BEST MANAGEMENT PRACTICES

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Summary

There are several factors in integrated environmental management that must be taken into consideration. A deeper understanding of the state of the environment, and how it is changing over time and from place to place, is one of the primary steps in the process of making decisions on integrated environmental management. It is then necessary to understand and determine why the environment is in the state it is through the scrutiny and analysis of the environmental impacts caused naturally and by human activities.

Many of the national and even local governments have established research and development programmes to bring deeper knowledge and up-to-date skills to the private sector for more effective and efficient environmental management of facilities.

A valuable outcome of many of the research and development programs has been technical and 'best practice' manuals. These can be sector-specific or general manuals on how cleaner production concepts can be implemented to protect health and the environment. Based on practical experience gained from demonstration projects, they describe how cleaner production can be implemented in practice, and how to overcome

obstacles to its implementation. As these manuals are based on practical experience, they are especially relevant to industry.

Indeed, they can be particularly useful to anyone lacking the resources available to research and development programs.

A typical example of such manuals is that on ‘Best Management Practices’, edited by the environmental authorities of the United Kingdom. It is on the management of water used in industry and agriculture, and it emanates from a project entitled 'Optimum Use of Water for Industry and Agriculture Dependent on Direct Abstraction' whose objective was to determine 'best practice' for a range of key industries in the United Kingdom.

1. Integrated environmental management

Environmental management is a set of practices covering any actions that aim to reduce or eliminate the environmental impacts of a human activity. As environmental processes are complex by nature, decision-making is a difficult task. Often hard choices have to be made and trade-offs considered depending on timing, type and nature of the activity to be undertaken and its impacts on the environment, financial and human resources available, public opinion or pressure, etc.

The concept of integrated environmental management includes a series of factors that must be taken into consideration. A deeper understanding of the state of the environment and how it is changing over time and from place to place, is one of the primary steps in the decision-making process. It is then necessary to understand and determine why the environment is in the state it is by examining and analysing the environmental impacts caused by natural and human factors.

Decision-making must be based on reliable information and its analysis to determine the types and levels of risk involved, relative costs and benefits of different options, and other considerations related to the environment as an important part of people’s quality of life.

Precise information is critical in making the right decisions, in establishing priorities, and in allocating resources within the planning process to ensure that money and effort are concentrated on actions that have potential to deliver the greatest environmental benefits.

Although performance is often assessed in terms of activities and outputs, it is very important that measurable improvements are made to the environment as a direct result of the expenditure targeted in different sectors. Of course, evaluation of the environmental status of a certain area must be continuous.

Different methods and approaches must be considered in the decision-making process, and the final selection of actions to be taken for improving the environment must embrace all aspects of modern environmental planning and management.

2. Industry and the environment

An understanding of the pressures, both human and natural, that are acting on the environment is an essential step before deciding on the best management option to be adopted. The most severe environmental impacts are caused by industrial activities, especially those of major industries that are essential both for the economy and high living standards of the community.

This is why in most countries environmental permitting systems are mainly addressed to those industries, in order to prevent or minimize pollution so that industrial activity can continue without causing too much damage to the environment or human health. Typically, major industries in the European Union must operate within the EC Directives on Integrated Pollution Prevention and Control, and on the Control of Major Accident Hazards, as well as other national and international laws, protocols and obligations.

These regulations seek to ensure that releases of polluting substances into the environment are under control and that the limits set by the competent authorities are adhered to. The use of Best Available Techniques (BAT) and Best Available Techniques not Entailing Excessive Costs **(**BATNEEC) aim to achieve pollution control in a way that reconciles society's environmental welfare with industry in both short- and long-term perspectives.

In recent years Research & Development programs have been supporting the development of regulatory frameworks and assessment methods and techniques to provide a firm scientific and technical basis for decision-making. They also assist in the development of quality management systems for monitoring polluting releases and encourage the most cost-effective options for pollution prevention. This will increasingly involve clean and efficient technologies, and encourage industry to take all the necessary measures to improve its environmental performance.

Research and development programs and projects are necessary for a host of issues concerned with industry. The environment is a key resource for both society and industry. Well-informed decisions on how to protect, maintain and improve the environment require an understanding of the overall state of the environment and processes essential to its wellbeing.

Research and development programs provide a framework for gathering and presenting all available and relevant data. Such data, usually interfaced with data gathered by other organisations, provide a strong tool for achieving better environmental performance at many levels (local, national, regional and global).

Notable advantages of research and development programs are that they:

- establish baselines and an information base on environmental performance that enable the competent authorities to develop effective regulation.

- develop monitoring methods and programs for polluting releases from industrial activities.
- examine the impact of hazardous substances on the environment.
- support the development of best regulatory practice (i.e. Best Practicable Environmental Option (BPEO)).
- help to understand the effectiveness of industrial processes for minimizing and treating pollutants; and,
- sharpen the competent authority's response to emergencies (e.g. nuclear emergencies).

Future state of the environment, subject to a host of current and unknown future impacts, is difficult to forecast. Environmental modelling can be used as a tool to predict and examine different future scenarios so that the authorities can choose the most appropriate response.

2.1 Industrial ecology

Industrial ecology is an emerging concept for promoting environmentally sound manufacture and consumption. It aims to balance industrial development with sustainable use of natural resources by considering groups of industries as industrial ecosystems within which the materials used and wastes produced are recycled and reused.

Frameworks for the comparative analysis and evaluation of methods used for the practical implementation of industrial ecology in enterprises have proved to be valuable tools for planning new industrial ecology activities in different industrial enterprises.

They have also enabled enterprises to organise their industrial ecology efforts to identify, evaluate and implement environmental improvements in their processes and products, as well as in the production chains and industrial sites they are part of, and to evaluate progress in reducing environmental impacts.

Application of Best Management Practices is essential for realising the industrial ecology approach, not least because it offers effective tools as well as practical experience for planning future industrial ecology activities in enterprises.

2.2 Good environmental practice is good business practice

There is now growing recognition by businesses that good environmental practice is also good business practice, and that incorporation of environmental considerations into day-to-day business practices can bring a number of benefits, including:

- Cost savings from reduced production costs achieved through improved resource efficiency;
- Compliance with environmental laws, thus minimizing risks of penalties or fines;
- Risk reduction by controlling and reducing risks and liabilities;

- More favourable market positioning of business achieved through improved public perception shaped by its environment-friendly credentials, and
- Environmental benefits: reduced environmental impacts such as global warming, ozone depletion, acid rain, air and water pollution, etc. that are all caused by local emissions.

3. Guides and guidance manuals

3.1 Objectives of guides

Guides are useful tools for governments, operators and/or the public in the sense that they facilitate understanding of the impacts of certain activities on the environment and provide a common framework under which they can all work together to improve both environmental performance and management methods. Appropriate use of information given in guides can also help operators to reduce both the environmental impacts of their activities and risks of any future liability resulting from pollution caused by them.

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Bibliography

EC (1996), *The IPPC Directive; Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control*. [This is the European Community's directive on the prevention and control of pollution in an integrated fashion].

UK Environment Agency (2000), *A Guide to Good Environmental Practice for Trading Estates and Business Parks*, University of Staffordshire, UK. [This document gives valuable guidance on good environmental practice for trading estates and business parks in the particular context of the UK, and contains much useful information on the same].

UK Environment Agency (1998), *Waste Minimisation — an Environmental Good Practice Guide for Industry*, London. [Referring to the EU hierarchy of waste management options, this document gives guidance for, and contains much valuable information on, the adoption of environmental good practice by UK industry generally].

United States Office of Enforcement and Environmental Protection Compliance Assurance Agency (1994), *Federal Facility Pollution Prevention Planning Guide*, USEPA, Washington DC. [Essentially a planning guide, this document describes in detail what the production facilities and business enterprises should do, and how, to comply with prevailing Federal regulations of the USA].

Biographical Sketches

Mr. Alexendros Karavanas received his Diploma in Chemical Engineering from the National Technical University of Athens, Greece, in 1977, followed by a degree in Pharmacology from the University of Athens in 1991.

Currently Mr. Karavanas is working for the Ministry of Environment, Physical Planning & Public Works, Athens, where he is responsible for Environmental Permitting. This involves environmental impact study of industries, granting environmental conditions and permits, corresponding EU legislation, as well as European Community's Support Framework for the Environment. His main duties and tasks include environmental impact assessment of industrial facilities (examination, authorization, setting of environmental conditions especially for the food, pharmaceutical and pesticide industries, tanneries, textile industries, chemical industries etc.).

He has represented the Greek Ministry of Environment (1997-2001) on the European Community's Committee on article 19 of Directive 96/61, "Integrated Pollution Prevention and Control (IPPC)", concerning the inventory of the IPPC industries, as well as on the European IPPC Bureau's Technical Working Group for Food and Milk, Seville, Spain. To date he has participated in several projects of the Greek Ministry of Environment concerning emission inventory of industrial sources in Greece, and implementation of the IPPC system and Best Available Techniques for industry. He has addressed several seminars organized by, among others, the National Technical University of Athens and the University of Athens on environmental issues including environmental impact statement, treatment of waste water effluents, air emissions, pollution control equipment, and impacts from the operation of the food, textile, and chemical industries.

Dr. Michael Christolis is a Civil Engineer specializing in environmental science and technology. Currently he is working as a research collaborator at the National Technical University of Athens (NTUA), Greece, on the mathematical modeling of environmental problems. He has so far accumulated twenty years of experience in air quality monitoring, pollutant dispersion modeling, assessment of the impacts of industrial accidents, design of emergency systems, and implementation of the Seveso Directive in Greece.

During 1983-1988 he was the Head of the Laboratory for the Air Quality Monitoring Network for the City of Athens. In 1988 he joined the Computational Fluid Dynamics Unit (CFDU) of the Chemical Engineering Department of the NTUA, working on research projects on the computational modeling of various applications focusing on environmental issues and problems.

Professor Nicholas C. Markatos obtained his Diploma in Chemical Engineering from the National Technical University of Athens, Greece, in 1967, followed by M.Sc, DIC and Ph.D degrees from the Imperial College of Science, Technology & Medicine, University of London, UK, during 1970 to 1974.

In 1983 Professor Markatos was appointed Director of the Centre for Mathematical Modeling and Process Analysis at the school of Mathematics and Scientific Computing of the University of Greenwich, London, England. At that time he was also a visiting lecturer to the Computational Fluid Dynamics Unit of Imperial College as well as working for CHAM Ltd, (Concentration Heat and Momentum, Limited), London, England. At CHAM he worked first as leader of the Aerospace Group (1976) and then, from 1977 until 1984, as Manager of the Applications Team working on various Fluid Mechanical, Thermodynamic and Transport problems.

Since 1974 he has served as technical consultant to many Research Centres, state institutions and industries.

In June 1980 he was awarded the "Certificate of Recognition" by the Inventions Council of NASA.

In 1985 Professor Markatos was elected Professor of Chemical Engineering at the National Technical University of Athens, and in 1990 he was elected Head of the Chemical Engineering Department. In 1991 he was elected Rector of that University.

Professor Markatos' main scientific interest is in the mathematical modeling of Transport Phenomena, Fluid Mechanics, Thermodynamics and Physical Processes like Fluid Flow (Laminar and especially Turbulent), Heat and Mass Transfer, Environmental Flows, Combustion, etc.

He is referee of scientific papers, reviewer of new books, as well as member of the Editorial Board of several international Scientific Journals.

He has published over 100 original scientific papers in international journals and participated and organized many international conferences, seminars and meetings all over the world. Author of two books, he has also published many articles in the popular press on Engineering Higher Education.