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United Nations Industrial Development Organization

Training Course
Ecologically Sustainable Industrial Development

Learning Unit 1

Introduction to the Course

Further information may be obtained from:
Environment Coordination Unit, UNIDO
Tele: (Austria) 43-1-21131-0 / Fax: 43-1-230-74-49

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Contents

Introduction

This training course is designed primarily for UNIDO field staff but is suitable for all staff of the United Nations as well as for anyone interested in industrial development.

Objectives

The objectives of the course are as follows:

- To examine the environmental impacts of industrial development.
- To understand ecologically sustainable industrial development (ESID) as an appropriate response to past and future trends in industrial development and the environment.
- To introduce Cleaner Production as a practical approach for achieving ESID.
- To become informed about the analytical tools that can be used to identify Cleaner Production opportunities.
- To become familiar with the economic analysis techniques that can be used to justify investments in Cleaner Production.
- To examine the potential role of Governments in encouraging the adoption of Cleaner Production.
- To recognize and use sources of information about Cleaner Production.
- To develop skills in incorporating environmental considerations into industrial development projects.
- To motivate further study.

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UNIDO

UNIDO, established in 1967, is the lead agency for industrial development in the United Nations system. It promotes industrial development by means of technical assistance, training, the exchange of information, investment promotion, national and regional planning and institution-building, and the transfer of technology.

It is closely involved in the growing international cooperation on environmental matters related to small and medium-sized enterprises. At the Conference on Ecologically Sustainable Industrial Development, held at Copenhagen in October 1991, the representatives of member States said that one of the major directions for possible UNIDO action was to assist developing countries, upon request, in building the technical and scientific institutional capacity to develop, absorb and diffuse Cleaner Production techniques and technologies.

The environment and energy programmes of UNIDO are interlinked and complementary efforts to assist developing countries. UNIDO activities in support of these programmes are described in an information packet, *A Better World with Clean Industry*, published in July 1993.

Course Content

This course is taught in ten Learning Units (LUs):

LU1 *Introduction* provides a general overview of the course content and its objectives. It includes an introductory test to assess existing knowledge about the subject matter.

LU2 *The Need For Ecologically Sustainable Industrial Development* (ESID) explains the significance of trends in industrial development and the environment.

LU3 *Defining Ecologically Sustainable Industrial Development* presents the concept of ESID and the three criteria (eco-capacity, efficiency and equity) for measuring progress in achieving it. It also sets out the actions that industry can take to meet the criteria.

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LU4 *Cleaner Production* explains the concept of Cleaner Production, describes many of the activities that constitute such production and outlines the advantages of and barriers to implementing Cleaner Production programmes in developing countries.

LU5 *Analytical Tools for Identifying Cleaner Production Opportunities* introduces techniques that may be profitable for enterprises and beneficial to the environment: waste reduction audits, environmental compliance audits, product life-cycle analyses and environmental impact assessments.

LU6 *Economic Techniques for Assessing Cleaner Production Options* introduces economic analysis techniques that can be used to justify investments in Cleaner Production: financial analysis, micro-economic impact analysis, benefit-cost analysis and macroeconomic impact analysis.

LU7 *The Role of Government in Industrial Environmental Management* describes the range of government activities that are used to manage the environment and discusses which of them are most effective for promoting Cleaner Production. It covers the basics of an environmental regulatory programme as well as innovative approaches such as economic incentives, multimedia permits, national sustainable development strategies and international agreements.

LU8 *Sources of Information on Cleaner Production* explains how to obtain information about Cleaner Production from UNIDO, the United Nations Environment Programme (UNEP) and many other sources.

LU9 *Environmental Considerations in Project Design* describes how UNIDO staff can incorporate environmental considerations into project designs consistent with the goals of the UNIDO environment programme, with the recommendations of the Conference on Ecologically Sustainable Industrial Development convened by UNIDO at Copenhagen, 14-18 October 1991, and with Agenda 21 of the United Nations Conference on Environment and Development (UNCED), held at Rio de Janeiro, 3-14 June 1992.

LU10 *Review, with a Course Appraisal,* provides a few exercises to help students recall the main points of the training course.

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Integral to the course, and required for its completion, are the following materials, which are included in the kit:

- Excerpts for reading, generally chapters of books or portions of reports or journal articles, which are bound in at the back of each Learning Unit.
- A video cassette containing seven short films:
  - *Our Common Future*
  - *Greenbacks*
  - *Pollution Prevention: Swedish Experiences*
  - *Competitive Edge*
  - *Money Down the Drain*
  - *Development and the Environment: A New Partnership*
  - *Paper Forest*
- A floppy disc containing MICRO-METADEX^{PLUS} and *Case Studies* from the International Cleaner Production Information Clearinghouse (ICPIC).
- A floppy disc containing the sample project document "Poilution prevention at the (name) industrial facility".
- *Cleaner Production Worldwide*, a UNEP booklet.
- *Audit and Reduction Manual for Industrial Emissions and Wastes*, a UNEP/UNIDO technical report.
- *Transforming Technology: An Agenda for Environmentally Sustainable Growth in the 21st Century*, a booklet written by G. Heaton, R. Repetto and R. Sobin for the World Resources Institute.
- A learning recall tape (LRT).

Structure of the Learning Units

Each Learning Unit is divided into four sections:

The *Introduction* outlines the objectives of the Learning Unit and the key learning points. At the end of the *Introduction* it is suggested that you take the short test in the last section, *Review*, and get a feeling for what you want to learn.

The second section, *Study Materials*, is the body of the Learning Unit. The text presents the principal points of the Learning Unit and guides you to the *Reading Excerpts* at the end of the Learning Unit or to the relevant video. At the end of most topics a short test helps you to review and assess your comprehension of the materials.

The section entitled *Case Studies* presents one or more case studies designed to help you think about and discuss with your colleagues some of the issues and questions covered in the Learning Unit.

The *Review* section contains a short test to help you review the Learning Unit and some ideas that will stimulate thought and discussion about some of the policy implications of the Learning Unit.

The Learning Units have been designed to require about four hours study time apiece. The time, which includes that needed to read the body of the unit and the excerpts and to take the test, is estimated on the contents page of each Learning Unit. To work through the Learning Unit, simply start at the *Introduction* and follow the text and the *Next Steps* boxes, which will guide you along.

Acknowledgements

This training course is based on workshops held at Vienna by the Environment Coordination Unit of the United Nations Industrial Development Organization (UNIDO). It was designed by Ralph (Skip) Luken, the Senior Environmental Adviser of the Environment Coordination Unit of UNIDO. He would like to acknowledge the contribution of two consultants, R.G.A. Boland and Lyman Clark. He would also like to thank Fritz Balkau and John Kryger of the Industry and Environment Programme Activity Centre at UNEP in Paris, Susan Becker of United Nations Development Programme (UNDP) in New York, Klaus North and others from the International Labour Organisation (ILO) at Geneva and Turin, for their contributions.

Thanks also to several colleagues in the Environment Coordination Unit at UNIDO — Robert O. Williams, Mats Zackrisson, Muki Daniel, Mari Ito and Silva Garabedian — and to colleagues elsewhere at UNIDO: Jaroslav Navratil, Caj Falcke, Lech Kurowski, Ritu Kumar, Harriet Gabbert and Peter Pembleton. Five interns who worked in the Environment Coordination Unit also contributed: Ulli Kastner, Philippe Leservoisier, Anne-Sylvie Senechal, Jacques Demajorovic and Jose Mario Carneiro.

Many thanks for all the colleagues in UNIDO who contributed in the preparatory work of the course.

Financial support for the development and production of the training course was provided by the Government of Norway.

Next Steps

1 On the following three pages are registration sheets. Please fill them out, taking some time to think about your objectives for the course and your reactions to the environmental policy statements.

2 When you have answered all of the questions, tear the three pages out and either give them to your instructor or mail them to the Environment Coordination Unit of UNIDO.

3 Then take the introductory test that follows the registration sheets.

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Registration Sheet

Basic Data

Date:

Location:

Name:

Organizational unit:

Previous Background

Please describe your relevant training and experience in environmental issues.

Your Course Objectives

1 What do you personally think about environmental issues? What does your organizational unit think?

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2 Briefly, what is your present working knowledge of ESID?

3 Briefly describe a situation you faced in the last six months that involved industrial development and the environment. How did it arise? What did you do? What was the result? What did you feel?

4 Can you now identify two very specific things that you hope to gain from this course?

a.

b.

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Environmental Attitudes

Please record your current opinion on each of the following statements on a scale of 10 (strongly agree) to 0 (strongly disagree):

1 Environment is of key importance for industrial development in most developed countries. _____

2 Environment is of key importance for industrial development in most developing countries. _____

3 ESID and Cleaner Production are realistic goals in developing countries. _____

4 Multinational corporations incorporate Cleaner Production in their activities in developing countries. _____

5 Environmental protection measures by industry are usually just cost without much benefit. _____

6 Waste minimization is a high industrial priority in developing countries. _____

7 The best way to achieve environmental protection by industry is strict enforcement of tougher environmental legislation. _____

8 Small and medium-sized industries in developing countries have nothing to gain from environmental concern. _____

9 Environmental protection is for the rich countries of the world. _____

10 The major industrial countries are willing to pay the developing countries for environmental protection measures. _____

11 Developing countries cannot afford the investment for Cleaner Production. _____

12 Developing countries perceive higher environmental standards as new trade barriers imposed by developed countries. _____

13 Pollution prevention always pays. _____

14 Technology is more important than training in helping developing countries to achieve ESID. _____

15 Developing countries have more important priorities than environmental concerns. _____

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Introductory Test

You will take this test now and again at the end of the course, in Learning Unit 10. At this point, you should do the test rapidly, perhaps by answering only the odd-numbered questions. Do not spend more than 60 minutes on this task. The test will serve as an introduction to the materials presented in this course and will help you assess your current knowledge of the subject matter. Compare your answers with those suggested.

LU2 The Need for Ecologically Sustainable Industrial Development

1 The developing countries' share of industrial output in 1990 was approximately

a. 10 per cent
b. 15 per cent
c. 20 per cent
d. 25 per cent

2 The region with the highest growth rate in industrial output in 1970-1990 was

a. Developed countries
b. East Asia/South-East Asia
c. Latin America
d. Africa

3 The region with the lowest growth rate in industrial output in 1970-1990 was

a. Developed countries
b. East Asia/South-East Asia
c. Latin America
d. Africa

4 Industry uses approximately

a. One fifth of the world's energy
b. One quarter of the world's energy
c. One third of the world's energy
d. One half of the world's energy

5 Emissions of CO_2 from fossil fuel burning are a major cause of

a. Greenhouse effect
b. Aquatic system damage
c. Ozone depletion
d. All of the above

6 Emissions of CFCs come from

a. Refrigerators
b. Solvents
c. Foams
d. All of the above

7 Acid rain results primarily from emissions of

a. Sulfur dioxide
b. Nitrogen oxides
c. Hydrocarbons
d. Particulate matter

8 All of the following are toxic heavy metals except

a. Mercury
b. Lead
c. Cadmium
d. Dioxin

9 The most polluting fuel per unit of energy is

a. Oil
b. Coal
c. Nuclear
d. Natural gas

10 The World Commission on Environment and Development called for

a. Zero economic growth
b. Economic growth that is equitable and compatible with the environment
c. Large-scale financial transfers to developing countries
d. Preservation of the world's resources

LU3 Defining Ecologically Sustainable Industrial Development

11 Sustainable development means meeting the needs of the present without

a. Compromising the needs of the future
b. Creating pollution problems for those over 60 years of age
c. Increasing population
d. Creating greenhouse effects

12 To achieve ESID, we need all of the following except

a. Eco-capacity
b. High GNP per capita
c. Efficiency
d. Equity

13 The critical load of industrial pollutants beyond which the quality of life and the proper management of natural assets are affected is called

a. Clean production limit
b. Effluent standard
c. Eco-capacity
d. Ambient environmental standard

14 Waste minimization is an objective of environmental

a. Eco-capacity
b. Equity
c. Economic analysis
d. Efficiency

15 The concept of a fair opportunity to share in the benefits of industrialization refers to

a. Efficiency
b. Eco-capacity
c. Dreams
d. Equity

16 The key to achieving ESID is

a. Transfer of clean technology
b. Government financial subsidies
c. Reduction of pollution intensity
d. Commitment to the Business Charter of the International Chamber of Commerce (ICC)

17 ESID is justified mainly by

a. Limited capacity for absorbing wastes from human activities
b. Shortage of natural resources
c. The need for new business ethics
d. UNCED

18 Agenda 21, chapter 30, "Strengthening the role of business and industry", calls for

a. Support of the Valdez Principles
b. Shipment of hazardous wastes to developing countries
c. Annual environmental reporting
d. Preparation of emergency response plans

19 The Rio Declaration is

a. A call for reform of the United Nations system
b. A statement of principles of sustainable development
c. A commitment to address climate change issues
d. Industry's response to sustainable development issues

20 Agenda 21 is

a. A global action plan to implement the Rio Declaration
b. A call for a new international order
c. A tropical forest action plan
d. A UNDP initiative for capacity building

LU4 Cleaner Production

21 The first step in improving Cleaner Production in industry is a change in

a. Technology
b. Customer preference systems
c. Attitudes
d. Legislation on recycling

22 Industrial environmental management has evolved through

a. Abatement to prevention to dilution
b. Prevention to dilution to abatement
c. Dilution to prevention to abatement
d. Dilution to abatement to prevention

23 The most cost-effective management choice for combating industrial pollution is

a. Prevention
b. Dilution
c. Abatement
d. Control

24 Cleaner Production eliminates waste

a. During production
b. At every stage of the life cycle of a product
c. By disposing of wastes safely in approved facilities
d. By recycling processing residues

25 Cleaner Production does not include

a. Better housekeeping
b. Ecologically benign products
c. Recycling of wastes by outside contractors
d. Low- and non-waste technology

26 From the practical business point of view, pollution prevention

a. Often pays
b. Does not pay
c. Has a long payback period
d. Is not possible

27 The implementation of Cleaner Production actions does not need

a. Training
b. Cooperation between government and industry
c. Change in management attitudes
d. Advanced technology

28 "Cleaner Production is just not realistic in developing countries where per capita GNP is below $1,000". This statement is

a. False
b. Correct
c. True
d. Helpful

29 The 10 steps for introducing Cleaner Production in an enterprise include all of the following except

a. Involvement of senior employees
b. Seeking government subsidies
c. Monitoring and evaluation
d. Disseminating information to employees

30 All of the following are barriers to Cleaner Production except

a. Lack of financial resources, awareness, training, expertise and know-how and access to existing knowledge
b. Uncertainty about the right information, technology and regulations
c. Attitudes of employees who feel threatened by change
d. Demonstration projects

LU5 Analytical Tools for Identifying Cleaner Production Opportunities

31 Pollution prevention opportunities may best be identified through

a. Environmental impact assessment
b. Waste reduction audit
c. Environmental compliance audit
d. Product life-cycle analysis

32 A waste reduction audit makes a detailed analysis of plant processes and wastes with the purpose of

a. Producing wastes
b. Completely eliminating wastes
c. Identifying wastes
d. Hiding wastes

33 A waste reduction audit is best described as

a. An input characterization
b. A material balance
c. A balanced financial statement
d. A least-cost production programme

34 The main purpose of an environmental compliance audit is to

a. Ensure that a firm is complying with environmental norms
b. Provide information to environmental management agencies
c. Meet the requirements of the Business Charter of ICC
d. Protect environmental quality

35 Conducting a waste reduction audit requires a commitment of

a. Top management
b. Supervisors
c. Workers
d. All of the above

36 A product life-cycle analysis considers

a. Only the design of a product
b. The potential for product recycling
c. All stages of production and consumption
d. The production process

37 The most controversial step in a product life-cycle analysis is

a. Cost analysis
b. Inventory analysis
c. Impact analysis
d. Improvement analysis

38 An environmental impact assessment predicts

a. Effects on the environment
b. Effects on production cost
c. Effects on management
d. Effects on pollutant discharge

39 Scoping for an environmental impact assessment means

a. Finding the best environmental location for a project
b. Identifying the major environmental impacts
c. Choosing the least-cost mitigation strategy
d. Finding the most qualified team of experts

40 All of the following are important principles in managing an environmental impact assessment except

a. Balancing the benefits and costs of mitigation measures
b. Involving the appropriate persons and groups
c. Linking information to decisions about the project
d. Presenting clear options for the mitigation of impacts

LU6 Economic Techniques for Assessing Cleaner Production Options

41 To justify a Cleaner Production investment, the economic technique that measures cash flows and profitability over a future period at the plant level is

a. Financial analysis
b. Micro-economic analysis
c. Macroeconomic analysis
d. Environmental impact assessment

42 A payback period of one year is equivalent to a

a. 25 per cent return on capital
b. 50 per cent return on capital
c. 100 per cent return on capital
d. 200 per cent return on capital

43 Payback analysis is a limited measure of investment because it fails to account for

a. Economic life of the investment
b. Income tax
c. Present value of cash flows
d. All of the above

44 The technique that estimates the economic impact of Cleaner Production investment at an industry level is

a. Environmental impact assessment
b. Micro-economic analysis
c. Macroeconomic analysis
d. Financial analysis

45 Micro-economic impact analysis examines all of the following except

a. Plant closure
b. Product price increases
c. Capacity expansion
d. Balance of payments

46 The economic technique that measures the cost of a Cleaner Production activity against possible benefits is

a. Marginal cost analysis
b. Financial analysis
c. Macroeconomic analysis
d. Benefit-cost analysis

47 The main difficulty with benefit-cost analysis is usually

a. Quantifying health effects
b. Estimating the costs
c. Valuing the benefits
d. Arithmetical

48 In environmental benefit-cost analysis, values can be

a. Market values based on prices and cost savings
b. Surrogate values based on land values, wage premiums, travel costs etc.
c. Survey values
d. All of the above

49 To justify a Cleaner Production investment, the economic tool that measures the effect of environmental expenditures on GDP, consumer prices and unemployment is

a. Environmental impact assessment
b. Micro-economic analysis
c. Macroeconomic analysis
d. Financial anaiysis

50 Expenditure on pollution prevention and control in most developed countries accounts for

a. 2 per cent of GDP
b. 5 per cent of GDP
c. 8 per cent of GDP
d. 10 per cent of GDP

LU7 The Role of Government in Industrial Environmental Management

51 The concept of market failures in environmental management refers to

a. State ownership of enterprises
b. Subsidies for energy use
c. Accelerated depreciation for pollution control equipment
d. Treating environmental resources as free goods

52 An example of policy failure in environmental management is

a. Absence of environmental laws
b. Subsidies for water use
c. Absence of a national environmental action plan
d. Subsidies for building municipal waste-water treatment plants

53 One essential environmental management activity that needs to be undertaken by Governments is

a. Support for environmental non-governmental organizations (NGOs)
b. Tax credits to industry for installing pollution control equipment
c. Collection and dissemination of environmental data
d. A ministerial appointment for the head of the environmental management agency

54 An effective command-and-control regulatory programme requires

a. Issuing discharge permits
b. Monitoring compliance
c. Enforcing permit conditions
d. All of the above

55 A multimedia approach to environmental management means

a. Using both command and control regulations and economic incentives
b. Documenting pollution problems with a video film
c. Using both self-monitoring and independent inspections to ensure compliance
d. Simultaneously regulating pollutant discharges to air, water and soil

56 Economic incentives include all of the following except

a. Effluent taxes
b. Marketable permits
c. Corporate income taxes
d. Deposit refund schemes

57 Economic incentives can

a. Promote least-cost solutions
b. Provide flexibility in pollution control technology
c. Stimulate the development of technology
d. All of the above

58 An essential component of a national sustainable development strategy is

a. Funding environmental research
b. Signing international protocols
c. Reducing pollutants in all sectors (agriculture, industry etc.)
d. Setting qualitative targets to be met at some unspecified time

59 The Montreal Protocol calls for

a. Information exchange on ozone depletion
b. Research on ozone depletion
c. Prior approval for the transboundary shipment of hazardous wastes
d. Limits on the production and consumption of ozone-depleting substances

60 A government action that directly encourages Cleaner Production is

a. A national strategy for sustainable development
b. Economic incentives
c. Negotiated environmental compliance that allows for innovation
d. Multimedia environmental permits

LU8 Sources of Information on Cleaner Production

61 The information system that supports 70 focal points around the world is

a. INTIB
b. IEPAC
c. REED
d. ICPIC

62 Data on UNIDO energy- and environment-related industrialization activities in developing countries are obtained from UNIDO via

a. METADEX
b. REED
c. Energy Technology Clearinghouse
d. ICPIC

63 The name of the UNEP on-line pollution prevention clearinghouse is

a. Pollution Prevention Information Clearinghouse
b. Awareness and Preparedness for Emergencies at a Local Level (APELL)
c. ICPIC
d. Energy and Environment Information Systems

64 A United Nations-sponsored source of data on hazardous chemicals and health is

a. INTIB
b. IRPTC
c. International Occupational Safety and Health Information Centre
d. REED

65 One source of information in setting up a national environmental management association for enterprises is

a. World Environment Centre
b. Business Council for Sustainable Development
c. International Network for Environmental Management Organizations (INEM)
d. World Industry Council for the Environment (WICE)

LU9 Environmental Considerations in Project Design

66 The United Nations organization that has prepared guidelines for the rapid assessment of sources of air, water and land pollution is

a. World Health Organization (WHO)
b. UNIDO
c. UNEP
d. UNDP

67 The UNIDO *Guidelines for Environmental Appraisal* are most useful at which stage of the project cycle?

a. Design
b. Identification
c. Approval
d. Evaluation

68 All of the following measures might be appropriate environmental measures for projects without capital implications except

a. Environmental awareness
b. Technology change
c. Training
d. Information management

69 All of the following measures might be appropriate environmental measures for projects with capital implications except

a. Information management
b. Good housekeeping
c. Process changes
d. Treatment and disposal of wastes

70 The UNDP *Handbook and Guidelines for Environmental Management and Sustainable Development* focuses on

a. Identifying environmental problems
b. Assessing environmental impacts
c. Designing environmental management agencies
d. Planning technical assistance

Answers to questions 1-70

1-10	b b c c a d a d b b
11-20	a b c d d c a c b a
21-30	c d a b c a d a b d
31-40	b c b a d c c a b a
41-50	a c d b d d a d c a
51-60	d b c d d c d c d c
61-70	a b c b c a a b a d

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@CHAPTER TITLE = Contents

@TABLESUBHD =

@TABLESUBHD = Time required

@TABLESUBHD = Section Page (minutes)

@TABLESUBHD =

@TOCNODOTS = Introduction to the course 1 15

@TOCNODOTS = Registration sheets 9 30

@TOCNODOTS = Introductory test 13 60

@TOCNODOTS = <MO>105<D>

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@BULLET2 = <MI>Development and the Environment: A New Partnership<D>

@BULLET2 = <MI>Paper Forest<D>

@BULLET = A floppy disc containing, MICRO-METADEX<M^>PLUS<D> and <MI>Case
Studies<D> from the International Cleaner Production Information Clearinghouse (ICPIC).

@BULLET = A floppy disc containing the sample project document <169>Pollution prevention at the (name) industrial facility<170>.

@BULLET = <MI>Cleaner Production Worldwide<D>, a UNEP booklet.

@BULLET = <MI>Audit and Reduction Manual for Industrial Emissions and Wastes<D>, a UNEP/UNIDO technical report.

@BULLET = <MI>Transforming Technology: An Agenda for Environ- mentally Sustainable Growth in the 21st Century<D>, a <%2>booklet writte<%0>n by G. Heaton, R. Repetto and R. Sobin for the World Resources Institute.

@BULLET = A learning recall tape (LRT).

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@MAJOR HEADING = Structure of the Learning Units

Each Learning Unit is divided into four sections:

The<MI> Introduction<D> outlines the objectives of the Learning Unit and the key learning points. At the end of the <MI>Introduction<D> it is suggested that you take the short test in the last section, <MI>Review<D>, and get a feeling for what you want to learn.

The second section, <MI>Study Materials<D>, is the body of the Learning Unit. The text presents the principal points of the Learning Unit and guides you to the <MI>Reading Excerpts<D> at the end of the Learning Unit or to the relevant video. At the end of most topics a short test helps you to review and assess your compre- hension of the materials.<P13B>

The section entitled <MI>Case Studies<D> presents one or more case studies designed to help you think about and discuss with your colleagues some of the issues and questions covered in the Learning Unit.<P13B>

The <MI>Review<D> section contains a short test to help you review the Learning Unit and some ideas that will stimulate thought and discussion about some of the policy implications of the Learning Unit.<P13B>

The Learning Units have been designed to require about four hours study time apiece. The time, which includes that needed to read the body of the unit and the excerpts and to take the test, is estimated on the contents page of each Learning Unit. To work through the Learning Unit, simply s<%2>tart at the <MI>Introduction<D> and follow the text and the <MI>Next Steps<D> boxes, which will guide you alo<%0>ng.

@PAGE BREAK =

@MAJOR HEADING = Acknowledgements

@FIRSTPAR = This training course is based on workshops held at Vienna by the Environment Coordination Unit of the United Nations Industrial Development Organization (UNIDO). It was designed by Ralph (Skip) Luken, the Senior Environmental Adviser of the Environment Coordination

Unit of UNIDO. He would like to acknowledge the contribution of two consultants, R.G.A. Boland and Lyman Clark. He would also like to thank Fritz Balkau and John Kryger of the Industry and Environment Programme Acti- vity Centre at UNEP in Paris, Susan Becker of United Nations Development Programme (UNDP) in New York, Klaus North and others from the International Labour Organisation (ILO) at Geneva and Turin, for their contributions.

Thanks also to several colleagues in the Environment Co- ordination Unit at UNIDO <197> Robert O. Williams, Mats Zack- risson, Muki Daniel, Mari Ito and Silva Garabedian <197> and to colleagues elsewhere at UNIDO: Jaroslav Navratil, Caj Falcke, Lech Kurowski, Ritu Kumar, Harriet Gabbert and Peter Pem- bleton. Five interns who worked in the Environment Coordination Unit also contributed: Ulli Kastner, Philippe Leservoisier, Anne- Sylvie Senechal, Jacques Demajorovic and Jose Mario Carneiro.

Many thanks for all the colleagues in UNIDO who con- tributed in the preparatory work of the course.

Financial support for the development and production of the training course was provided by the Government of Norway.

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@MAJOR HEADING = Introductory Test

@FIRSTPAR = You will take this test now and again at the end of the course, in Learning Unit 10. At this point, you should do the test rapidly, perhaps by answering only the odd-numbered questions. Do not spend more than 60 minutes on this task. The test will serve as an introduction to the materials presented in this course and will help you assess your current knowledge of the subject matter. Compare your answers with those suggested.

@MINOR HEADING = LU2 The Need for Ecologically Sustainable<R> Industrial Development

@TEST? = 1 The developing countries' share of industrial output in 1990 was approximately

@TEST2 a. 10 per cent

@TEST2 b. 15 per cent

@TEST2 c. 20 per cent

@TEST2 = d. 25 per cent

@TEST? = 2 The region with the highest growth rate in industrial output in 1970-1990 was

@TEST2 = a. Developed countries

@TEST2 = b. East Asia/South-East Asia

@TEST2 = c. Latin America

@TEST2 = d. Africa

@TEST? = 3 The region with the lowest growth rate in industrial output in 1970-1990 was

@TEST2 = a. Developed countries

@TEST2 = b. East Asia/South-East Asia

@TEST2 = c. Latin America

@TEST2 = d. Africa

@TEST? = 4 Industry uses approximately

@TEST2 = a. One fifth of the world's energy

@TEST2 = b. One quarter of the world's energy

@TEST2 = c. One third of the world's energy

@TEST2 = d. One half of the world's energy

@PAGE BREAK =

@TEST? = 5 Emissions of CO<MV-2-D> from fossil fuel burning are a major cause of

@TEST2 = a. Greenhouse effect

@TEST2 = b. Aquatic system damage

@TEST2 = c. Ozone depletion

@TEST2 = d. All of the above

@TEST? = 6 Emissions of CFC's come from

@TEST2 = a. Refrigerators

@TEST2 = b. Solvents

@TEST2 = c. Foams

@TEST2 = d. All of the above

@TEST? = 7 Acid rain results primarily from emissions of

@TEST2 = a. Sulfur dioxide

@TEST2 = b. Nitrogen oxides

@TEST2 = c. Hydrocarbons

@TEST2 = d. Particulate matter

@TEST? = 8 All of the following are toxic heavy metals except

@TEST2 = a. Mercury

@TEST2 = b. Lead

@TEST2 = c. Cadmium

@TEST2 = d. Dioxin

@TEST? = 9 The most polluting fuel per unit of energy is

@TEST2 = a. Oil

@TEST2 = b. Coal

@TEST2 = c. Nuclear

@TEST2 = d. Natural gas

@TEST?2 = <P16BJ243>10<P255DJ0> <%2>The World Commission on Environment and Development<%0> called for

@TEST2 = a. Zero economic growth

@TEST2 = b. Economic growth that is equitable and compatible with<R>
the environment

@TEST2 = c. Large-scale financial transfers to developing countries

@TEST2 = d. Preservation of the world's resources

@PAGE BREAK =

@MINOR HEADING = LU3 Defining Ecologically Sustainable Industrial Development

@TEST?2 = <P16BJ243>11 <P255DJ0>Sustainable development means meeting the needs of the<R>
present without

@TEST2 = a. Compromising the needs of the future

@TEST2 = b.<%2> Creating pollution problems for those over 60 years of<R>
<%0>age

@TEST2 = c. Increasing population

@TEST2 = d. Creating greenhouse effects

@TEST?2 = <P16BJ243>12<P255DJ0> To achieve ESID, we need all of the following except

@TEST2 = a. Eco-capacity

@TEST2 = b. High GNP per capita

@TEST2 = c. Efficiency

@TEST2 = d. Equity

@TEST?2 = <P16BJ243>13 <P255DJ0%2>The critical load of industrial pollutants beyond which the<%0> quality of life and the proper management of natural assets are affected is called

@TEST2 = a. Clean production limit

@TEST2 = b. Effluent standard

@TEST2 = c. Eco-capacity

@TEST2 = d. Ambient environmental standard

@TEST?2 = <P16BJ243>14<P255DJ0> Waste minimization is an objective of environmental

@TEST2 = a. Eco-capacity

@TEST2 = b. Equity

@TEST2 = c. Economic analysis

@TEST2 = d. Efficiency

@TEST?2 = <P16BJ243>15<P255DJ0> <%2>The concept of a fair opportunity to share in the benefits of<%0> industrialization refers to

@TEST2 = a. Efficiency

@TEST2 = b. Eco-capacity

@TEST2 = c. Dreams

@TEST2 = d. Equity

@PAGE BREAK =

@TEST?2 = <P16BJ243>16<P255DJ0> The key to achieving ESID is

@TEST2 = a. Transfer of clean technology

@TEST2 = b. Government financial subsidies

@TEST2 = c. Reduction of pollution intensity

@TEST2 = d. <%2>Commitment to the Business Charter of the International<R> <%0> Chamber of Commerce (ICC)

@TEST?2 = <P16BJ243>17<P255DJ0> ESID is justified mainly by

@TEST2 = a.<%2> <%3>Limited capacity for absorbing wastes from human ac<%4>tivitie<%5>s<%0>

@TEST2 = b. Shortage of natural resources

@TEST2 = c. The need for new business ethics

@TEST2 = d. UNCED

@TEST?2 = <P16BJ243>18<P255DJ0> Agenda 21, chapter 30, <169>Strengthening the role of business and industry<170>, calls for

@TEST2 = a. Support of the Valdez Principles

@TEST2 = b. Shipment of hazardous wastes to developing countries

@TEST2 = c. Annual environmental reporting

@TEST2 = d. Preparation of emergency response plans

@TEST?2 = <P16BJ243>19<P255DJ0> The Rio Declaration is

@TEST2 = a. A call for reform of the United Nations system

@TEST2 = b. A statement of principles of sustainable development

@TEST2 = c. A commitment to address climate change issues

@TEST2 = d. Industry's response to sustainable development issues

@TEST?2 = <P16BJ243>20<P255DJ0> Agenda 21 is

@TEST2 = a. A global action plan to implement the Rio Declaration

@TEST2 = b. A call for a new international order

@TEST2 = c. A tropical forest action plan

@TEST2 = d. A UNDP initiative for capacity building

@PAGE BREAK =

@MINOR2 = LU4 Cleaner Production

@TESTSZ = <P16BJ243>21<P255DJ0%2> The first step in improving Cleaner Prod<%0>uction in industry is a change in

@TEST2 = a. Technology

@TEST2 = b. Customer preference systems

@TEST2 = c. Attitudes

@TEST2 = d. Legislation on recycling

@TESTSZ = <P16BJ243>22<P255DJ0> Industrial environmental management has evolved through

@TEST2 = a. Abatement to prevention to dilution

@TEST2 = b. Prevention to dilution to abatement

@TEST2 = c. Dilution to prevention to abatement

@TEST2 = d. Dilution to abatement to prevention

@TESTSZ = <P16BJ243>23<P255DJ0> <%2>The most cost-effective management choice for combating<%0> industrial pollution is

@TEST2 = a. Prevention

@TEST2 = b. Dilution

@TEST2 = c. Abatement

@TEST2 = d. Control

@TESTSZ = <P16BJ243>24<P255DJ0> Cleaner Production eliminates waste

@TEST2 = a. During production

@TEST2 = b. At every stage of the life cycle of a product

@TEST2 = c. By disposing of wastes safely in approved facilities

@TEST2 = d. By recycling processing residues

@TESTSZ = <P16BJ243>25<P255DJ0> Cleaner Production does not include

@TEST2 = a. Better housekeeping

@TEST2 = b. Ecologically benign products

@TEST2 = c. Recycling of wastes by outside contractors

@TEST2 = d. Low- and non-waste technology

@TESTSZ = <P16BJ243>26<P255DJ0> From the practical business point of view, pollution prevention

@TEST2 = a. Often pays

@TEST2 = b. Does not pay

@TEST2 = c. Has a long payback period

@TEST2 = d. Is not possible

@PAGE BREAK =

@TEST?2 = <P16BJ243>27<P255DJ0> <%2>The implementation of Cleaner Production actions does not<%0> need

@TEST2 = a. Training

@TEST2 = b. Cooperation between government and industry

@TEST2 = c. Change in management attitudes

@TEST2 = d. Advanced technology

@TEST?2 = <P16BJ243>28<P255DJ0> <169>Cleaner Production is just not realistic in developing countries where per capita GNP is below $1,000<%2>0<170>.<%0>

This statement is

@TEST2 = a. False

@TEST2 = b. Correct

@TEST2 = c. True

@TEST2 = d. Helpful

@TEST?2 = <P16BJ243>29<P255DJ0> The 10 steps for introducing Cleaner Production in an enter- prise include all of the following except

@TEST2 = a. Involvement of senior employees

@TEST2 = b. Seeking government subsidies

@TEST2 = c. Monitoring and evaluation

@TEST2 = d. Disseminating information to employees

@TEST?2 = <P16BJ243>30<P255DJ0> All of the following are barriers to Cleaner Production except

@TEST2 = a. Lack of financial resources, awareness, training, expertise<R> and know-how and access to existing knowledge

@TEST2 = b. Uncertainty about the right information, technology and<R> regulations

@TEST2 = c. Attitudes of employees who feel threatened by change

@TEST2 = d. Demonstration projects

@MINOR HEADING = LU5 Analytical Tools for Identifying Cleaner Production Opportunities

@TEST?2 = <P16BJ243>31<P255DJ0> Pollution <%2>prevention opportunitie<%0>s may best be identified through

@TEST2 = a. Environmental impact assessment

@TEST2 = b. Waste reduction audit

@TEST2 = c. Environmental compliance audit

@TEST2 = d. Product life-cycle analysis

@TEST?2 = <P16BJ243>32<P255DJ0> A waste reduction audit makes a detailed analysis of plant processes and wastes with the purpose of

@TEST2 = a. Producing wastes

@TEST2 = b. Completely eliminating wastes

@TEST2 = c. Identifying wastes

@TEST2 = d. Hiding wastes

@TEST?2 = <P16BJ243>33<P255DJ0> A waste reduction audit is best described as

@TEST2 = a. An input characterization

@TEST2 = b. A material balance

@TEST2 = c. A balanced financial statement

@TEST2 = d. A least-cost production programme

@TEST?2 = <P16BJ243>34<P255DJ0> The main purpose of an environmental compliance audit is to

@TEST2 = a. Ensure that a fir<%-2>m is complying with env<%0>ironmental norms

@TEST2 = b. <%-2>Provide information to environmental management agencies<%0>

@TEST2 = c. Meet the requirements of the Business Charter of ICC

@TEST2 = d. Protect environmental quality

@TEST?2 = <P16BJ243>35 <P255DJ0>Conducting a waste reduction audit requires a commitment of

@TEST2 = a. Top management

@QUESTIONS2 = b. Supervisors

@QUESTIONS2 = c. Workers

@QUESTIONS2 = d. All of the above

@TEST?2 = <P16BJ243>36<P255DJ0> A product life-cycle analysis considers

@QUESTIONS2 = a. Only the design of a product

@QUESTIONS2 = b. The potential for product recycling

@QUESTIONS2 = c. All stages of production and consumption

@QUESTIONS2 = d. The production process

@TEST?2 = <P16BJ243>37<P255DJ0> The most controversial step in a product life-cycle analysis is

@QUESTIONS2 = a. Cost analysis

@QUESTIONS2 = b. Inventory analysis

@QUESTIONS2 = c. Impact analysis

@QUESTIONS2 = d. Improvement analysis

@PAGE BREAK =

@TEST?2 = <P16BJ243>38<P255DJ0> An environmental impact assessment predicts

@QUESTIONS2 = a. Effects on the environment

@QUESTIONS2 = b. Effects on production cost

@QUESTIONS2 = c. Effects on management

@QUESTIONS2 = d. Effects on pollutant discharge

@TEST?2 = <P16BJ243>39<P255DJ0> Scoping for an environmental impact assessment means

@QUESTIONS2 = a. Finding the best environmental location for a project

@QUESTIONS2 = b. Identifying the major environmental impacts

@QUESTIONS2 = c. Choosing the least-cost mitigation strategy

@QUESTIONS2 = d. Finding the most qualified team of experts

@TEST?2 = <P16BJ243>40<P255DJ0> All of the following are important principles in managing an environmental impact assessment except

@QUESTIONS2 = a. Balancing the benefits and costs of mitigation measures

@QUESTIONS2 = b. Involving the appropriate persons and groups

@QUESTIONS2 = c. Linking information to decisions about the project

@QUESTIONS2 = d. Presenting clear options for the mitigation of impacts

@MINOR HEADING = LU6 Economic Techniques for Assessing Cleaner Production Options

@TEST?2 = <P16BJ243>41<P255DJ0> To justify a Cleaner Production investment, the economic tech- nique that measures cash flows and profitability over a future period at the plant level is

@TEST2 = a. Financial analysis

@TEST2 = b. Micro-economic analysis

@TEST2 = c. Macroeconomic analysis

@TEST2 = d. Environmental impact assessment

@TEST?2 = <P16BJ243>42<P255DJ0> A payback period of one year is equivalent to a

@TEST2 = a. 25 per cent return on capital

@TEST2 = b. 50 per cent return on capital

@TEST2 = c. 100 per cent return on capital

@TEST2 = d. 200 per cent return on capital

@PAGE BREAK =

@TEST?2 = <P16BJ243>43<P255DJ0> Payback analysis is a limited measure of investment because it fails to account for

@TEST2 = a. Economic life of the investment

@TEST2 = b. Income tax

@TEST2 = c. Present value of cash flows

@TEST2 = d. All of the above

@TEST?2 = <P16BJ243>44<P255DJ0> The technique that estimates the economic impact of Cleaner Production investment at an industry level is

@TEST2 = a. Environmental impact assessment

@TEST2 = b. Micro-economic analysis

@TEST2 = c. Macroeconomic analysis

@TEST2 = d. Financial analysis

@TEST?2 = <P16BJ243>45<P255DJ0> Micro-economic impact analysis examines all of the following except

@TEST2 = a. Plant closure

@TEST2 = b. Product price increases

@TEST2 = c. Capacity expansion

@TEST2 = d. Balance of payments

@TEST?2 = <P16BJ243>46<P255DJ0> The economic technique that measures the cost of a Cleaner Production activity against possible benefits is

@TEST2 = a. Marginal cost analysis

@TEST2 = b. Financial analysis

@TEST2 = c. Macroeconomic analysis

@TEST2 = d. Benefit-cost analysis

@TEST?2 = <P16BJ243>47<P255DJ0> The main difficulty with benefit-cost analysis is usually

@TEST2 = a. Quantifying health effects

@TEST2 = b. Estimating the costs

@TEST2 = c. Valuing the benefits

@TEST2 = d. Arithmetical

@PAGE BREAK =

@TEST?2 = <P16BJ243>48<P255DJ0> In environmental benefit-cost analysis, values can be

@TEST2 = a. Market values based on prices and cost savings

@TEST2 = b. Surrogate values based on land values, wage premiums,<R> travel costs etc.

@TEST2 = c. Survey values

@TEST2 = d. All of the above

@TEST?2 = <P16BJ243>49<%2> <P255DJ0>To justify a Cleaner Production i<%0>nvestment, the economic tool that measures the effect of environmental expenditures on GDP, consumer prices and unemployment is

@TEST2 = a. Environmental impact assessment

@TEST2 = b. Micro-economic analysis

@TEST2 = c. Macroeconomic analysis

@TEST2 = d. Financial analysis

@TEST?2 = <P16BJ243>50<P255DJ0> <%2>Expenditure on pollution prevention and control in most<%0> developed countries accounts for

@QUESTIONS2 = a. 2 per cent of GDP

@QUESTIONS2 = b. 5 per cent of GDP

@QUESTIONS2 = c. 8 per cent of GDP

@QUESTIONS2 = d. 10 per cent of GDP

@MINOR HEADING = LU7 The Role of Government in Industrial<R> Environmental Management

@TEST?2 = <P16BJ243>51<P255DJ0> The concept of market failures in environmental management refers to

@TEST2 = a. State ownership of enterprises

@TEST2 = b. Subsidies for energy use

@TEST2 = c. Accelerated depreciation for pollution control equipment

@TEST2 = d. Treating environmental resources as free goods

@TEST?2 = <P16BJ243>52<P255DJ0> An example of policy failure in environmental management is

@TEST2 = a. Absence of environmental laws

@TEST2 b. Subsidies for water use

@TEST2 c. Absence of a national environmental action plan

@TEST2 = <%3>d. <%0>Subsidies for <%2>building<%0> <%1>mu<%3>ni<%1>cipal

<%0>waste-water treatment<R>
<%3> plants<%0>

@TEST?2 = <P16BJ243>53 <P255DJ0%2>One essential environmen<%0>tal management activity that needs to be undertaken by Governments is

@TEST2 = a. Support for environmental non-governmental organiza-<R>
tions (NGOs)

@TEST2 = b. Tax credits to industry for installing pollution control<R>
equipment

@TEST2 = c. Collection and dissemination of environmental data

@TEST2 = d. A ministerial appointment for the head of the <R>
environmental management agency

@TEST?2 = <P16BJ243>54<P255DJ0> <%2>An effective command-and-control regulatory programme<%0> requires

@TEST2 = a. Issuing discharge permits

@TEST2 = b. Monitoring compliance

@TEST2 = c. Enforcing permit conditions

@TEST2 = d. All of the above

@TEST?2 = <P16BJ243>55<P255DJ0> A multimedia approach to environmental management means

@TEST2 = a. Using both command and control regulations and <R>
economic incentives

@TEST2 = b. Documenting pollution problems with a video film

@TEST2 = c. Using both self-monitoring and independent inspections<R>
to ensure compliance

@TEST2 = d. Simultaneously regulating pollutant discharges to air,<R>
water and soil

@TEST?2 = <P16BJ243>56<P255DJ0> Economic incentives include all of the following except

@TEST2 = a. Effluent taxes

@TEST2 = b. Marketable permits

@TEST2 = c. Corporate income taxes

@TEST2 = d. Deposit refund schemes

@TEST?2 = <P16BJ243>57 <P255DJ0>Economic incentives can

@TEST2 = a. Promote least-cost solutions

@TEST2 = b. Provide flexibility in pollution control technology

@TEST2 = c. Stimulate the development of technology

@TEST2 = d. All of the above

@PAGE BREAK =

@TESTSZ = <P16BJ243>58<P255DJ0> An essential component of a national sustainable development strategy is

@TEST2 = a. Funding environmental research

@TEST2 = b. Signing international protocols

@TEST2 = c. <%-2>Reducing pollutants in all sectors (agriculture, industry etc.)<%0>

@TEST2 = d. <%2>Setting qualitative t<%0>argets to be met at some unspecified<R>
time

@TESTSZ = <P16BJ243>59<P255DJ0> The Montreal Protocol calls for

@TEST2 = a. Information exchange on ozone depletion

@TEST2 = b.<N> Research on ozone depletion

@TEST2 = c. Prior approval for the transboundary shipment of <R>
hazardous wastes

@TEST2 = d. Limits on the production and consumption of ozone-<R>
depleting substances

@TESTSZ = <P16BJ243>60<P255DJ0> <%2>A government action that directly encourages Cleaner Pro- duction is<%0>

@TEST2 = a. A national strategy for sustainable development

@TEST2 = b. Economic incentives

@TEST2 = c. Negotiated environmental compliance that allows for<R>
innovation

@TEST2 = d. Multimedia environmental permits

@MINOR HEADING = LU8 Sources of Information on Cleaner Production

@TESTSZ = <P16BJ243>61<P255DJ0> The information system that supports 70 focal points around the world is

@TEST2 = a. INTIB

@TEST2 = b. IE/PAC

@TEST2 = c. REED

@TEST2 = d. ICPIC

@TESTSZ = <P16BJ243>62<P255DJ0> Data on UNIDO energy- and environment-related

industrial- ization activities in developing countries are obtained from UNIDO via

@TEST2 = a. METADEX

@TEST2 = b. REED

@TEST2 = c. Energy Technology Clearinghouse

@TEST2 = d. ICPIC

@PAGE BREAK =

@TESTSZ = 6<P16BJ243>3<P255DJ0> The name of the UNEP on-line pollution prevention clearing- house is

@TEST2 = a. Pollution Prevention Information Clearinghouse

@TEST2 = b. Awareness and Preparedness for Emergencies at a Local<R>
Level (APELL)

@TEST2 = c. ICPIC

@TEST2 = d. <%2>Energy and Environment Information Systems<%0>

@TESTSZ = <P16BJ243>64 <P255DJ0%2>A United Nations-sponsored source of data on hazardous<%0> chem- icals and health is

@TEST2 = a. INTIB

@TEST2 = b. IRPTC

@TEST2 = c. International Occupational Safety and Health Informa-<R>
tion Centre

@TEST2 = d. REED

@TESTSZ = <P16BJ243>65<P255DJ0> One source of information in setting up a national environ- mental management association for enterprises is

@TEST2 = a. World Environment Centre

@TEST2 = b. Business Council for Sustainable Development

@TEST2 = c. International Network for Environmental Management<R>
Organizations (INEM)

@TEST2 = d. World Industry Council for the Environment (WICE)

@MINOR HEADING = LU9 Environmental Considerations in Project Design

@TESTSZ = <P16BJ243>66<P255DJ0> The United Nations organization that has prepared guidelines for the rapid assessment of sources of air. water and land pollution is

@TEST2 = a. World Health Organization (WHO)

@TEST2 = b. UNIDO

@TEST2 = c. UNEP

@TEST2 = d. UNDP

@TESTSZ = <P16BJ243>67<P255DJ0> The UNIDO <MI>Guidelines for Environmental Appraisal<D> are most useful at which stage of the project cycle?

@TEST2 = a.<MI> <D>Design<MI>

@TEST2 = b. Identification<MI>

@TEST2 = c. Approval

@TEST2 = d. Evaluation<MI>

@PAGE BREAK =

@TEST?2 = <P16BJ243>68<P255DJ0> All of the following measures might be appropriate environ- mental measures for projects without capital implications except

@TEST2 = a. Environmental awareness

@TEST2 = b. Technology change

@TEST2 = c. Training

@TEST2 = d. Information management

@TEST?2 = <P16BJ243>69 <P255DJ0>All of the following measures might be appropriate environ- mental measures for projects with capital implications except

@TEST2 = a. Information management

@TEST2 = b. Good housekeeping

@TEST2 = c. Process changes

@TEST2 = d. Treatment and disposal of wastes

@TEST?2 = <P16BJ243>70<P255DJ0> The UNDP<MI> Handbook and Guidelines for Environmental Management and Sustainable Development<D> focuses on

@TEST2 = a. Identifying environmental problems

@TEST2 = b. Assessing environmental impacts

@TEST2 = c. Designing environmental management agencies

@TEST2 = d. Planning technical assistance