UNIT-2 Environmental Management Systems

Learning Outcomes

By the end of this unit the learner will be able to:

- ✓ Identify key elements of EMS
- ✓ Understand ISO Standrads

Unit 2

Environmental Management Systems

Introduction

Environmental management system (EMS) refers to the management of an organisation's environmental programmes in a comprehensive, systematic, planned and documented manner. It includes the organisational structure, planning and resources for developing, implementing and maintaining policy for environmental protection.

An environmental management system (EMS):

- Serves as a tool to improve environmental performance
- Provides a systematic way of managing an organisation's environmental affairs
- Is the aspect of the organisation's overall management structure that addresses immediate and long-term impacts of its products, services and processes on the environment
- Gives order and consistency for organisations to address environmental concerns through the allocation of resources, assignment of responsibility and ongoing evaluation of practices, procedures and processes
- Focuses on continual improvement of the system

An EMS follows a plan-do-check-act cycle or PDCA. It shows the process of first developing an environmental policy, planning the EMS and then implementing it. The process incorporates checking the system and acting on it. The model is continuous because an EMS is a process of continual improvement in which an organisation is constantly reviewing and revising the system. EMS is an important tool for managing the environment effectively and efficiently.

This model can be employed by a plethora of organisations with distinct areas of specialisation.

1. What are some key elements of an EMS?

- Policy statement: A statement of the organisation's commitment to the environment
- Identification of significant environmental impacts: Environmental attributes of products, activities and services and their effects on the environment
- Development of objectives and targets: Environmental goals for the organisation
- Implementation: Plans to meet objectives and targets
- Training: Instruction to ensure employees are aware and capable of fulfilling their environmental responsibilities
- Management review

2. Can existing environmental management activities be integrated into the EMS?

   An EMS is flexible and necessitates organisations to 'retool' their existing activities. An EMS establishes a management framework by which an organisation's impact on the environment can be systematically identified and reduced. For example, many organisations, including counties and municipalities, have active and effective pollution prevention activities underway. These activities are an important tool to manage the ecosystems and prevent them from decaying. These could be incorporated into the overall EMS.

ISO Standards

1. **ISO, ISO 14000 and ISO 14001**

   ISO stands for the International Organisation for Standardisation, located in Geneva, Switzerland. ISO is a non-governmental organisation, which was established in 1947. The organisation mainly functions to develop voluntary technical standards that aim at making development, manufacture and supply of goods and services more efficient, safe and clean.

   ISO is a very vital tool in ensuring the effectiveness of hygiene and cleanliness. ISO 14000 refers to a set of voluntary standards and guidance documents to help organisations address environmental issues. These include standards for environmental management systems, environmental and EMS auditing, environmental labelling, performance evaluation and life-cycle assessment.

   In September 1996, the International Organisation for Standardisation published the first edition of ISO 14001, the environmental management systems standard. This is an international voluntary standard elucidating specific requirements for an EMS. ISO 14001 is a specification standard to which an organisation may receive certification or registration. ISO 14001 is considered the foundation document of the entire series. A second edition of ISO 14001 was published in 2004, updating the standard. In ISO 14001, many updates were made to make sure that nobody would get away with the loopholes, which were prevalent in the old system.

   Questions may arise when implementing an EMS following the ISO 14001 standard. The U.S. body that provides input into the standard's development is the U.S. TAG (Technical Advisory Group) to the TC 207 (Technical Committee). This same body has established a formal process to respond to questions that may arise regarding clarification of the ISO 14001 ('the standard'). These responses reflect the interpretation of the standard as it was intended during the drafting of the standard and may be found in the 'Clarification of Intent of ISO 14001'. These standards are maintained with the help of these avenues.

2. How are these standards Developed?

All ISO standards are generated through a voluntary, consensus-based approach. ISO has many member countries across the globe. Each member country develops its position on the standards and these positions are then negotiated with other member countries. Draft versions of the standards are sent out for formal written comment and each country casts an official vote on the drafts at the appropriate stage of the process. Within each country, myriad organisations can participate in the process. Industries, government (federal and state) and interested parties, like various non-government organisations, become a part of the system. For example, EPA and some states participated in the development of the ISO 14001 standard and are now evaluating its usefulness through a variety of pilot projects.

3. The 17 Requirements of the ISO 14001:2004 standard

- Environmental policy: Develop a statement of the organisation's commitment to the environment
- Environmental aspects and impacts: Identify environmental attributes of products, activities and services and their effects on the environment
- Legal and other requirements: Identify and ensure access to relevant laws and regulations
- Objectives and targets and environmental management programme: Set environmental goals for the organisation and plan actions to achieve objectives and targets
- Structure and responsibility: Establish roles and responsibilities within the organisation
- Training, awareness and competence: Ensure that employees are aware and capable of their environmental responsibilities
- Communication: Develop processes for internal and external communication on environmental management issues
- EMS documentation: Maintain information about the EMS and related documents
- Document control: Ensure effective management of procedures and other documents
- Operational control: Identify, plan and manage the organisation's operations and activities in line with the policy, objectives and targets and significant aspects
- Emergency preparedness and response: Develop procedures for preventing and responding to potential emergencies
- Monitoring and measuring: Monitor key activities and track performance including periodic compliance evaluation
- Evaluation of compliance: Develop procedure to periodically evaluate compliance with legal and other requirements
- Non conformance and corrective and preventive action: Identify and correct problems and prevent recurrences
- Records: Keep adequate records of EMS performance

- EMS audit: Periodically verify that the EMS is effective and achieving objectives and targets
- Management review: Review the EMS

4. Legislation and standards

The Environmental Liability Directive [ELD] 2004/35/EC is an instrument of paramount importance that business need to comply with and must be included in EMS. It came into force across Europe during 2009 and became a law on 1 March 2009 converting the various national Pollution Prevention Guidelines (PPGs) such as the UK PPG11, PPG18 and PPG21 into requirements. Failure to comply with these requirements could result in penalty in the form of fines and more significantly reformation/ reinstatement costs, which can run into many millions of Euro or Dollars. Within this directive is a requirement to mitigate the effects of events such as spills and firewater (the latter is the runoff from fires). The directive makes it clear that it is the site owner's responsibility to contain spills and firewater on site by using any form of containment apparatus such as sealing the drains.

5. ISO 14000

a. Definition

The ISO 14000 is a standard for environmental management systems that is applicable to any business, regardless of size, location or income. The aim of the standard is to reduce the environmental footprint of a business and to decrease pollution and waste that ensues business processes. The most recent version of ISO 14001 was released in 2004 by the International Organisation for Standardisation (ISO), which has a representation from committees all over the world.

The major objective of the ISO 14000 series of norms is "to promote more effective and efficient environmental management in organisations and to provide useful and usable tools- ones that are cost effective, system-based, and flexible and reflect the best organisations and the best organisational practices available for gathering, interpreting and communicating environmentally relevant information". The intended result is the enhancement of environmental performance.

It works as a source of guidance for introducing and adopting environmental management systems based on the ideal universal practices, in the same way that the ISO 9000 series on quality management systems, which is now widely applied, represents a tool for technology transfer of the best available quality management practices.

The ISO 14000 environmental management standards exist to help organisations minimise their operations' negative effect upon the environment. In structure, it is similar to ISO 9000 quality management and both can be implemented synchronously. In order for an

organisation to be awarded an ISO 14001 certificate, it must be externally audited by an audit body that has been accredited by an accreditation body. In the UK, this is the UKAS. Certification auditors need to be accredited by the International Registrar of Certification Auditors. The certification body has to be accredited by the ANSI-ASQ National Accreditation Board in the USA or the National Accreditation Board in Ireland.

- ISO 14001 Environmental management systems: Requirements with guidance for use
- ISO 14004 Environmental management systems: General guidelines on principles, systems and support techniques
- ISO 14015 Environmental assessment of sites and organisations
- ISO 14020 series (14020 to 14025): Environmental labels and declarations
- ISO 14031 Environmental performance evaluation: Guidelines
- ISO 14040 series (14040 to 14049): Life Cycle Assessment (LCA) discusses pre-production planning and environment goal setting.
- ISO 14050 Terms and definitions
- ISO 14062 discusses making improvements to environmental impact goals.
- ISO 14063 Environmental communication: Guidelines and examples
- ISO 19011, which specifies one audit protocol for both 14000 and 9000 series standards Together

This replaces ISO 14011 meta-evaluation (how to determine if your intended regulatory tools worked). ISO 19011 is now the only recommended way to determine this.

b. ISO 14001 Definition

ISO 14001 defines an environmental audit, as "ISO 14001 is the environmental standard against which organisations are assessed. It specifies the requirements for an EMS, which provides a framework for an organisation to control the environmental impacts of its activities, products and services".

Three Types

According to Mattsson and Olsson, there are three types of audit:

- Liability audit
- Management audit
- Functional audit (sometimes called an activity or issues audit)

Liability audits assess compliance with legal obligations. Management audits verify that an Environmental Management Strategy meets its stated objectives. An activity audit may investigate a specific area such as energy or water use.

EMAS Description

EMAS is generally a site-based registration system with due consideration provided to off-site activities that may have a bearing upon the products and services of the primary site. Within the UK, an extension to the scheme has been agreed upon for local government operations, who may also register their Environmental Management Systems to the EMAS regulations.

EMAS requires an existing environmental policy within the organisation, fully supported by senior management and outlining the policies of the company, not only to the staff but also to the public and other stakeholders. The policy needs to clarify compliance with environmental regulations that may affect the organisation and stress a commitment to continued improvement. Emphasis has been placed on policy as this provides direction for the remaining management system.

Those companies who have witnessed ISO9000 assessments are aware that the policy is frequently discussed during assessment; many staff members are asked if they understand or are aware of the policy. Any problems associated with the policy are seldom serious. The Environmental Policy is different. It forms initial foundation for the management system and is more stringently reviewed than the similar ISO9000 Policy. The statement must be publicised in non-technical language so that it can be understood by majority of its readers. It should relate to the sites within the organisation encompassed by the management system, it should provide an overview of the company's activities on the site and a description of those activities. A clear picture of the company's operations is presented by the authorities to the lawmakers.

In addition to a summary of the process, the statement requires quantifiable data on current emissions and environmental effects emanating from the site, waste generated, raw materials utilised, energy and water resources consumed and any other environmental aspect that may relate to operations on the site.

The preparatory review is part of an EMAS assessment. This is not the case for BS7750. The environmental review must be comprehensive in consideration of input processes and output at the site. This control process is fashioned to identify all relevant environmental aspects that may arise from existence on the site. These may relate to current operations, they may relate to future, perhaps even unplanned future activities and they will certainly relate to the activities performed on site in the past (i.e. contamination of land). These processes are very important in order to ensure that the rules and regulations are enforced.

The initial or preparatory review will also include a wide-ranging consideration of the legislation, which may affect the site, whether it is currently being complied with and perhaps even, whether copies of the

legislation are available. Many of the environmental assessments that have been undertaken highlighted that companies are often unaware of the legislations that impinge upon them. Thus, they often do not meet the requirements of such legislations.

Enforcing these legislations is critical for protecting the environment and other related processes. The company can declare its primary environmental objectives that have the propensity to have maximum environmental impact. In order to gain most benefits, these will become the primary areas of consideration within the improvement process and the company's environmental programme. The programme will incorporate plans to achieve specific goals or targets along the route to a specific goal and describe the means to reach those objectives such that they are real and achievable. The Environmental Management System provides further detail on the environmental programme. The EMS establishes procedures, work instructions and controls to ensure that implementation of the policy and achievement of the targets can become a reality. Communication is a vital factor, enabling people in the organisation to be aware of their responsibilities and of the objectives of the scheme and able to contribute to its success.

The Environmental Management System

As with ISO9000, the Environmental Management System requires a planned comprehensive periodic audit to ensure that it is effective in operation, is meeting specified goals and the system continues to perform in accordance with the relevant regulations and standards. The audits are designed to provide additional information in order to exercise effective management of the system, provide information on practices, which differ from the current procedures or offer an opportunity for improvement. Under EMAS, the minimum frequency for an audit is at least once every three years. The companies can have an audit more frequently if they are willing to do so.

Most companies produce routine annual reports and accounts that entail details of activities of the organisation over the previous year and its plans for the future. EMAS generally expects a similar system for the company's environmental performance. It expects a periodic statement, which incorporates performance during the previous period, a set of current performance data and notice of any particular plans for the future that may have an effect upon the environmental performance of the organisation, whether detrimental or beneficial.

The peculiarity with EMAS is that the policy statement, the programme, the management system and audit cycles are reviewed and validated by an external accredited EMAS verifier. The verifier not only provides a registration service, but is also required to confirm and perhaps even sign the company's periodic environmental statements.

PDCA (PLAN-DO-CHECK-ACT)

It is an iterative four-step problem-solving process typically used in business process improvement. It is also known as the Deming cycle, Shewhart cycle, Deming wheel or plando- study-act.

THE PDCA Cycle

Plan

Establishes the objectives and processes necessary to deliver results in accordance with the expected output. By making the expected output the focus, it differs from other techniques as the completeness and accuracy of the specification is part of the improvement.

Do

Implement the new processes on a small scale, if possible.

Check

Measure the new processes and compare the results against the expected results to ascertain any differences.

Act

Analyse the differences in order to determine their cause. Each will be part of either one or more of the P-D-C-A steps. Determine where changes must be applied so that they also engender improvement. When a check through these four steps does not result in the need to improve, the scope is refined. PDCA is applied to this nascent scope and the cycle is repeated until there is a plan that involves improvement.

PDCA

PDCA was made popular by Dr. W. Edwards Deming, who is considered father of modern quality control by many; however, he always referred to it as the 'Shewhart cycle'. Later in Deming's career, he modified PDCA to 'Plan, Do, Study, Act' (PDSA) to elucidate his recommendations in a better manner.

The concept of PDCA is based on the scientific method that was developed from the work of Francis Bacon (Novum Organum, 1620). The scientific method can be written as 'hypothesis' - 'experiment' - 'evaluation' or plan, do and check. Shewhart delineates manufacture under 'control' - under statistical control - as a three-step process of specification, production and inspection. He also specifically relates this to the scientific method of hypothesis, experiment and evaluation. Shewhart says the statistician "must help to change the demand (for goods) by showing...how to close up the tolerance range and to improve the quality of goods". Clearly, Shewhart intended the analyst to take action based on the conclusions of the evaluation. Deming noticed, during his lectures in Japan in the early 1950's, that the Japanese participants shortened the steps to the now traditional plan, do, check, act. Deming preferred plan, do, study and act because 'study' has connotations in English closer to Shewhart's intent than 'check'. A fundamental principle of the scientific method and PDSA is iteration- once a hypothesis is confirmed (or negated), executing the cycle again will extend the knowledge further. Repeating the PDSA cycle can bring us closer to the goal, which is usually a perfect operation and output.

In Six Sigma programmes, the PDSA cycle is called 'define measure, analyse, improve, control' (DMAIC). The iterative nature of the cycle must be explicitly added to the DMAIC procedure. This procedure also forms an important feature in the management of energy systems.
PDSA should be repeatedly implemented in spirals of increasing knowledge of the system that converge on the ultimate goal, each cycle closer than the previous. One can envision an open coil spring, with each loop being one cycle of the scientific method- PDSA and each complete cycle indicating an increase in our knowledge of the system under study.

This approach is based on the belief that our knowledge and skills are limited but improving. Especially at the start of a project, key information may not be known; the PDSA- scientific method- provides feedback to justify our guesses (hypotheses) and increase our knowledge.
Rather than enter 'analysis paralysis' to get it perfect the first time, it is better to be approximately right than exactly wrong. There is a greater probability of being right this way.

With improved knowledge, we may choose to refine or alter the goal (ideal state). Certainly, the PDSA approach can bring us closer to whatever goal we choose. Rate of change i.e. rate of improvement, is a key competitive factor in today's world. PDSA allows for major 'jumps' in performance ('breakthroughs' often desired in a Western approach), as well as Kaizen (frequent small improvements associated with an Eastern approach). The PDSA approach is normally a cumbersome process, which entails detailed efforts from the people involved. In the United States, as a PDSA approach is usually associated with a sizable project involving numerous people's time, thus managers want to see large 'breakthrough' improvements to justify the effort expended. However, scientific method and PDSA apply to all sorts of projects and improvement activities. The power of Deming's concept lies in its apparent simplicity. The concept of feedback in the scientific method, in the abstract sense, is today firmly rooted in education. This concept is easy to adapt when compared to other concepts. While apparently easy to comprehend, it is often difficult to accomplish on an on-going basis due to the intellectual difficulty of judging one's proposals (hypotheses) based on measured results. Many people have an emotional fear of being proved 'wrong', even by objective measurements. To avoid such comparisons, we may instead cite complacency, distractions, loss of focus, lack of commitment, re-assigned priorities, lack of resources etc.

Energy Efficiency

In a slightly different context, EMS can also refer to a system in an organisation to achieve energy efficiency through well laid out procedures and methods and to ensure continual improvement, which will spread awareness of energy efficiency throughout an entire organisation.

Automated Control of Building Energy

The term Energy Management System can also refer to a computer system, which is designed specifically for automated control and monitoring of the heating, ventilation and lighting needs of a building or group of buildings such as university campuses, office buildings or factories. Most of these Energy

Management Systems also facilitate reading of electricity, gas and water meters. The data obtained from these can then be employed to produce trend analysis and annual consumption forecasts.

The word environment refers to a vast area. The protection of the environment is vital for sustainable human development. Relevant factors of the environment include food, water, energy, natural resources, toxic substances etc. Energy is one of the most important factors of the environment. Energy management is critical to our future economic prosperity and environmental well-being. Energy is essential for the functioning of most of the industrialised world as well as developing and under developed nations. Yet, at the same time energy production and consumption causes degradation of the environment of the industrialised world. Developing countries are also not bereft of problems of a similar kind.

Energy management is one of the most critical issues for the future as so much of the world is dependent upon it. Thus, we need to comprehend the traditional sources of energy and their quality, availability and environmental effects, as well as the potential alternatives for energy and the effects of these upon the natural environment and modern industrial economies. Over the past two hundred years, the use of primary energy sources in manufacturing or processing has evolved from simply using locally available resources such as waterpower, firewood or coal. The transition from coal to a petroleum-based fuel economy took place during the twentieth century. With changes to the oil market in the year 2000, which caught media attention around the world, there is further interest in the ongoing transition to renewable energy sources. Managing energy is now a basic feature in the global economy and environment. Fossil fuels in the form of oil, natural gas and coal comprise approximately 80% of the world's energy use. We now face a world where the environmental impacts of combusting fossil fuels such as coal and oil are identified as unsustainable in the long term. The need to turn to an increasing use of sustainable and renewable energy sources is clearly agreed.

EMAS

The EU Eco-Management and Audit Scheme (EMAS) is a management tool for companies and other organisations to evaluate reports and improve their environmental performance. The scheme has been available for participation of companies since 1995. It was originally restricted to companies in industrial sectors. This system has considerably increased the efficiency of the systems involved and has made the process more transparent. Since 2001, EMAS has been open to all economic sectors including both public and private services.

In 2009, EMAS Regulation was revised and modified for the second time. Regulation (EC) No 1221/2009 of the European Parliament and of the Council of 25 November 2009 on the voluntary participation by organisations in a community eco-management and audit scheme (EMAS) was published on 22 December 2009 and entered into force on 11 January 2010.

Eco-Management and Audit Scheme

The Eco-Management and Audit Scheme (EMAS) is the EU voluntary instrument, which acknowledge organisations that improve their environmental performance on a continuous basis.

An increasing number of companies are taking up this project to be a part of their system. More than 4,100 registered organisations are legally compliant, run an environmental management system and report on their environmental performance through the publication of independently verified environmental statements. They are recognised by the EMAS logo, which guarantees the reliability of the information provided. Certified organisations include industrial companies, small and medium enterprises, services, third sector organisations, administrations and international organisations (including the European Commission and the European Parliament themselves).

Requirements

The following are some requirements, which must be fulfilled by organisations in order to obtain the registration of EMAS:

- The organisation must have a policy related to the environment
- There must be an on-site review of the policy
- There must be clear objectives of the organisation regarding environment, on the basis of the policy and review discussed above
- Audit of the matter related to the environment
- A clear statement by the organisation regarding the environment

Environmental Auditing

Environmental audits are intended to quantify environmental performance and environmental position. In this way, they perform an analogous (similar) function to financial audits. An environmental audit report ideally contains a statement of environmental performance and environmental position and may aim to define steps to be taken to sustain or improve indicators of such performance and position.

However, access to manage this system is limited. Interested parties need to go through a process of evaluation to become eligible to enforce this system. Environmental auditors can obtain certification through a written exam and an acceptance of the Environmental Auditor Association code of ethics. Depending on the nature of the audit, there are several different designations to choose from CECAB (Canadian Environmental Certification Approvals Board) administers this designation.

Environmental auditing is a management tool to evaluate environment management systems systematically and objectively. It has the following objectives:

- Waste prevention and reduction
- Assessing compliance with regulatory requirements
- Placing environmental information in the public domain

Compliance with regulatory norms, through an adoption of clean technologies and improvement in management practices for prevention and control of pollution, is not only mandatory but also has wide acceptance among the industrial community. Charter on corporate responsibility for environmental protection (CREP) also calls for commitment and voluntary initiatives of industry for responsible care of the environment, which will help in building a partnership for pollution control.

There are a few ambiguities in this system. Industries and use this ambiguities to their own advantage. It is a fact that enforcement agencies are often not fully equipped in terms of labour and other infrastructure to identify violation of Pollution Control norms by industries. Since, there is high probability that enforcement agencies may monitor only limited number of industries spread over in different areas in the entire state, the government intends to introduce a new scheme called 'Environmental Auditing Scheme'. Thus, to make sure that there are no loopholes in the system, technically qualified professionals (Auditors) become a link between industries, enforcement agencies and Association of Industries in this scheme. This scheme works in tandem with added vital elements of accountability and transparency.

The scheme intends to carry out the following action plan:

- Identification of highly polluting industries in different sectors
- Development of Standard Operating Procedures/Protocols in different sectors to assist the industry in developing self-audit programmes at individual facilities for evaluating their compliance with the environmental requirements under the environmental laws and regulations for monitoring the pollution.
- Developing training modules to train regulators, industrial and environmental auditors and imparting training to the stakeholders (auditors/industries/regulators)
- Identification and accreditation of the environmental auditors
- Development of MIS system to process the environmental auditing reports
- Support and guidance to industries to mitigate the pollution

Impact Assessment and Environmental Auditing

Environmental impact assessment is the mandatory assessment of compliance of planned activities such as planning documents, programmes and projects, with environmental protection requirements and with the principles of sustainable development, with the aim of determining the optimum solution. It becomes an important tool in managing and understanding the effects of the organisation on the environment.

On the other hand, environmental audit is the assessment of the compliance of environmental administration and performance of an operating business with environmental protection requirements, with sound environmental practice in general and with the principles of sustainable development. Environmental auditing is mandatory only in cases stipulated by law.

Environmental audits are being used as a tool and an aid to test the effectiveness of environmental efforts at the local level. These audits should be carried out with transparency and honesty and the results should be made public. An environmental audit is a systematic, independent internal review to check whether the results of environmental work tally with the targets. An environmental audit also focuses on the effectiveness of the methods used to achieve goals. To be more precise, the work of an environmental audit is to examine documents and reports to determine whether there are any deviations between targets and results. This is done by interviewing key people in the organisation. An environmental audit will confirm whether the environmental targets have been attained.

The concept of environmental auditing is closely related to monitoring, norms and standards:

Environmental Monitoring	**Environmental Norms**	**Environmental Standards**
Environmental monitoring is the systematic observation of the state of the environment and of the factors influencing it. Its main purposes are to forecast changes to the state of the environment and to provide initial data for planning documents, programmes and projects. The procedure of environmental monitoring shall be established by law	Environmental norms are reference figures or use rates of natural resources per production unit established for the quality of the environment, the volume of waste or per production unit	Environmental standards are documents setting rules, guidelines and numeric values defined by the involved parties and regulating activities or results of activities, which either have or are likely to have impact on the state of the environment

Table 2.1

These audits are conducted at regular intervals by various personnel who are involved in the process. During a typical environmental audit, a team of qualified inspectors, either employees of the organisation being audited or contractor personnel, conducts a comprehensive examination of a plant or other facilities to determine whether it is complying with environmental laws and regulations. Employing checklists and audit protocols and relying on professional judgment and evaluations of site-specific conditions, the team systematically verifies compliance with applicable requirements. The team may also evaluate the effectiveness of current systems to manage compliance and assess the environmental risks associated with facility's operations.

Environmental Management and Valuation

Environmental resources are a very important aspect in the global systems. From scenic beauty and recreational opportunities to direct inputs into the production process, environmental resources provide a complex set of values to individuals and benefits to society. Coastal areas, for example, endow scenic panoramas and radiant sunsets. Fish and other edible sea life caught in coastal areas afford a rich and nutritious source of food to consumers. Beaches are also excellent recreation areas that are used for relaxation, exercise or bird watching. These are only the direct benefits. The indirect benefits are also enormous if we start calculating. These values are not directly tied to use, such as climate modulation, physical protection and stewardship for future generations. All of these benefits are relevant in environmental valuation.

Methods for Valuing the Environment

Environmental valuation is largely based on the assumption that individuals are willing to pay for environmental gains and conversely are willing to accept compensation for some environmental losses. The individual demonstrates preferences, which, in turn, places value on environmental resources. That society values environmental resources is certain; monetising the value placed on changes in environmental assets such as coastal areas and water quality is far more complex. Environmental economists have developed a number of market and non-market-based techniques to value the environment. The figure below presents some of these techniques and classifies them according to the basis of the monetary valuation, either market-based, surrogate market or non-market-based.

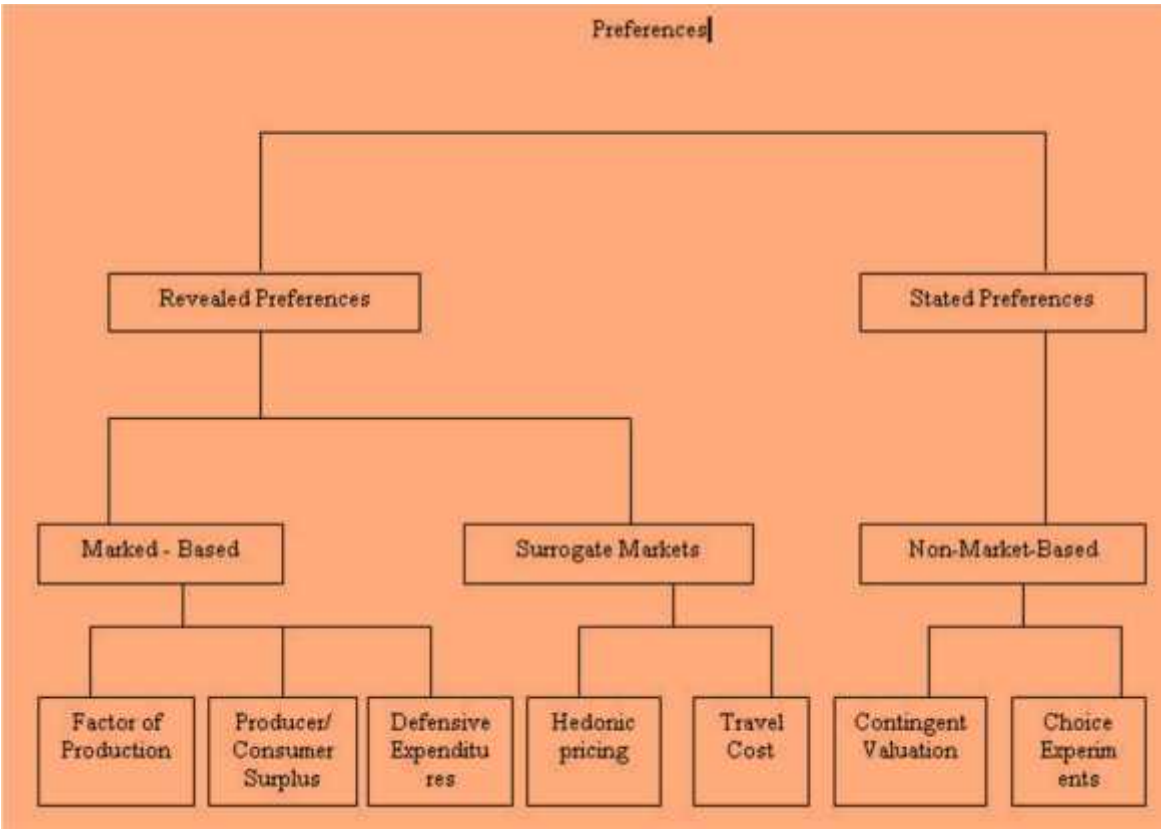

Fig : 2.1 Environmental Valuation Methods

Market-Based Methods:

Economists generally prefer to rely on direct, observable market interactions to place monetary values on goods and services. Markets enable economists to measure an individual's willingness to pay in order to acquire or preserve environmental services. In turn, consumers reveal their preferences through the choices they make in allocating scarce resources among competing alternatives.

There are a number of market-based methods of environmental valuation. There are three market-based techniques:

1) factor of production approach,
2) change in producer/consumer surplus and
3) examination of defensive expenditures.

The value of a natural resource can be monetised based on its value as a factor of production. An Economic View of the Environment notes that the output of any firm is a function of several important inputs, e.g. land, capital, natural resources, which are collectively known as 'factors of production'. In their role as factors of production, raw materials and environmental inputs are used in the production of other goods. When a natural resource has direct value as a factor of production and the impact of

environmental degradation on future output of that resource can be accurately measured, the resultant monetary value of the decline in production or higher cost of production can be measured.

For example, a decline in water quality could have a direct and detrimental impact on the productivity and health of shellfish beds. This technique is methodologically straightforward; however, it is limited to those resources that are used in the production process of goods and services sold in markets. Because many goods and services produced by the environment are not sold in markets, the factor of production method generally fails to capture the total value of the resource to society.

Surrogate Market Methods:

Due to the absence of clearly defined markets, the value of environmental resources can be assessed from information from surrogate markets. The most common markets used as surrogates are those for property and labour. Two common surrogate market methods discussed below are the hedonic price method and the travel cost method. The hedonic price method employs surrogate markets for placing value on environmental quality. The real estate market is the most commonly used surrogate in this price method. Water, air and noise pollution have a direct impact on property values. By comparing properties with similar characteristics or by examining the price of a property over time as environmental conditions change and correcting for all non-environmental factors, information about the housing market can be used to estimate people's willingness to pay for environmental quality.

Travel cost method is used to measure the value of a recreational site by surveying travellers' economic costs incurred (e.g. time and out-of-pocket travel expenses) when visiting the site from some distance away. These expenditures are indicators of society's willingness to pay for access to the recreational benefits provided by the site.

Conclusion

Environmental valuation techniques are primarily driven by the principle that individuals are self-interested and demonstrate preferences that form the basis of market interactions. These market interactions demonstrate how individuals value environmental goods and services. The market-based nature of economic theory emphasises the maximisation of human welfare. The market, in turn, determines resource-allocation based on the forces of supply and demand.

The environment, thus, is used as an instrument to achieve human satisfaction. In turn, the environment can be treated like any other commodity and its associated value can be broken down into many elements. For example, the value of coastal areas could be theoretically quantified based on the value of the products it offers (e.g. fish, crabs, clams, recreation and bird watching). In this manner, environmental valuation can be viewed as a mechanistic approach in which the total value of an environmental system is assessed in terms of the value of its individual parts.

Existence values are not demonstrated in the marketplace and are somewhat based on unselfish motives, thus making them problematic to environmental analysts. To quantify existence values accurately within the framework of environmental valuation is difficult.

Revealed preference methods (e.g. travel cost method and hedonic pricing methods) measure the demand for the environmental resource by measuring the demand for associated market goods. Existence values are not adequately captured using these methods. Existence values are only revealed through surveys of individual willingness to pay for the environmental resource or willingness to accept compensation for environmental losses.

Environmental Accounting

Every business has an overriding responsibility to make the fullest possible use of its resources, both human and material. An enterprise is a corporate citizen. Like a citizen, it is esteemed and judged by its actions in relation to the community of which it is a member as well as by its economic performance. As far as the Indian corporate sector is concerned, it is sad but true that it has not been performing as a good citizen. Keeping this in view, many laws have been laid down and further amended as per requirement, in order to bind the corporate sector to fulfill their social responsibility for better development of Indian economy. Responsibility towards the environment has become one of the most crucial areas of social responsibility. Recent years have witnessed rising concern for environmental degradation, which is taking place mainly in the form of pollution of various types, viz. air, water, sound, soil erosion, deforestation etc. It is a worldwide phenomenon. It spoils human health, reduces economic productivity and leads to loss of amenities. Developing countries like India are faced with the twin problem of protecting the environment and promoting economic development. A trade-off between environmental protection and development is required. A careful assessment of the benefits and costs of environmental damages is necessary to uncover the safe limits of environmental degradation and the required level of development.

Forms of Environmental Accounting

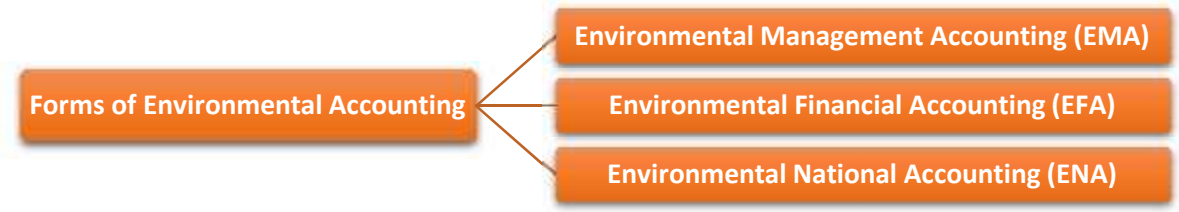

Fig : 2.2

1. **Environmental Management Accounting (EMA): This refers to management accounting with a** particular focus on material and energy flow information and environmental cost information. This type of accounting can be further classified into the following subsystems:

- Segment Environmental Accounting: This is an internal environmental accounting tool to select an investment activity or a project, related to environmental conservation from among all processes of operations and to evaluate environmental effects for a certain period.
- Eco Balance Environmental Accounting: This is an internal environmental accounting tool to support PDCA for sustainable environmental management activities.
- Corporate Environmental Accounting: This is a tool to inform the public about relevant information compiled in accordance with Environmental Accounting. It should be called Corporate Environmental Reporting. For this purpose, the cost and effect (in quantity and monetary value) of its environmental conservation activities are used.

2. **Environmental Financial Accounting (EFA):** This refers to financial accounting with a particular focus on reporting environmental liability costs and other significant environmental costs.

3. **Environmental National Accounting (ENA):** This refers to national level accounting with a particular focus on natural resources stocks and flows, environmental costs and externality costs etc. Need of Environmental Accounting at Corporate Level: It helps to know whether an organisation has been discharging its responsibilities towards the environment. A company is expected to fulfil the following environmental responsibilities.

- Meeting regulatory requirements or exceeding that expectation.
- Cleaning up pollution that already exists and properly disposing off the hazardous material. Disclosing, the amount and nature of the preventative measures taken by the management (disclosure required if the estimated liability is greater than a certain percent of the company's net worth), to both potential and current investors.
- Operating in a way that those environmental damages do not occur
- Promoting a company having wide environmental attitude
- Control over operational and material efficiency gains driven by the competitive global market
- Control over increases in costs for raw materials, waste management and potential liability of political environment in which they occur

Environmental Trade Shifts

International trade may affect sustainable agricultural and rural development and the environment in a number of ways. First, trade may encourage production activities to shift from places where the environment is less sustainable to places where it is more sustainable or vice versa. Second, increased trade liberalisation changes the pattern and level of world consumption, production and income and these changes can affect the environment in ways that go beyond the shifting of consumption and production among countries. Third, trade influences the process of economic development, creating fresh opportunities for the profitable use of productive resources. For instance, international trade in agricultural products is large and an important source of foreign exchange earnings for many countries.

As incomes rise, demands on resources increase but, at the same time, income growth can also lead to more demands for better environmental quality. In addition, increased incomes make investment in resource-conserving strategies both more affordable and more attractive. Moreover, higher incomes are associated with lower population growth rates, reducing the pressure on environmental resources. Higher incomes and better employment opportunities widen the range of choices, thus leaving fewer rural people dependent on environmentally fragile areas like steep hillsides for subsistence.

Trade shifts the incidence of environmental effects. Trade geographically separates production from consumption. When environmental effects are national and not transborder in their incidence and are mainly associated with production, trade may shift the environmental effects from one country to another. In addition, where consumption produces waste that has become an important part of the ecological cycle (for example, when nutrients are returned to the farmers' fields), separation of production and consumption in trade may put stable ecosystems out of balance. In some cases, production in one country may have environmental effects on neighbouring countries. For instance, water used for irrigation that then drains back into the river system raises the salt content for users in other countries downstream. In other cases, the act of production has beneficial global environmental effects e.g. planting trees that absorb and store carbon.

Although shifting the location of environmental damage may not affect the total world environmental damage, it often poses problems of international concern. Where the negative effects are purely national, the unilateral action of one country to alleviate its own environmental problems may well raise costs to producers and hence cause a competitive handicap for its exports of affected products. If the country is big enough, the effect may be an increase in world trade prices, with consequences for all countries. In other cases, such as when an importer raises food safety standards, environmental protection measures may adversely affect exports from other countries.

Trade affects world production and consumption. Trade shapes global production and consumption. If there were no trade in coffee, for example, world consumption and production would be far less because coffee cannot be produced everywhere. The argument also applies to commodities that are produced in a far wider spectrum of countries than tropical beverages. By exploiting comparative advantages, a country can enjoy higher levels of consumption and production, which influence the ways in which natural and environmental resources are used and protected.

This basic interrelationship between trade and the environment implies that trade policy has an impact on the environment. Conversely, because environmental policy affects the supply and demand situation of commodities, it affects trade too. It is in recognition of this two-way relationship that UNCED called for mutually supportive environmental and trade policies.

Measuring the Effects

The impact of trade on the environment depends on the volume of trade, the share of trade in production and consumption and the environmental impact of production and consumption. Large

volumes of forestry and fishery products are traded along with several agricultural commodities including cereals, sugar, fats and oils, oil meals, meat, bananas, fresh citrus, cotton, pulses, dairy products, wine, coffee and rubber. At the global level, for trade of agricultural commodities: production ratio is usually low, while for commodities such as tropical beverages and rubber world trade is the main stimulus to production. Trade in cereals accounts for little more than 12 percent of world production.

The Trade

Production ratio in some commodities is often significant for individual countries even when it is not significant globally. For example, while only 3 to 4 % of the world's rice production is traded, exports account for more than 20 % of production in Australia, the EC, Guyana, Pakistan, Thailand, Uruguay and the United States. At the same time, imports of rice account for more than 80 % of consumption in as many as 43 countries. The production and processing of commodities result in varying degrees of environmental effects. These effects depend on numerous factors including technology, soils, topography, water quality and the ecosystem. There is no overall measure of pollution produced or consumed per tonne of a given product that can be applied to all countries and ecosystems.

Green Funding

Environmental management practices are directed towards the welfare of the community and economy as a whole. The major problem affecting the development of the environmental framework in various countries is the lack of knowledge, support and monetary funding. To support environmental sustainability, governments of various countries are funding environmental projects and green ventures. The funding is made available through government bodies such as central government, regional government, local government, government offices and regional local development agencies.

Government funding for environmental management practices are usually allotted as a percentage of the 'economic stimulus package', which is bailout money allotted by the government to boost the economic growth of the country. The stimulus package consists of government funding for various economic and social activities and includes tax rebates. The focused areas for funding are energy efficient infrastructure, usage expansion of renewable source of energy, reduction in greenhouse gases and carbon emissions, development of low carbon vehicles, clean technologies and green infrastructure for waterways, roadways and railways and conservation of water resources.

Further Reading:

- ✓ ***Environmental Management Systems,By Stephen Tinsley, Ilona Pillai,(2012)***
- ✓ ***Environmental Management Systems,By Christopher Sheldon, Mark Yoxon,(2012)***