Support System.  
Odum,E.P. 1989. Sunderland,mass,ISE.
2. Living in the Environment, Principles, connections and solutions. Miller, G.T.(Jr).2004. Books/Cole-Thomson Learning.USA.
3. Principles of Environmental Science; Inquiry and Applications, Cunningham,W.P. and Cunningham,. A. 2003. Tata McGraw-Hill publishing Company Ltd. New York,USA.
4. Climatology; An atmospheric Science. Oliver,J.E. and Hidore,J.J. 2003. Pearson Education, Singapore.
5. Understanding weather and climate. Aguado,E and Burt, J.E. 2001. Prentice Hall, N.J. USA.
6. Atmospheric Chemistry and Global change, Brasseur,G.P.,Orlando,J.J. and Tyndall,G.S. 1999. Oxford University Press.New York,USA.
7. Geosystems,Christopherson, R.W. 2000. Prentice Hall, N.J. USA.
8. Biodiversity,Biopiracy and Biopolitics:The Global Perspective. Chauhan S.S.2001.Kalinga Publications.New Delhi.
9. Environmental Protection and Management: From Stockholm to Rio and After. Chauhan S.S.2004 Kalinga Publications.New Delhi.
10. World Regional Geography: A Development Approach. Clawson, D.L. 2001. Prentice Hall. N.J. USA.
11. Introduction to Meteorology, Cole, F.W. 1980. John Wiley and Sons,New York,USA.
12. Principles of Atmospheric Physics and Chemistry. Richard,G 1995.Oxford University Press.New York USA.
13. Global environmental change. Hidore, J.J. 1996. Prentice Hall, N.J. USA.
14. Our changing Planet. Mackenzie,F.T.1998.Prentice Hall, N.J.USA.

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15. Chemistry of Atmosphere. Wayne, R.P..1999. Oxford University Press.
16. World Geography.Hussain,,2004.Rawat Publication .New Delhi.
17. Ecology; Theories and applications. Stiling,P.2002. Prentice Hall of India Pvt. Ltd. New Delhi.
18. Atmosphere and Air Pollution Control Techniques. Khan,T.I. 2004.Avishkar Publishers, Jaipur.
19. Air Pollution Control Theory Crawford, . 2002 Tata Mc Graw Hill,New Delhi.
20. Ecology in practice,Castric and Barker,1984.UNESIO Paris.
21. Environmental Impact of Production and use of Enewrgy, Prakash,I 1988.Scientific publishers, Jodhpur.
22. Desert Ecology. Prakash 1988.Scientific Publishers Jodhpur.
23. Disease Ecology, Learonth, A. 1988.Slackwell,Oxford.
24. Environmental and Natural Resources Economics Titenberg, T. 1986. Foreseman and Co. London.
25. State of the world. World watch Institute Annual Reports.
26. Our Common Fitire.1998 Oxford Universities Press.
27. Global Biodiversity Conservation Measures. Khan, T.I. and Al-Ajmi, D.N. 1999 Pointer Publishers,Jaipur.
28. Hydrogen Energy; Economics and Social Challenges. Ekins, P 2010.RFF Press London.
29. The Economics of Waste. Porter,R.C. 2002.RFF Press, London.
30. Climate Change Economics and Policy. Toman,M.A.2001.RFF Pres, London.
31. The Economics of Ecosystems and Biodivrsity. Ecological and Economic foundation. Earth scan 2010.RFF Press. London.
32. Conserving and valuing ecosystem services and Biodiversity. Ninan, K.N. 2008 RFF Press, London.
33. The Trade in wildlife. Oldfield, S 2002. RFF Press London.
34. Small is profitable. Lovins, A.B. 2003. RFF Press, London.
35. The Solar economy. Scheer, H.2004 RFF Press London.

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36. Environmental Principles and Policies, Beder, S. 2006, RFF Publishers, London.
37. Managing Solid Wastes in Developing Countries, Holmes, J.R.1984 John Wiley and Sons, New York,USA.
38. Solid Waste management in developing Countries. Wilson, D.C. and Nair, C 1991 Singapore.
39. Introduction to Energy. Cassedy E.S. and Grossman,p.z.1998 Cambridge University press. N.Y.
40. Prospects for Sustainable energy cassedy, E.S. jr.2000 Cambridge University Press U.K.
41. Ecology Facts. Allaby . 1986.Bridge House, London.
42. Ecology colin van X,P 1986.John Wiley and sons NY
43. Environmental Impact Assessment. Wathen,P. 1988.unwin Hyman, Boston.
44. Industry Environment and the law. Shastri,S Bakre,P.P. and Khan,T.I.1996.RBSA Publishers, Jaipur.
45. Water and sanitation.Bourne,P.G.1984.Academic press. New York.
46. Biotechnology and Waste Water treatment Cambridge University press, London.
47. Principles of Water quantity Control. Tebbut, T.H.Y. 1983.WHO.
48. Waste Water Engineering Metcalf and Eddy. 1972. McGraw Hill, N.Y.
49. Air pollution Control equipments, Brauer, H and varma, Y.B.G. 1981. Springer, Berlin.
50. Nuclear Development: Advanced Nuclear Fuel Cycles and Radioactive Waste Management. OECD,Nuclear Energy Agency Published by: OECD Publishing.
51. Radioactive Waste: The problem and its management, K.R. Rao.CURRENT SCIENCE, 1534 VOL.81,No.12, 25 DECEMBER 2001.

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