The
Institution
of
Engineers,
Australia

ENVIRONMENTAL PRINCIPLES FOR ENGINEERS

Principles for the Engineering Profession for the Planning, Implementation and Management of Engineering Works that are Socially, Ecologically and Economically Sustainable

Issued by the
INSTITUTION OF ENGINEERS, AUSTRALIA
11 National Circuit
BARTON ACT 2600

1992

Prepared by the
National Committee on Environmental Engineering

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Foreword by the President of The Institution of Engineers, Australia

Virtually any engineering project modifies the environment in some way and therefore has an effect on the welfare, health and safety of the surrounding community. In most instances the modifications resulting from specific projects have had a net beneficial effect, albeit that some consequences have not been fully understood.

Historically, engineering has been society's tool for converting ideas into reality. The engineer has been viewed as the leading instrument in the process of adaptation and growth. The next great challenge for the engineering profession will be to adapt to the requirements of ecologically sustainable development and provide leadership in the incorporation of sustainability principles.

The first edition of The Institution's Environmental Code of Practice *was published in 1987 and was based on a similar code produced by The Institution of Professional Engineers, New Zealand. The Code was distributed to all members of The Institution. A steady demand has existed and a second edition was published in 1989, following minor editing.*

By 1990 it became obvious that a major revision of the code was required. The principal catalyst was recognition of the responsibility of the profession to provide leadership in the application of sustainable development .

The document has been developed by the National Committee on Environmental Engineering (NCEnvE) after wide consultation with professional bodies, industry, government and academia.

The NCEnvE has played a key role in The Institution. It was formed in 1970 and it has in recent years been responsible for The Institution's endorsement of the National Conservation Strategy for Australia (1985), the original Environmental Code of Practice (1987), the Policy on Sustainable Development (1989), and the Policy on the Greenhouse Effect (1989).

I commend this document to all engineers and heartily endorse the principles and policies that are contained herein.

President of The Institution of Engineers, Australia

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Environmental Principles for Engineers

'The further development of civilisation, the conservation and management of natural resources, and the improvement of the standards of living of mankind are greatly affected by the work of the engineer. For that work to be fully effective it is necessary not only that engineers strive constantly to widen their knowledge and improve their skill but also that the community be willing to recognise the integrity and trust the judgement of members of the profession of engineering.' (Code of Ethics).

The Institution's Code of Ethics, in expanding the above objectives, sets a number of tenets for the professional behaviour of Institution members. The tenets provide direction on social and professional responsibilities.

Engineers, because of their professional role in society, have a particular obligation towards the integration of development and the environment, leading towards sustainable development.

The purpose of this document is to define a set of environmental principles for engineering practice. These principles complement the Code of Ethics and incorporate the concept of ecologically sustainable development, and the practice generally of environmentally responsible engineering.

Background to the *Environmental Principles* is provided in the various chapters of the document. Topics include ethics, sustainable development, environmental impact assessment, environmental economics, community participation and considerations for the practice of engineering internationally.

Statements and policies from the World Federation of Engineering Organisations (WFEO), and the International Federation of Consulting Engineers (FIDIC) have been incorporated in part in the following principles, thus reflecting international thinking.

Environmental Principles

1. Engineers Need to Develop and Promote a Sustainability Ethic, and:

1.1 Recognise that ecosystem interdependence and diversity form the basis for our continued existence.

1.2 Recognise the finite capacity of the environment to assimilate human made changes.

1.3 Recognise the rights of future generations. No generation should increase its wealth to the detriment of others.

1.4 Promote a clear understanding of the actions required in engineering practice to improve, sustain, and restore the environment.

1.5 Promote the development of alternatives to the use of non-renewable resources.

1.6 Promote the wise use of non-renewable resources through waste minimisation and recycling, wherever possible in engineering activities.

1.7 Strive to achieve the beneficial objectives of engineering work with the lowest possible consumption of raw materials and energy, and by adopting sustainable management practices.

2. Engineers Need to Recognise the Interdisciplinary Nature of Engineering, and:

2.1 Recognise that the expertise required for carrying out a specific engineering activity may not be sufficient for judging the environmental implications of that activity.

2.2 Involve other environmentally-based disciplines in determining the environmental implications of engineering activities.

2.3 Recognise individual limitations in assessing environmental effects, and respect other professional opinions.

3. Engineers Should Practice Engineering in Accord with a Sustainability Ethic that leads to Sustainable Development, and:

3.1 Study thoroughly the environment that will be affected, assess all the impacts that may arise, and select the best alternative for an environmentally sound and sustainable project.

3.2 Urge clients or employers to incorporate environmental objectives into design criteria, and to prevent or minimise the adverse environmental effects of engineering activities.

3.3 Include consideration of environmental effects at all phases of planning and implementation of engineering activities.

3.4 Consider the consequences of all proposals and actions, direct or indirect, immediate or long term, upon cultural heritage, social stability, health of people, and equity.

3.5 Identify and act to minimise potential environmental effects of engineering activities.

3.6 Rigorously examine the basic functions and purposes behind a project to recognise options and alternatives to improve sustainability.

3.7 Inform clients that engineers can reduce but not always eliminate adverse environmental impacts without incurring increased costs. This does not imply that increasing the cost will solve all environmental problems.

3.8 Suggest alternatives to clients if the proposed engineering activity is likely to create unavoidable environmental risks.

3.9 Urge clients to incorporate monitoring of environmental change into projects, and to adjust operations as a result of monitoring.

3.10 Include costs and benefits relating to environmental quality and degradation in economic evaluations of engineering activities.

3.11 Recognise the rights of the community to be involved in project formulation and development and actively encourage such involvement.

4. Engineers Should Act with Integrity, Objectively and Ethically, remembering their Responsibility to the Community, and:

4.1 Recognise all actual, potential or perceived conflicts of interest in relation to engineering activities.

4.2 Recognise that compromising environmental quality or standards in engineering activities is an inappropriate means of reducing cost. This approach may only achieve short term gains at the expense of long term sustainability.

4.3 Provide information to clients, employers, the public and government about ways of improving the sustainability of engineering activities.

4.4 Disclose environmental implications and external costs of engineering activities, taking into account the often inadequate and uncertain nature of environmental data.

4.5 Report on environmental issues with honesty and integrity.

4.6 Decline to be associated with engineering activities if the client or employer is unwilling to support adequate efforts to evaluate environmental issues or to mitigate environmental problems.

5. Engineers Should Pursue and Encourage Professional Development, and:

5.1 Keep informed on global environmental trends and issues.

5.2 Actively support and participate in environmental education.

5.3 Maintain dialogue about sustainable development with other professions.

5.4 Learn the skills necessary to develop active community participation in engineering activities.

5.5 Assist and advise other engineers where necessary in the application and use of the principles of sustainable development identified in this document.

1. Introduction

Environmental awareness in Australia has developed progressively over the last 30 years. Pollution control legislation was introduced over the 1960s and 1970s.

The establishment of the environmental impact assessment process was the next important step. The requirement for integrating consideration of environmental factors into the development planning process was a crucial step in legitimising community concern over environmental issues.

During the 1980s a national perspective has developed with a greater involvement of the Commonwealth government in environmental matters and moves towards national policies and standards on environmental issues.

The Commonwealth government has also been active in endorsing international initiatives on environmental protection and enhancement. The concepts in the *World Conservation Strategy* of 1980 were incorporated in the *National Conservation Strategy for Australia* in 1983. *Our Country Our Future — a Statement on the Environment* was released by the Prime Minister in 1989.

The World Commission on Environment and Development provided the definitive statement on the state of the global environment in its report, *Our Common Future*, more commonly known as the Brundtland report, in 1987.

The Brundtland report confirmed the level of deterioration in the world's environment and developed the concept of sustainable development. Many of the policies developed in the report are useful to the engineer in striving to achieve a sustainable future.

Global problems are directly related to the selection and use of technology. Accordingly, the engineering profession carries a large responsibility to contribute to the creation of new policies . . . *Engineers have the potential and the duty to be a major influence in the achievement of the primary goals of the future: a sustainable habitat for all life, and one that continues to allow mankind to achieve his potential and to enjoy the process of living* (Submission by World Federation of Engineering Organisations to UNCED Conference, 1992).

Engineers need a mature understanding of environmental and social values and an ability to identify, manage and incorporate these aspects into engineering practice. Compliance with legislative environmental requirements is now only one facet of environmentally responsible engineering.

The achievement of a sustainable future will require the development of national strategies, policy directions, community education, research, and development of sustainability technologies. The Australian Government released a discussion paper in 1990, *Ecologically Sustainable Development* and commenced the implementation phase by the establishment of working groups in various sections of the Australian economy. These groups have made recommendations for the achievement of sustainable development in Australia.

The purpose of the *Environmental Principles* document is to facilitate the adoption by the engineering profession of the principles and practice of ecologically sustainable development.

The Code of Ethics of The Institution of Engineers, Australia provides a set of rules which governs professional behaviour. The *Environmental Principles* are a complementary set of principles that further develop the ethical framework for the practice of engineering.

The *Environmental Principles* is an introductory document. It replaces the *Code of Environmental Practice* but is not a substitute for it. The practice of environmentally responsible engineering will also require knowledge of the tools of environmental engineering including environmental impact assessment, environmental auditing, environmental management, economic evaluation etc. In due course it is intended that practice manuals will be produced for the application of these techniques as a development of the *Environmental Principles*.

The National Committee on Engineering Heritage has prepared a manual which addresses the heritage, and conservation of the built environment. This will complement the *Environmental Principles*.

The preparation of this document has involved wide consultation within the engineering profession in all states and with statutory authorities, academia and the private sector. The assistance of all those who have contributed to the *Environmental Principles* is gratefully acknowledged.

2. Engineering and the Environment

A spiritual and philosophic attachment to the environment exists in many groups within Australian society. Features such as landscape quality, wilderness areas, sacred places, historic structures and buildings, etc., all help contribute to a sense of belonging for many citizens.

Many in the community are concerned about the legacy that will be passed to succeeding generations. They wish to ensure that we do not irrevocably damage the environment, natural or built, that we leave for the future.

Engineers need to reflect these community concerns in their work: through development projects, remedial or maintenance projects, or pollution detection and control projects.

The environment has a finite capacity to accept and assimilate human-made changes. It is important to acknowledge this limitation and determine the appropriate assimilation and production levels.

Engineering practice and environmental protection are not mutually incompatible. The practice of engineering demands an empathy with all aspects of the environment.

Engineering needs to be carried out within a framework which allows for the integration of economic development and conservation.

Engineers have contributed to improvements in the quality of life through, for example, the provision of better water supplies and sanitation, systems for the production and preservation of food, and by the development of natural resources, energy, and communication and transportation systems. These advances have contributed to population and economic growth. In some instances they have led to environmental problems because of a failure to recognise the finite capacity of the environment.

Engineers alone cannot provide the solutions to all environmental problems. However, engineers through their actions should not contribute to environmental damage. A co-operative approach involving government, interest groups, business, trade unions, and the community is necessary to achieve sustainable solutions.

Engineering projects are for the benefit of the community, as indicated in the first tenet of The Institution's Code of Ethics. Community concerns and values must be reflected in engineering solutions through the community's participation in the decision-making processes.

Environmental assessment, if used correctly, is one technique for the identification and possible resolution of environmental problems. Environmental economics also will have an increasingly important role in projects as the full cost of environmental consequences are included in the analyses. This will require inclusion of long term benefits and costs and demand a major change in economic thinking.

Australian engineering is not only applied within Australia. When working in other countries, Australian engineers should recognise the different social, cultural, economic and natural environments of those countries. Nevertheless, the principles of sustainability still apply, no matter where engineering is practised.

For human survival, it is critical to ensure that future development is sustainable. Engineers need to develop a 'sustainability ethic', for without this, sustainable development will not be achieved.

3. Sustainable Development

The concept of sustainable development was set out in the *World Conservation Strategy*, which was released in 1980. The Strategy stressed the need to consider, as a matter of urgency, the carrying capacity of ecosystems, the reconciliation of development and conservation, and the needs of future generations. The Australian Government endorsed the *World Conservation Strategy* in 1981. *The National Conservation Strategy for Australia* was adopted by the Commonwealth Government in 1983, and endorsed by The Institution of Engineers, Australia, in 1985.

The report, *Our Common Future*, more commonly known as the Brundtland report, further developed the concept of sustainable development. The report challenged governments to change the way that they function and plan to allow the goal of sustainable development to be realised.

The three principal objectives of the world and national conservation strategies are:

- ❑ to maintain essential ecological processes and life-support systems, such as soil regeneration and protection, the recycling of nutrients, and the cleansing of water, on which human survival and development depend;
- ❑ to preserve genetic diversity, on which depend the breeding programmes necessary for the protection and improvement of cultivated plants and domestic animals, as well as scientific advance, technical innovation, and the security of the many industries that use living resources; and
- ❑ to ensure the sustainable utilisation of species and ecosystems.

Caring for the Earth: A Strategy for Sustainable Living, which was published in 1991, is seen as the successor of the *World Conservation Strategy*. It emphasises the interdependence of conservation and development. The strategy is based on three points (paraphrased):

- *first, the world's people want to survive, with a satisfactory life for ourselves and our descendants;*
- *second, we depend on the resources of the Earth to meet our basic and vital needs; and*
- *third, we need not lose; we can eliminate the risk by ensuring that the benefits of development are distributed equitably, and by learning to care for the Earth and live sustainably.*

The Australian Government has published a major statement on the environment called *Our Country Our Future* which is a paper on ecologically sustainable development. The Australian International Development Assistance Bureau (AIDAB)has also published a paper called *Ecologically Sustainable Development in International Development Cooperation.*

Sustainable development is defined in the Brundtland Report as, . . . *development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*

There are many other definitions of sustainable development. They all revolve around integrating conservation and development on a long term basis to provide social and economic benefits, without compromising the needs of future generations.

The term 'sustainable development' is often criticised as ambiguous. It has been subject to

a wide range of interpretations. *Caring for the Earth* points out that 'sustainable development', 'sustainable growth', and 'sustainable use' have been used interchangeably, as if their meanings were the same.

'Sustainability' is a characteristic of a process or a state that can be maintained indefinitely. 'Sustainable growth' is a contradiction in terms in that nothing physical can grow indefinitely. 'Sustainable use' is applicable only to renewable resources and means using them at rates within their capacity for renewal.

'Sustainable development' is used in *Caring for the Earth* to mean *'. . . improving the quality of human life while living within the carrying capacity of supporting ecosystems'*.

The Institution of Engineers, Australia, adopted a *Policy on Sustainable Development* in 1989 which tries to address these problems at The Institution and individual engineer levels.

The policy of The Institution of Engineers, Australia is to support sustainable development. Within the context of the policy the specific objectives are:

- ❑ to ensure that decision making is multidisciplinary by nature, and includes:
  - evaluation of all relevant options, including non-structural solutions;
  - consideration of long-term effects of options, preference being given to achieving long-term sustainable development over short-term benefits;
  - incorporation of conservation objectives into design criteria;
- ❑ to protect our natural and cultural heritage and limit interference to natural processes, such that the environment can absorb the changes without adverse consequences;
- ❑ to conserve our renewable resources and to limit their utilisation to their sustainable yield;
- ❑ to conserve our non-renewable resources, to encourage recycling and to develop renewable alternatives;
- ❑ to use demand management to limit the need to develop additional resources to meet projected demand;
- ❑ to promote energy conservation, the efficient use of energy and transition to renewable energy sources;
- ❑ to reduce emission of substances which may contribute to long-term climate change;
- ❑ to limit contamination of water and air to the capacity of the environment to disperse and assimilate wastes and to keep pollution levels below the threshold of damage to public health and the environment;
- ❑ to protect and restore the land and revive rivers, coasts and wetlands;
- ❑ to reduce soil erosion to below the rate of soil generation;
- ❑ to protect and enhance the aesthetics of the environment and ensure that noise does not interfere with planned land use;
- ❑ to reduce the production of wastes and to produce only those wastes which can be converted to resources or disposed of safely;
- ❑ to incorporate monitoring of environmental change into the operation of development projects and to adjust operations as a result of monitoring;
- ❑ to seek identification and equitable distribution within the community of the costs and benefits of all development and conservation initiatives;
- ❑ to strive to ensure that new products and processes are consistent with the objectives of sustainable development;
- ❑ to encourage the community to adopt lifestyles that accord with the principles of sustainable development;
- ❑ to contribute to public discussion and in turn seek information and opinions from the public.

The policy provides a strategy for implementation for individual engineers. The policy states that conservation and development should be integrated recognising their essential interdependence, and that options for the future use of resources should be retained. This will require a multidisciplinary approach to decision-making in which preference should be given to achieving long term sustainable development over short term benefits, and that conservation objectives should be incorporated into design criteria. It is of particular importance that the policy recognises the concept of sustainable yield or capacity.

Examples of moves towards sustainable development or sustainable use of resources are:

- ❑ renewable energy — substitutes for fossil fuels;
- ❑ agriculture — solutions to land degradation problems, controls on the use of chemicals, achievement of biodiversity in agro-ecosystems;
- ❑ forestry — concept of sustainable yield, planting of native trees, and preservation of some forest regions;
- ❑ transport — reduction of energy use and greenhouse gases; and
- ❑ manufacturing — reduction in hazardous chemical production and reuse of chemicals within the production system.

The successful implementation of sustainable development and use will require the interaction of government, business, professional organisations, interest groups and the wider community in a cooperative approach.

4. Role of Economics

Caring for the Earth indicates that economic policy is an essential instrument for achieving sustainable development. Environmental resources, and their depletion, need to be correctly valued and included in national assessments.

Previously, economic aspects of environmental impacts were excluded from the economic evaluation of the projects. They were considered as 'externalities'. The 'polluter pays' principle is one way of 'internalising' these impacts.

There is an increasing move to place monetary values on such things as natural resources, environmental quality and degradation, and to include these values in the economic analysis of projects. The difficulty is that different groups and individuals will place different values on particular parts of the environment, and that many aspects of the environment cannot be satisfactorily evaluated in monetary terms.

It is not possible to put a value on all aspects of the environment. It is necessary that development is subject also, to a framework of environmental standards.

The final role of deciding on appropriate environmental values and the acceptability of impacts appropriately rests with elected representatives.

Our Country Our Future notes that many of our environmental problems have arisen because market prices do not reflect the full cost of various human activities. The government recognises the 'polluter pays' principle in which each producer and consumer should be responsible for the costs which their activities impose, not only on themselves, but also on the rest of society, both now and in the future.

The 'polluter pays' principle requires that market prices reflect the full costs of environmental damage arising from pollution. The result is that a strong incentive for pollution control is created.

Caring for the Earth suggests that governments should also adopt the 'user pays' principle.

The 'user pays' principle requires that prices reflect the full social cost of use or depletion of a resource. This provides incentive for sustainable use and discourages needless depletion.

It is vital also that governments do not inadvertently encourage environmental damage through tax concessions, subsidies or other special assistance. Land degradation and salinity are good examples where the farming of marginal land has occurred through government subsidies and inappropriate pricing of water.

The utilisation of natural resources requires that at the macro-economic level their depletion be incorporated into national accounting which reflects the nation's wealth and productivity. A conflict occurs between economic rationality and the sustainable use of resources when economic incentives for resource use are greater than the capacity of the environment to sustain that use.

Intergenerational equity needs to be considered in the application of market forces to the environment. No generation should increase its wealth to the detriment of later ones. If economic evaluation discounts future benefits and costs, then short term utilisation is favoured over long term resource use or conservation.

A number of economic approaches are available to promote conservation and sustainable resource use. Measures, such as charges and subsidies, directly alter prices with the aim of charging users for environmental costs and benefits. They act as incentives for operators to reduce discharges to the extent that it is cheaper to treat them than to incur the charge. Product charges can be applied to reflect the cost of environmental management. Tax differentiation can be used to modify the relative prices of products by penalising those harmful to the environment.

Measures, such as tradeable permits, create a right to use environmental resources, or to emit to the environment up to a pre-determined limit. This concept requires that the assimilative capacity of the environment in relation to pollution is known. Tradeable permits are not effective when the pollutant being controlled accounts for a very small proportion of the cost of the product, since there is no incentive to participate.

These economic approaches, together with others, are supported in *Caring for the Earth*.

5. Environmental Impact Assessment (EIA)

The EIA concept has been accepted by the Commonwealth Government and all State and Territory Governments. The object of EIA is to provide for environmental matters to be taken into account in the making of decisions, by all interested parties. The Australian and New Zealand Environment and Conservation Council (ANZECC), in a report on a national approach to environmental impact assessment procedures throughout Australia (to provide greater streamlining of EIA and other approvals processes), identified the objectives of EIA as:

- ❑ to ensure that decisions are taken following timely and sound environmental advice;
- ❑ to encourage and provide opportunities for public participation in environmental aspects of proposals before decisions are taken;
- ❑ to ensure that proponents of proposals take primary responsibility for protection of the environment relating to their proposals;
- ❑ to facilitate environmentally sound proposals by minimising adverse aspects and maximising benefits to the environment;
- ❑ to provide a basis for ongoing environmental management including through the results of monitoring; and
- ❑ to promote awareness and education in environmental values.

Caring for the Earth considers that EIA is most effective and constructive for new projects when potential environmental impacts are assessed at the pre-feasibility and feasibility stages. It further notes that it is important that all groups affected by the project should be provided with relevant information early enough so that they may participate in the assessment process.

As a result of the varying legislative and procedural arrangements adopted by differing governments, requirements for environmental documentation also vary.

Most, however, have the following features in common:

- ❑ provision of initial information to authorities and affected parties. This is a brief summary of matters including the nature of the proposal, the existing environment, the principal environmental impacts likely to result from the project, and any proposals for preventing or ameliorating adverse impacts. Further EIA requirements are usually determined on the basis of this information.
- ❑ the principal EIA document is known variously as an Environmental Impact Statement or Environmental Impact Study (EIS), or Environmental Effects Statement (EES). It addresses in some detail matters such as the need for the development, possible alternatives to the proposal, the existing environment, the environmental impacts of the proposal and its alternatives, proposals for environmental safeguards, management and monitoring etc.
- ❑ Commonwealth and some States' procedures also make provision for a less exhaustive document, known as a Public Environment Report (PER). This is utilised in those circumstances when it is desirable that the public be made aware of the environmental aspects of a proposal and measures taken to protect the environment, but where the preparation of a full EIS is not warranted. As appropriate, a PER may address only a particular feature of a proposal and its environmental implications.

Under all EIA procedures in Australia, the responsibility for preparation of the documentation rests with the proponent of the proposed action. This is a controversial issue. However unless the proponent or their agent prepares the assessment there is no direct mechanism for modifying and adapting the proposed development so that it meets the necessary standards of environmental compatibility.

Where a proposed development comes under Commonwealth, State (or Territory), or Local Government jurisdiction, it may have to meet the EIA requirements of all governmental levels.

At the time of preparation of these *Environmental Principles*, there are formal and informal cooperative arrangements between the Commonwealth and State governments to provide for the integration of their respective assessment requirements and procedures.

To avoid any future duplication and delays, the intergovernmental agreement on the environment between the Commonwealth, all states and territories, and local government, includes a schedule to improve the consistency of approach applied by all levels of government and avoid duplication.

In practice, both the current and proposed arrangements for environmental impact assessment, require only one document to be submitted and assessed in accordance with agreed arrangements.

Careful and thorough evaluation of the justification for a project in terms of environmental, economic and social considerations is of fundamental importance. The proponents of a project, be they politicians, government departments, ad hoc bodies, local authorities, private companies or individuals, may perceive a need which may not be shared or perceived by parts of the local, regional or national community. Proponents should seek to ensure a high standard of community awareness of a proposed project, including the environmental ramifications.

Alternative ways of achieving defined objectives should be rigorously examined. Achieving defined objectives may not always require new works. The better management of demand may allow objectives to be achieved without the need for developing new resources. The rationale behind the need for any project must be examined upfront before proceeding to other assessments.

There are fundamental questions to be asked and answered at the planning concept stages of a project to ensure that the need is evaluated on a rational basis. Engineers have an important professional and environmental responsibility to question unclear motives and logic, omissions, possible misrepresentation of need and urgency, and possible unwise use of resources. The analysis should include an attempt to understand and define the associated effects of alternatives to the proposal. Although detailed environmental statements on these associated proposals may not be possible, it is often the lack of reference to these sorts of issues that leads to criticism of proposals. It may not always be the engineer's responsibility to answer these questions but there should be a responsibility to ensure that this important project stage has been carefully addressed.

Environmental impact assessment has only been briefly summarised above. The purpose has been to demonstrate the importance of, and the important features of EIA, for the implementation of ecologically sustainable development. In due course the legislative requirements and the practice of EIA are to be the subject of a subsequent Section of the *Environmental Principles.*

As stated in ANZECC (1991) *'. . . EIA in Australia is now a mature process within the overall machinery of government decision making . . . A national approach to EIA is being promoted to assist in the implementation of ecological sustainable development.'*

6. Community Participation

The community is increasingly demanding a role in decision making, particularly where environmental aspects are concerned. The community wants to know how a project or operation affects them and the environment, how the predicted impacts of new projects will be handled, and how decisions are made.

Community participation can occur in the formulation stage of a proposed project, during the environmental assessment process, or later for an existing project when new environmental information becomes available. The important point is that community participation is not restricted to one type of action or one point in the decision making process.

Community participation should not be seen as a panacea for solving all problems relating to the environment. It cannot overcome all opposition, resolve all differences in opinion or values, nor can it replace the statutory planning processes. However, early involvement of the community in a proposed project or environmental issue is desirable to ensure that all the relevant parameters are included. Appropriate community involvement can lead to a more flexible decision making process and solution, result in a less confrontationist approach, and in the long term lead to a more cost effective and better result.

Community participation is a two-way communication, with the overall goal being a decision which is both better and more acceptable to all parties. Since people cannot evaluate alternatives and understand issues unless they have been adequately informed, community information is a central element in any community participation programme. It is necessary to provide sufficient information in clear and readily accessible form about the project or problem and its effects.

An effective participation programme should include identifying community concerns and values, informing the community of opportunities and alternatives, and developing a consensus. The community participation process will assist in developing and maintaining the credibility of the organisations involved, and reducing the level of misconception and misinformation about a proposed project or environmental issue.

The form of community participation requires careful consideration. The appropriate process depends on such factors as the type of project or issue and the range of community interests. There is no universal technique but there are a number of principles. Early active involvement of the public in a proposed project ensures early identification of their concerns and incorporation of their local knowledge. Involving the community in project planning or discussion of environment issues, rather than informing the community of decisions already made, means that their views can be more readily incorporated in the process, thereby gaining greater acceptance.

Engineers have not usually been trained to deal with community participation and often try to avoid such involvement. Engineers need to become more comfortable with public involvement and to learn the skills involved in active community participation.

Engineers involved in project development should encourage proponents to have an open and discussive attitude towards their projects. Concern over possible compromising of commercial interests needs to be respected. However such concerns must be examined and analysed as to their significance or importance within the framework of project planning.

7. Overseas Practice

The environment needs to be seen in a universal context as many environmental problems do not stop at national borders. Global warming, depletion of the ozone layer, reduction of forest areas, the nuclear accident at Chernobyl, the Exxon Valdez oil spill in Alaska, and the oil well fires in Kuwait indicate the global nature of environmental problems and the need for global perspectives. The international nature of environmental issues is recognised in *Our Country Our Future.*

Developing countries are reluctant to forego the economic benefits of technologies and processes that have assisted the developed world. In the short term developing countries are likely to give economic development priority over concern for the environment. Australian engineers working in overseas countries need to be aware of national and international implications of their work.

In relation to Australian aid projects, the Australian International Development Assistance Bureau has developed a strategy for ecologically sustainable development (AIDAB, 1991), which uses the principles set out in the Brundtland Report and *Our Country Our Future.*

The World Bank has produced an Operational Directive (World Bank, 1990), on environmental assessment for the guidance of the Bank's staff. The World Bank directive uses a broad definition of the purpose and nature of environmental assessment so that development options under consideration are environmentally sound and sustainable.

Whether or not an environmental assessment statement is required for an individual project, the individual engineer should act in an environmentally sensitive and responsible manner. It is necessary to determine what government and professional policies relate to the environment in the particular country, as well as cultural values and community attitudes and expectations. It is essential to work closely with citizens and professionals of the country in question.

Relevant interest groups should be identified and included in discussions where considered appropriate. Where environmental standards allow developments to cause environmental damage, engineers have a responsibility to inform their clients of the problem, to make known the existence of relevant national or international standards, and to develop a solution which will try and meet the requirements of the country in terms of development and the environment.

8. Ethics

Caring for the Earth places considerable emphasis on the need for a world ethic of sustainability. This need is acknowledged in one of the World Federation of Engineering Organisation's (WFEO) recommendations to the 1992 United Nations Conference on Environment and Development. They further recommend that mechanisms must be set in place to develop, adopt and promote such a world ethic. Engineers, because of their professional role in society, need by practice and example to develop, adopt and promote such an ethic. The first tenet of The Institution's Code of Ethics gives engineers this responsibility.

A sustainable development ethic is central to the objective of the *Environmental Principles.*

Professional ethics have been a key foundation of the profession's development. Engineers need to develop a standard of engineering practice and individual behaviour that demonstrates an awareness, understanding and application of sustainable development.

Engineers also need to display their knowledge and be seen as sensitive and considerate professionals, taking a key role in decision making and leadership in the community. Insensitive, ill considered and seemingly arrogant statements on controversial issues do immeasurable harm to the credibility of the profession.

An environmental ethic for engineers needs to incorporate:

- a professionalism that provides for the honest interpretation of available environmental data, a recognition of any inadequacies in the data base, an understanding of the uncertainties that may be part of any analysis or assessment, and an unbiased statement of findings.
- a standard of honesty and integrity that specifically excludes any association with:
  - any practice that seeks to gain from using wrong or misleading environmental information;
  - any situation which is likely to produce a conflict of interest, and which is not in the interests of the community;
- an appreciation of the rights of individuals in the community to be aware of how engineering projects might affect them, and to provide the opportunity for those individuals to have their point of view known.

A sustainability ethic gives nature a standing which recognises maintenance of ecosystem independencies and diversity. This does not accord nature an ethical standing similar to that of humans. Any recognition that all forms of nature have an inherent value unrelated to any utility would present new challenges to impact assessment and project evaluation.

Glossary

AUDIT	A process to check for compliance with conditions of an approval; an internal review of environmental management practices by proponents; a form of site evaluation for environmental liability.
BIOLOGICAL DIVERSITY OR BIODIVERSITY	The variety of life in all its forms, levels and combinations.
BUILT ECOSYSTEM	Ecosystem dominated by buildings, roads, airports, docks, dams, mines, and other human structures. Includes urban and suburban parks, gardens, and golf courses.
CARRYING CAPACITY	The capacity of an ecosystem to support healthy organisms while maintaining its productivity, adaptability, and capability of renewal.
CONSERVATION	The management of human use of organisms or ecosystems to ensure such use is sustainable.
DEVELOPMENT	Increasing the capacity to meet human needs and improve the quality of human life.
ECOLOGICALLY SUSTAINABLE DEVELOPMENT	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
ECOSYSTEM	A system of plants, animals and other organisms together with the non-living components of their environment.
ENVIRONMENT	The physical, biological, cultural, economic and social characteristics of an area, region or site.
ENVIRONMENTAL IMPACT ASSESSMENT	The orderly and systematic evaluation of a proposal including alternatives and objectives and its effect on the environment including the mitigation and the management of those effects. (The process should extend from the initial concept of the proposal through to its implementation, completion and, where appropriate, decommissioning).
ENVIRONMENTAL ECONOMICS	A philosophy that is based on the recognition that the full social and environmental cost of development should be included along with financial costs in evaluating and making development decisions, and including the methodologies for placing monetary values on such things as natural resources, and environmental and social quality (or degradation).
ENVIRONMENTAL IMPACT STATEMENT	A document prepared by the proponent to present the case for the assessment of the proposal as part of the environmental impact assessment process.
GREENHOUSE EFFECT	Predicted global climatic change (global warming) associated with the buildup of certain gases, in the atmosphere. (The increase in concentration of these gases including carbon dioxide, nitrous oxide, methane and chlorofluorocarbons is believed to be a by-product of man's industrialisation activities, primarily the burning of fossil fuels and deforestation.)
INTERGENERATIONAL EQUITY	Equity between the current generation and subsequent ones — philosophy that no generation should increase its wealth, or generally benefit because of the utilisation of resources, if it is to the detriment of subsequent generations.
LIFE-SUPPORT SYSTEM	An ecological process that sustains the productivity, adaptability, and capacity for renewal of lands, waters, and/or the biosphere as a whole.
MONITORING	The checking of predicted impacts of a proposal in order to improve environmental management practices and to check the efficiency and effectiveness of the EIA process.
RESOURCE	Anything that is used directly by people. A renewable resource can renew itself (or be renewed) at a constant level, either because it recycles quite rapidly (water), or because it is alive and can propagate itself or be propagated (organisms and ecosystems). A nonrenewable resource is one whose consumption necessarily involves its depletion.
SUSTAINABILITY	A characteristic of a process or a state that can be maintained indefinitely.
SUSTAINABLE USE	Use of an organism, ecosystem or other renewable resource at a rate within its capacity for renewal.
TENET	A doctrine which is held to be true.

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