

**Environmental Impact Assessment in
the Netherlands**

**Experiences and views presented by and to
the Commission for EIA**

June 1996



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PREFACE


On the occasion of the EIA-summit in Quebec, Canada in 1994, the Commission for Environmental Impact Assessment (EIA) published a compilation of papers in the English language entitled '*EIA-methodology in the Netherlands, views of the Commission for EIA*'. This happened on repeated request of institutions abroad which are interested in application of EIA in the Netherlands. The papers were the result of experiences of the Commission with scoping and review advices on about 500 EIA-procedures since the introduction of EIA in the Netherlands in 1987, and presented a fairly complete picture of EIA as viewed by the Commission. This EIA-practice could be acquired as the Commission for EIA plays a central role as an independent advisor to pertinent competent authorities in all EIA-procedures. The articles focused on subjects like effectiveness of EIA, scoping and comparing alternatives, illustrated with 10 case studies, reviewing of EISs and EIA for plans and programmes.

Since 1994 about 200 new EIA-procedures have commenced, leading to a further accumulation of experiences of the Commission. Moreover, the Commission has cooperated intensively with other countries in the international Environmental Assessment (EA) effectiveness study that was launched in 1994 in Quebec and managed by the Canadian Environmental Assessment Agency and the International Association for Impact Assessment. In the framework of this study the Commission has concentrated its contribution on the subjects '*strategic environmental assessment (SEA)*' and '*reviewing EISs*'. A marked progress in EIA-practice of the Commission is represented by the development of reviewing criteria for EISs. Since 1994, the new experiences yielded a number of articles and papers that were prepared for and presented during various international meetings. They are compiled into a new volume of papers. They include the following subjects: SEA, reviewing EISs, the added value of EIA to decision-making and ways in which EIA contributed to more environmentally sound decisions by adopting preventing, mitigating and compensating measures in the preferred alternative. Some case studies are presented addressing subjects like siting and licensing of radioactive waste facilities, expansion of Amsterdam airport and development of residential zones near Zaanstad. Some of these case studies will also be made available by the Australian Environment Protection Agency (EPA) on the World Wide Web in the near future, as one of the results of the international EA effectiveness study. Since 1993, the Commission is also involved in EIA for projects in the context of international cooperation, as independent advisory body for the Directorate General for International Cooperation (DGIS) of the Netherlands Ministry of External Affairs. One paper concisely addresses the functions, working routines and experiences of the Commission in this field.

Finally, special attention is drawn to a paper of dr. Christopher Wood that reviews the Netherlands environmental impact assessment (EIA) system from a comparative, international perspective. This paper was presented on a symposium organised on the occasion of the tenth anniversary of the Commission in May 1996.

The Commission hopes that this new publication will contribute to the growing international exchange of EIA-experiences, with the aim to support EIA-practitioners in improving current EIA-practice.

Utrecht, 28 May 1996


Peter van Duursen,
chairman

1 EIA IN THE NETHERLANDS: A COMPARATIVE ASSESSMENT¹

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1. INTRODUCTION

This paper reviews the Netherlands environmental impact assessment (EIA) system from a comparative perspective. The Dutch EIA system is widely regarded as the strongest in Europe, not least because it provides for more rigorous assessment than does the European Directive on EIA. Observers from further afield are also interested in the operation of the Dutch EIA system and, in particular, in the role and effectiveness of the highly influential EIA Commission.

The Dutch EIA system (or MER - milieu-effectrapportage) system, which owes its parentage more to Canada than to the United States, was very carefully considered before its implementation. The Netherlands commissioned a series of research studies in the late 1970s and 'trial run' EIAs were undertaken to ensure that the procedures envisaged were practicable. By the time the first legislation on EIA was passed, in 1986, considerable experience of EIA had been gained. The current legislative basis for EIA contained in the Environmental Management Act 1994, is very similar to the 1986 Act.

The main features of the Dutch EIA system are shown in simplified form in Figure 1 (see also Glasson, Therivel and Chadwick, 1994). Several features of the EIA system should be noted:

- The EIA process is integrated into existing decision-making procedures
- The EIA process is not confined to projects
- There are statutory requirements relating to the treatment of alternatives, to scoping, (including the preparation of project-specific guidelines) to the review of EIA reports and to the monitoring of the impacts of implemented projects.
- There are provisions for public participation at both the scoping and EIA report review stage and there is a third party right of appeal against decisions
- The Dutch EIA Commission plays a central role in the EIA process generally and at the scoping and EIA report review stages in particular

¹ Paper presented at the Seminar on the occasion of the Tenth Anniversary of the Commission for EIA, 13 May 1996, The Hague.

Below, each aspect and stage of the Dutch EIA system is briefly reviewed in turn: legal basis, coverage, consideration of alternatives, screening of actions, scoping of impacts, environmental impact statement (EIS) preparation, EIS review, decision making, monitoring and auditing of actions, mitigation of impacts, consultation and participation, EIA system monitoring, costs and benefits of EIA and strategic environmental assessment. In the conclusion to the paper the performance of the Dutch EIA system is tested against a set of evaluation criteria and a number of observations is made. Finally, the Dutch EIA system is compared with seven other EIA systems using the same evaluation criteria. Of the EIA systems in the United States of America, California, the United Kingdom, Canada, the Commonwealth of Australia, Western Australia and New Zealand only that in Western Australia compares favourably with that in the Netherlands.

2. THE NETHERLANDS EIA SYSTEM

Legal basis. The Environmental Management Act 1994 contains detailed requirements relating to the coverage of EIA, the content of the EIS, the preparation of the EIS, the decision-making procedure and the post-project evaluation. The Act provides for the EIA process to be integrated into existing decision-making procedures. Together with the Notification of Intent Decree and the EIA Decree, the EIA Act contains provisions relating to each step in the EIA process shown as obligatory in Figure 1. The one area not provided for in the Act relates to the provision of supplementary information as a result of the review of the EIS by the EIA Commission and the public.

There is a large handbook on the EIA procedure with an explanatory leaflet (Ministry of Housing, Physical Planning and Environment) and Ministry of Agriculture, nature Management and Fisheries, 1991). In addition, numerous other documents on more technical aspects of EIA exist. In general, there is probably more official information about EIA in the Netherlands than in any jurisdiction outside North America. The existence of this information, like that of the very clear and specific legal provisions relating to EIA in the Netherlands, reflects the careful preparation for (and subsequent administration of) the Dutch EIA system.

Coverage. The Dutch EIA system applies to both public and private projects though most of the EIAs undertaken have been for private developments. The Act specifies that energy, resource, waste disposal and traffic impacts are included and indirect and cumulative impacts are now also included.

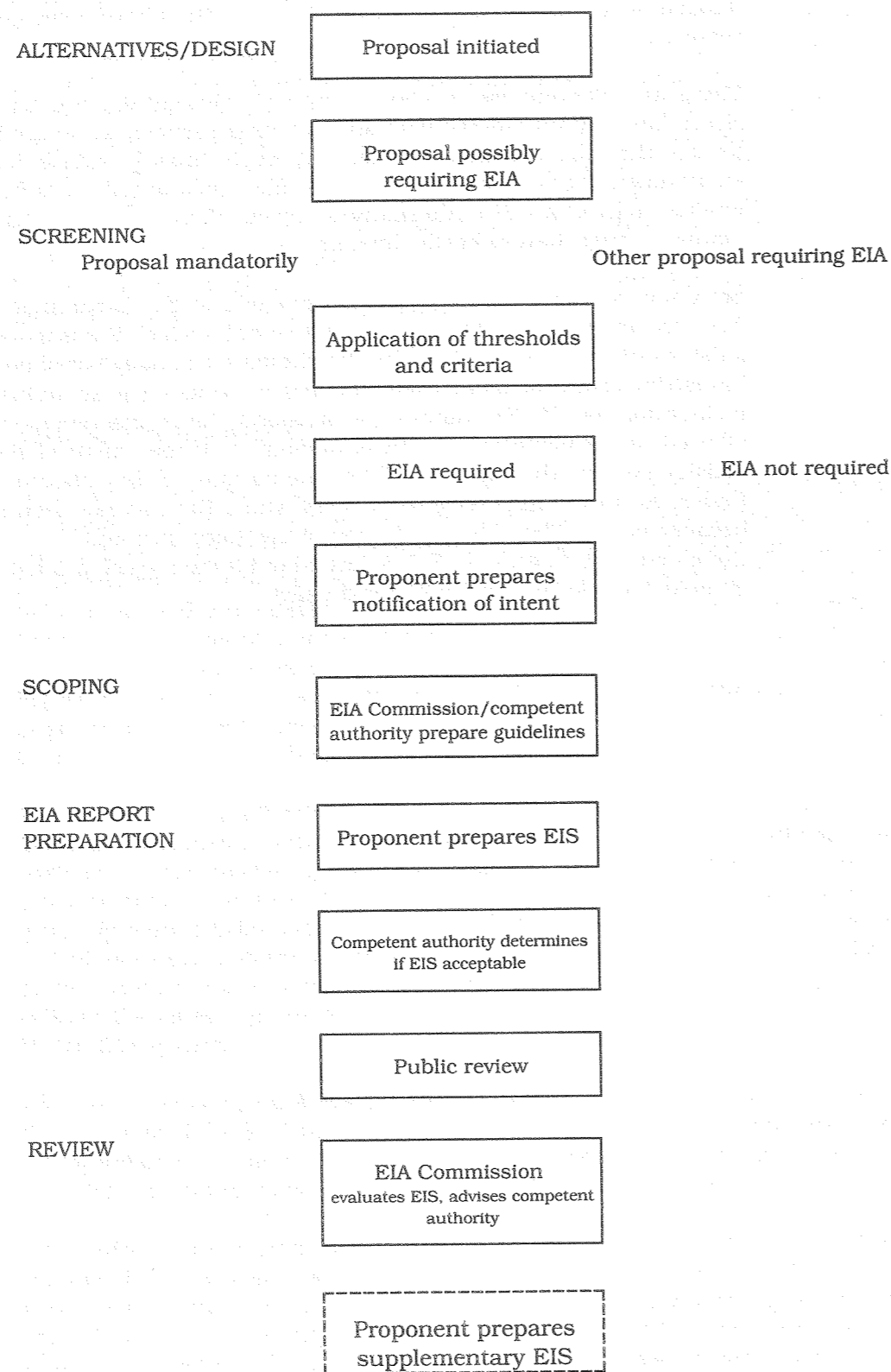
Alternatives. The Dutch EIA system lays considerable emphasis on the treatment of alternatives. In the Netherlands alternatives may include measures which would be described as mitigatory elsewhere (eg technical controls over pollution). The Environmental Management Act 1994 specifies the minimum contents of an EIS and lays great emphasis on the coverage of reasonable alternatives. Alternatives to the proposed activity and their

environmental consequences must be described both in the EIS and in the non-technical summary. Further, a comparison between the environmental impacts of the proposed development and of the alternatives considered is required.

There are different views about how well alternatives are treated in the Netherlands. Many Government and business participants in the EIA process believe that the treatment of alternatives is broadly satisfactory whereas environmental groups believe that the analysis of alternatives is frequently the weakest part of an EIS. Alternatives appear often to involve changes at the margin, rather than radically different approaches.

Screening of actions. Part C of the Schedule to the Environmental Impact Assessment Decree contains a list of activities for which EIA is mandatory, and a list of criteria to be applied. The thresholds are usually based on area (eg an industrial estate of more than 100 ha) or weight (eg an industrial waste incinerator for 25,000 tonnes pa or more). Little discretion is seemingly allowed: implementation of EIA is mandatory if the extent of the proposed activity exceeds the threshold. (Proponents may, if they choose, voluntarily undertake EIA.) There have been cases where EIA has not been undertaken because of over-liberal interpretation of the guidelines and thresholds but, in general, EIA is carried out if the project is listed and its size exceeds the relevant threshold (next page).

FIGURE 1 MAIN STEPS IN THE NETHERLANDS EIA PROCESS



DECISION-MAKING

Competent authority makes decision

MONITORING

Monitoring

--- optional step

While there is consultation of selected bodies (eg the provincial environmental inspectorate) during screening there is no public participation. There is a third party right of appeal to the competent authority at the decision stage of the EIA process which may relate to screening decisions. On balance, while too many projects have escaped the EIA process in the past, screening has worked well for the limited range of projects subject to EIA in the Netherlands.

Scoping of impacts. The Environmental Management Act 1994 makes it a requirement that project-specific guidelines be prepared for each EIA. The notification of intent prepared by the proponent alerts the competent authority that an EIA is to be undertaken and that guidelines are to be prepared. In turn, the competent authority must publish the notification of intent and alert the EIA Commission.

The EIA Commission's advice, which is made public, provides the competent authority with a draft of the scoping guidelines. Indeed, guidelines written by the EIA Commission are often (but by no means always) simply adopted by the competent authority. The scoping guidelines tend to be somewhat general (despite lengths of 20-30 pages or more) and not to eliminate potentially irrelevant topics. However, guidelines very rarely neglect relevant impacts, largely because of the expertise of the increasingly influential EIA Commission. In general, scoping works well. The main problem appears to be making the competent authorities take full responsibility for, and commit themselves to, the guidelines issued in their name.

EIS preparation. The Environmental Management Act 1994 specifies the minimum contents of an environmental impact statement. Information held by the competent authority must be made available to the proponent who prepares the EIS in accordance with that authority's guidelines for the action. As shown in Figure 1 the competent authority evaluates the acceptability of the EIS before it is made available for public review. This check ensures that the requirements of the Act and the recommendations in the guidelines are met.

While a few proponents still see the EIS merely as a paper exercise, their number is diminishing rapidly. On the whole (and with exceptions) EIA report preparation is thought to take place reasonably effectively in the Netherlands. There is a noticeable improvement in the efficiency of preparation and in

quality when proponents or their consultants are preparing a second or subsequent EIS rather than their first.

EIS review. Once the competent authority has accepted the EIS, the public must be notified and the EIS is made public together with the draft decision on the proposal. The public review period of at least 5 weeks for the EIS coincides with the public review period for the application to which the EIS relates. The EIA Commission checks the EIS against the legislation and the regulations and against the scoping guidelines to see whether it is complete. The Commission must also make a judgement about whether the EIS is adequate for decision-making purposes. The review findings of the EIA Commission are published. These findings, which are confined to the contents of the EIS rather than to the advisability or otherwise of the proposal, are almost always accepted by the competent authority.

In general the EIA review process is working reasonably well. The level of expertise within the competent authorities is growing, the public is becoming increasingly involved and increasingly sophisticated: as a result, the quality of EISs is improving. While there is no right of appeal against the EIA Commission's review findings, they are widely regarded as authoritative and are very seldom challenged by proponents, by the competent authority or by environmental groups.

Decision-making. The competent authority is obliged by the Environmental Management Act 1994 to incorporate the findings of the EIS, of the EIA Commission's review and of the comments of the consultees and the public in its deliberations on the decision. The competent authority must explain fully the reasons for its decision in writing. These reasons must also indicate the weight which has been attached to environmental parameters in comparison to other factors.

It is generally accepted that EIA is actually affecting decisions in the Netherlands, even if the reasons given for the decision are occasionally invented to justify it. Some decision-makers decline to read EISs or to consider their findings, so that environmental arguments are sometimes used to explain economic decisions. However, proponents are often more positive than competent authorities about the EIA process and they (and the authorities) are modifying proposals as a result of it.

Monitoring and auditing of actions. The Dutch Environmental Management Act 1994 does not require any information on monitoring to be submitted as part of the EIS. However, the EIA Commission advises that the proponent covers monitoring and auditing in the EIS by specifying, in the scoping guideline recommendations, that impact measurement and possible corrective arrangements should be described. Most guidelines issued by the competent authorities make this advice a requirement. The Act also contains five sections devoted to 'evaluation', ie to auditing. In summary, these are:

- 1) the competent authority must monitor the consequences of the implemented action.

- 2) the proponent must provide the competent authority with monitoring information.
- 3) the competent authority must prepare a post-auditing report (or evaluation) comparing impacts with those predicted in the EIS, publish it and send it to the EIA Commission and the statutory consultees.
- 4) the competent authority must take action (eg by tightening licence conditions) if impacts are more severe than anticipated.
- 5) detailed regulations relating to monitoring can be made (none have not yet been issued).

There is, therefore more than adequate provision for monitoring and auditing in the Dutch EIA system. However, this provision is not proving to be effective.

No mention has been made of monitoring in about half of the decisions reached to date. There has been detailed reference to auditing only in about 25% of the decisions made. So far, very few auditing reports have been published. While relatively few projects have been fully implemented, the main reason for the failure to prepare more auditing reports is the lack of attention paid to monitoring by many competent authorities. The authorities are not pressing proponents for the necessary information and not preparing the monitoring reports for publication and transmittal to the EIA Commission.

Mitigation. Mitigation is not referred to by name in the Dutch Environmental Management Act 1994. It is not a requirement that mitigation be mentioned in the notice of intention and, frequently, mitigation measures are not specifically included in the scoping guidelines. EISs frequently (but not invariably) contain specific reference to mitigation measures. Perhaps surprisingly, the suite of EIA guidance documents does not include a volume on mitigation. Mitigation is largely subsumed in the treatment of alternatives in the Dutch EIA system. There is no doubt that mitigation of environmental impacts is taking place as a result of the EIA process and the involvement of the EIA Commission. Though not universal, changes to improve the proposal's environmental compatibility usually take place by iteration in the EIA process. Changes in location, in design and in technical controls are all common. There is, perhaps, a view that many of these changes, while significant, are relatively minor in nature.

Consultation and participation. The Dutch Environmental Management Act 1994 specifies two occasions in the EIA process on which the statutory consultees and the public must be given the opportunity to comment. The first is public participation in regard to the establishment of the scoping guidelines. The second is when the EIS is reviewed. The notification of intent, the decision and the auditing report by the EIA Commission are also published.

Generally, consultation and public participation in the Netherlands work reasonably effectively. Many members of the public object to the proposal at both the scoping and EIS review stages but others make useful comments on such matters as alternatives, vulnerable people or receptors, potential damage to people and difficulties in predicting impacts. There have been instances where an additional alternative has been put forward as a result of public

participation, and public comments have often helped to refine proposals. More important to the decision, however, is the informal consultation between the proponent, the competent authority and the EIA Commission. The open nature of the Dutch EIA process, with consequent minimisation of the possibility of abuse, must be seen as one of its great strengths.

EIA system monitoring. The Netherlands EIA system is subject to several monitoring provisions. Perhaps the most important is the requirement of the Environmental Management Act 1994 for the EIA system to be reviewed every 5 years. To undertake that review an evaluation committee was set up to advise on how the EIA system was working. Many of its recommendations (Evaluation Committee on EIA, 1990; VROM, 1991) have now been implemented.

Despite the amount of information available about the EIA system in the Netherlands, the results of individual EIAs are not sufficiently fed back into the system. The EIA Commission is able to utilise previous experience in drawing up scoping guideline recommendations and, to a lesser extent, in reviewing EISs but many developers and consultants are failing to utilise fully the available information. Competent authorities are not utilising sufficiently the experience of similar projects gained elsewhere. There is, therefore, some scope for improving practice in the well-monitored Dutch EIA system.

Costs and benefits. No records of financial costs or time are kept. However, it is believed that the total costs of EIA are generally limited to 0.0001-0.01% of the cost of large projects but, perhaps, constitute 1% or more of the cost of smaller projects. The total Government annual budget on EIA is about NLG6M, including the research it funds but excluding the cost of its own staff. This is a very substantial sum. There is no doubt that the substantial sums of money spent by the government, by proponents and by third parties in the EIA process considerably exceed those which would have been expended on proposals in any event. The main delays in the EIA process result from the activities of the developer (especially if supplementary information is required) and the competent authority.

It is widely believed that the EIA system has changed the behaviour of the participants but this is very difficult to measure. There is no empirical evidence to prove that EIA has altered the outcome of decisions, especially if this is measured in terms of the number of cancellations of projects. However, some projects have been cancelled and in other cases a less damaging alternative has been chosen. In almost every case, further consideration has been given to the environment than it would have been given without EIA.

Strategic environmental assessment. Environmental Impact Assessment Decree makes provision for certain types of plans and programmes to be subject to EIA. These relate to structure plans for electricity supply, industrial and drinking water supply, landscaping, nature conservation and outdoor recreation, to provincial waste management proposals, mineral extraction plans and certain types of land use plans (Verheem, 1993). The Decree does not apply to national policy plans. Experience of the EIA of over 30 plans and

programmes has been gained to date (van Eck, 1993). However, decisions have been reached on only a few of these plans and programmes and even fewer have been implemented. Experience has shown that the EIA approach for projects generally worked satisfactorily for plans and programmes, largely as a result of formal scoping and the preparation of guidelines and that practice was bound to improve (van Eck, 1993).

Conclusions

A set of evaluation criteria can be advanced to evaluate the formal legal procedures, the arrangements for their application, and practice in their implementation in any EIA system (Hollick, 1986; Australian and New Zealand Environment and Conservation Council, 1991; Gibson 1993; Wood, 1995).

The Netherlands EIA system meets almost every one of the evaluation criteria utilised in this review (Table 1). The only criterion which is not met relates to monitoring and even here the

legal provisions meet the criteria: it is practice which falls short. On the other hand, the mitigation of environmental impacts is not separately specified in the law but there appears to be no inherent weakness in the treatment of mitigation in the EIA system. Mitigation is subsumed under the very extensive coverage of alternatives in the Dutch EIA system and, in particular, in the environmentally preferable alternative. However, since Article 5(2) of the European EIA Directive requires the EIS to include "a description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects" it is somewhat surprising that the omission of mention of mitigation measures in the Dutch EIA legislation persists.

Glaring omissions in the implementation of the monitoring and auditing provisions of the Environmental Management Act 1994 exist. It would assist the operation of the EIA system, and the knowledge base for EIA, if these provisions were strengthened, perhaps by time-limiting permissions and requiring the submission of satisfactory monitoring information. This would improve the feed-back of knowledge into the EIA system, where weaknesses in utilising previous experience are apparent. This is, perhaps, symptomatic of the failure, in some instances, fully to integrate the results of the EIA into the proponent's own planning and project development at a sufficiently early stage to genuinely influence project design. It may also reflect the willingness of the competent authorities to leave too much of the operation of the EIA process to the increasingly influential EIA Commission and not to make EIA truly central to their decisions.

The Evaluation Committee on EIA (1990) made a number of recommendations relating to the EIA system including broadening the types and numbers of activities subject to EIA, improving safeguards where the proponent and the competent authority are one and the same, expanding the scope of the notification of intent, spelling out the least damaging alternative more fully and expanding the coverage of EIA to include energy use. All these recommendations have now been implemented. Further improvements in the effectiveness of the Dutch EIA system can therefore be anticipated.

TABLE 1 PERFORMANCE OF THE NETHERLANDS EIA SYSTEM

Criterion	Criterion Met	Comment
1. Is the EIA system based on clear and specific legal provisions?	Yes	EIA Act and decrees specifically provide for clearly defined EIA process integrated into other decision-making procedures.
2. Must the relevant environmental impacts of all significant actions be assessed?	Yes	Covers highly significant projects and certain policies, plans and programmes. Indirect and cumulative environmental impacts covered, but not legally specified.
3. Must evidence of the consideration, by the proponent, of the environmental impacts of reasonable alternative actions be demonstrated in the EIA process?	Yes	Alternatives, including the 'no- action' and the environmentally preferable alternatives, must be considered in scoping, the EIA report and the decision.
4. Must screening of actions for environmental significance take place?	Yes	Lists of activities, thresholds and criteria in EIA Decree allow competent authorities little discretion.
5. Must scoping of the environmental impacts of actions take place and specific guidelines be produced?	Yes	Public scoping process, involving EIA Commission, produces action-specific guidelines for EISs.
6. Must EIA reports meet prescribed content requirements and do checks to prevent the release of inadequate EIA reports exist?	Yes	EIS is checked against guidelines and EIA Act by competent authority before release for public consultation.
7. Must EIA reports be publicly reviewed and the proponent respond to the points raised?	Yes	EIA Commission reviews the EIS and, where necessary, supplementary information is requested by competent authority.

Criterion	Criterion Met	Comment
8. Must the findings of the EIA report and the review be a central determinant of the decision on the action?	Yes	Explanation of way environmental impacts considered in decision is mandatory. In practice, EIA generally does influence decision.
9. Must monitoring of action impacts be undertaken and is it linked to the earlier stages of the EIA process?	Partially	Specific requirements relating to monitoring and comparison with EIS. However, in practice these are often not observed.
10. Must the mitigation of action impacts be considered at the various stages of the EIA process?	Yes	Mitigation is subsumed in treatment of alternatives but is not separately required. Practice often satisfactory.
11. Must consultation and participation take place prior to, and following, EIA report publication?	Yes	Formal requirements for consultation and public participation in both scoping and review.
12. Must the EIA system be monitored and, if necessary, be amended to incorporate feedback from experience?	Yes	EIA Commission prepares annual report and comprehensive quinquennial EIA system review is undertaken.
13. Are the financial costs and time requirements of the EIA system acceptable to those involved and are they believed to be outweighed by discernible environmental benefits?	Yes	Virtually unanimous belief that benefits of EIA outweigh its financial and time costs.
14. Does the EIA system apply to significant programmes, plans and policies, as well as to projects?	Yes	EIA Decree defines 'proposal' to include certain policies, plans and programmes. Growing SEA practice.

The Dutch EIA system compares very well with other EIA systems (Figure 2). Only the Western Australian EIA system performs as well as the Dutch system and it is quite likely that the crucial decision-making stage in that system may be weakened. The EIA system in the Netherlands has sometimes been criticised as overly cumbersome, expensive, time-consuming and limited in application: a Rolls Royce where a Ford would suffice. The Dutch would generally argue that the wealth of their concern about the environment of their small and vulnerable country justifies their extensive preparation for, and introduction of, the best EIA system their money could purchase. They would also argue that the EIA system is flexible enough to allow them only to use a car when absolutely necessary: that detailed EIA is needed to address only the most acute problems. As the Evaluation Committee on EIA (1990, p13) put it:

... the Evaluation Committee can only express its satisfaction about the way the regulation has operated in the first years since its introduction. Experience to date gives ground for optimism.

Most observers from abroad can only agree.

FIGURE 2 THE OVERALL PERFORMANCE OF THE EIA SYSTEMS

Evaluation Criterion	Criterion met within jurisdiction							
	USA	California	UK	Netherlands	Canada	Australia	Western Australia	New Zealand
1. Legal basis	☑	☑	☑	☑	☑	☑	☑	☑
2. Coverage	☑	☑	☑	☑	○	☑	☑	☑
3. Alternatives in design	☑	☑	○	☑	☑	☑	☑	☑
4. Screening	☑	☑	☑	☑	☑	○	☑	☑
5. Scoping	☑	☑	○	☑	☑	☑	☑	☑
6. Content of EIA report	☑	☑	☑	☑	☑	☑	☑	○
7. Review of EIA report	☑	☑	☑	☑	☑	☑	☑	☑
8. Decision-making	○	○	○	☑	○	○	☑	○
9. Impact monitoring	○	☑	○	☑	☑	○	☑	○
10. Mitigation	☑	☑	☑	☑	☑	☑	☑	☑
11. Consultation and participation	☑	☑	☑	☑	☑	☑	☑	☑
12. System monitoring	☑	○	○	☑	☑	○	☑	○
13. Costs and benefits	☑	☑	☑	☑	☑	☑	☑	☑
14. Strategic EA	☑	☑	○	☑	○	○	☑	☑

☑ Yes ☐ Partially ○ No

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1.

INTRODUCTION

In the Netherlands activities having significant adverse environmental impacts are subject to three levels of decision-making. All three involve the use of environmental impact assessment (EIA). The highest level – the strategic level – concerns policies, plans and programmes, mostly initiated by national or regional government. At the second level the accent is on site selection for activities and routing decisions, mostly initiated by regional government. The third level involves licensing: the design and implementation of projects initiated by regional and local government and private developers.

In most cases EIA is carried out at the third level of decision-making, where activities can be clearly defined and quantitative predictions of impacts are possible. The added value of EIA is provided by the identification and application of mitigating measures, and in informing the public about the environmental impacts of the activity. Nevertheless, EIA at this level is often not satisfactory, it being felt that the most crucial decisions on the nature and site of the activity are made at an earlier stage and without considering the environmental impacts.

This problem could be solved by carrying out an EIA earlier on in the decision-making, when a large number of options can still be considered. The potential for improving decisions is high, but defining environmental impacts for decisions of a strategic nature can be difficult. Questions such as Is strategic EIA useful? Can it be applied? and How can it add to decision-making? are often raised. This paper addresses these questions, drawing upon experience of EIA at the strategic level in the Netherlands, and presenting the lessons learned.

2.

STRATEGIC EIAs

A wide range of experience with EIA has been acquired in the Netherlands: over 600 EIAs, including about 40 'strategic' EIAs (SEA) for policy plans and programmes, have been completed. It should be stated that the SEAs mainly address environmental impacts and do not include 'integrated' policy and plan-making approaches.

According to the Dutch Environmental Impact Assessment Decree, EIA is compulsory for several strategic decisions at the national and regional level. The Decree states that EIA is compulsory for:

- the adoption of plans relating to the final disposal of wastes, waste disposal facilities, or the location of such facilities or installations
- physical plans making prior provisions for allocating residential or industrial areas
- the adoption of a national plan determining the fuels to be used for generating electricity, potential sites for the production of electricity, and maximum generating capacities

Therefore, SEAs are prepared for:

- the National Structure Plan on Electricity Supply
- regional land use plans, when site selection for major residential and industrial areas is at stake
- the National Policy Plan for Industrial and Drinking Water Supply
- that part of the National Structure Plan for the Rural Areas dealing with the planning framework for land development projects
- regional plans for waste management, the processing and storage of dredged sludge and sewage sludge, and site selection for facilities
- the National Plan on the Management of Hazardous Waste

SEA was carried out for two national plans on a voluntary basis. Both plans aim to provide a framework for regional and local authority plans. The Environmental Impact Statement (EIS) made for these plans provides essential information for the EISs at the regional level. SEA was carried out for:

- the Ten Year Programme on Waste Management, a national policy plan from the Dutch Waste Management Council
- the Government's National Guidelines for the disposal of dredged sludge

Recently, Parliament adopted a Cabinet Directive requiring an 'environmental test' for all Cabinet decisions with significant environmental impacts (as far as not requiring an SEA under the EIA section of the Environmental Management Act). Procedural and content requirements of this test are kept at a minimum to provide for as much flexibility in the process as possible. In principle, the assessment should give an answer to the key indicators affecting sustainable development (see box 1). A so-called 'environmental paragraph' should be prepared by the lead authority, with a mandatory involvement of the Minister of the Environment. Although the first environmental paragraphs are currently under preparation, it is yet too early to draw any conclusions on the effectivity of the new instrument.

Box 1.

The Dutch Environmental Test: Sustainability checklist

1. effect on energy consumption (use of fossil fuels such as gas, coal, oil and energy demand of consumers)
2. effect on use of renewable (eg timber, fish) or non-renewable (eg sand, clay, ground- and springwater) natural resources and raw materials
3. quantity and quality of waste flows and emissions to soil, air and water
4. use of space and impact of existing functions of space

Finally, the Dutch Ministry of Foreign Affairs has decided to use SEA – where appropriate – in its planning of development assistance. So far, the Dutch EIA Commission has issued guidelines on the required content of SEAs that will be carried out for alternative development strategies in the Rio Paute Region in Ecuador, as well as the Environmental Profile of Shabwah Province in Yemen.

3.

CONTENTS OF AN SEA

A number of cases are briefly discussed to illustrate the way in which alternatives can be described in the EIS, and the way in which environmental impacts can be assessed. The content of the EIS for the Ten Year Programme on Waste Management and its linkages to regional plans is described in more depth in Chapter 4.

3.1

National Structure Plan on Electricity Supply

The National Structure Plan on Electricity Supply is drawn up by the Government. It contains decisions on the fuels to be used for the coming 20 years and the selection of sites for power stations, windmill parks and transportation facilities. The plan is revised every 5 to 10 years.

For **fuel use** the alternatives '50 per cent natural gas, 50 per cent coal' and '33 per cent natural gas, 33 per cent coal, 33 per cent oil-gasification' were taken into account, and the impacts of these alternatives were described. The emissions were calculated as the sum of all individual plants for which data were available.

The following **environmental parameters** were used to assess the environmental impacts:

- emissions: SO₂, NO_x, and CO₂, chloride, fluoride, barium, selenium, mercury and dust
- waste and residues
- radiation (in waste and emissions)
- use of natural resources.

As a result of the EIS it was suggested that the amount of coal burnt had to be reduced and restricted to the use of modern technology for coal gasification.

In the EIS the proposed **sites** and **transportation facilities** in the draft Structure Plan were checked against the objectives of the Nature Policy Plan, which contains a map of the proposed ecological structure, and the expected impacts on cooling-water capacity, water quality, noise disturbance and safety. The potential 24 power stations sites were assessed for sustainability on the basis of the following environmental criteria.

- Environmental criteria for site selection:
- thermal effects (because of the use of cooling water)
 - other effects on surface water quality (eg toxic substances in the wastewater)
 - effects of fuel transport to and from the location
 - spatial impacts, eg landscape and habitat impacts
 - noise – safety – radiation.

Assessments were made on the basis of existing data in the literature. The SEA was judged to be useful by the lead authority and had a major impact on the structure plan finally adopted.

3.2 Land use planning

Several SEAs have been carried out for regional land use plans where the **site selection** for major residential, industrial and recreational areas was at stake. Selection and comparison of possible sites is often performed by the use of **multi-criteria analysis** (MCA).

- Criteria groups considered relate to:
- pollution of soil and water
 - nature and landscape protection
 - mobility guidance
 - quality of life^{3]}
 - economy of resources.

Geographic Information Systems (GIS) have recently been used in EIAs to allow the use of MCA, greatly improving the ability to make comparisons and visualize site potentials. Sites that prove to be the most favourable, or least damaging to the environment, are selected to be part of 'the alternative most favourable to the environment'. SEA and the use of multi-criteria analysis is by now widely regarded as a fruitful aid for (complex) site selection decisions.

Plans for new residential and industrial areas are not only made at the regional level of government; there is a formal national policy on spatial development set out in the Supplement to the Fourth National Policy Plan on Spatial Planning, but no SEA was carried out for this. The Minister argued that the Plan establishes only 'directions for development', and would not decide on specific locations for housing, industry or recreation. As it turned out, it proved

3 Quality of life is defined as accessibility to public buildings such as schools and shops, disturbance by noise, smells and air pollution.

to be quite decisive in the selection of sites for future urban development at the regional level. Discussions are under way at the moment on how an SEA for the coming policy review should be carried out.

3.3 National guidelines for the disposal of dredge spoil

Located in the delta of several major rivers, the Netherlands relies on the dredging and storage of sludge to maintain navigable waterways. Since the seventies the sludge has been so polluted that it has to be disposed of under special conditions, depending upon the amount of contamination. **Five policy alternatives** for sludge disposal were presented in the SEA, consisting of combinations of spreading the sludge over land, processing, and disposal in landfills. Environmental impacts were described in a **qualitative manner** for the following aspects.

- Environmental impacts:
- emission to surface and ground water
 - energy use
 - air pollution
 - use of space
 - saving of primary feedstock.

To establish the most favourable **storage conditions** the environmental impacts and risks associated with storage on land were compared against those for storage under water, taking into account the need for effective sealing. Although storage on land appeared to be easier to carry out, control and monitor, storage under water was a better solution for sludge polluted with heavy metals, which are highly immobile under anaerobic conditions. Most of the findings of the SEA were included in the national guidelines.

3.4 National plan for the disposal of hazardous wastes

The national plan for the disposal of hazardous wastes is revised every three years. In this plan the national government and the 12 regional governments will decide on the methods to be used for processing and disposing of hazardous wastes, and the selection of sites for new processing plants and landfills. The scoping guidelines for the SEA on the plan have recently been adopted. The main issue will be the comparison of **processing methods** for 13 different types of hazardous waste. Environmental aspects will be described quantitatively using **multi-criteria analysis**. The following aspects will be taken into account:

- emissions to air, soil and water
- generation of residuals
- energy use
- use of primary feedstock
- risk of calamities
- use of space

In addition to a comparison of processing methods, policy alternatives will be described for:

- combining activities for collection, storage, processing and final disposal
- reducing the number of license holders

- import and export criteria.
- Environmental impacts for these alternatives will be discussed qualitatively.

3.5 Sea of the National Plan on Drinking and Industrial Water

The main issues of this SEA were to determine effects on nature of alternative national water production policies, and to compare alternative methods for water production on environmental and other aspects.

Effects on nature of alternative water production policies

As a first step in the SEA several alternative options for future national water production policy were developed:

- focus on the use of existing production methods:
 - alternative 1: increasing total drinking water production
 - alternative 2: decreasing total drinking water production
 - alternative 3: decreasing industrial use of water
- aiming at a change in production methods:
 - alternative 4: increasing existing use of ground water (shallow & deeper ground water, infiltrated river water)
 - alternative 5: decreasing existing use of ground water

In a second step, an appropriate GIS and national hydrological models (both for ground water and surface water) were developed. With the help of these models and prognoses of the future water production capacities needed in each of the alternative policy options, the effect of alternatives on surface and ground water in the Netherlands were determined.

A third step consisted of the development of a method to determine existing natural values of moist and wet ecosystems in the Netherlands (the DEMNAT model). Main features of this method are the identification of homogenous ecosystems (so called 'ecotope groups') and the estimation of existing natural value of these ecosystems per km² on the basis of:

- presence of ecotope groups
- national and international rarity of these groups.

Step four consisted of the determination of changes in existing natural values, to be expected because of the effect of policy alternatives on surface and ground water.

The above described method led to the following results:

- there is a *direct relation* between the amount of water production and effect on nature
- ending all *ground water* production would lead to a 12% increase in natural value of moist and wet ecosystems (as compared to 1988)
- ending all *drinking water* production would lead to a 10% increase in natural value
- ending all *industrial use* of water would lead to a 2% increase

- ending the use of shallow ground water is most effective to increase natural value, followed by deep ground water, infiltrated river water and industrial use

Comparison of production methods

The SEA compared the following production methods:

- 1 use of ground water: shallow ground water, deeper ground water and infiltrated river water
- 2 use of surface water: direct extraction, via a natural reservoir and via an artificial reservoir
- 3 artificial infiltration: surface infiltration and deep infiltration

Comparison took place on the following environmental aspects:

- Abiotic environment (use of resources, waste production, energy)
- Nature effects
- Landscape effects

In addition to environmental aspects the following aspects were assessed:

- public health
- use of space
- technical/economical aspects (such as availability, flexibility, vulnerability and costs of methods)

The following assessment method was used:

- for each aspect several *subcriteria* were defined
- a *mix* of quantitative and qualitative information was used, on the basis of which each of the subcriteria was scored
- scores on subcriteria were translated into *one score*, using a mix of methods (normalisation)
- thorough sensitivity analyses were carried out
- per aspect methods were classified from 'best' to 'worst'

This method led to the following results:

Comparison of water production methods					
Methods ranked from best (1) to worst (7)					
Method	Health	Abiotic	Nature	Landscape	Space used
use of shallow g.w.	4	1	4	1	6
use of deep g.w.	2	2	3	1	7
use of river g.w.	6	3	2	3	4
direct use of s.w.	7	5	1	4	1
use of nat. reserv.	5	5	1	3	2
use of artif. reserv.	5	5	1	6	2
surface infiltration	3	4	2	5	5
deep infiltration	1	6	1	2	3

(g.w. = ground water)
 (s.w. = surface water)
 (nat. reserv. = natural reservoirs)
 (artif reserv. = artificial reservoirs)

On the basis of the ranking, final conclusions were drawn on the basis of a multi criteria analysis, weighing from different perspectives. The perspectives chosen were: health, abiotic environment, nature, landscape and economy.

It showed that from all perspectives the main conclusions were broadly the same:

- best score: deep ground water, infiltrated river water and deep infiltration
- medium score: surface infiltration and natural reservoir surface water
- worst score: direct surface water, shallow ground water and artificial reservoir

To distinguish between alternative methods for water production the aspects public health, abiotic environment, nature, landscape and use of space proved to be most important. Less important were technical and hydrological aspects.

The Dutch EIA Commission reviewed the SEA as of good quality. In particular the development of the DEMNAT model was judged very favourably. However, the lead authority was advised to be careful in applying the results of the assessment at the regional level. The production techniques that score best in the SEA could score different in specific regions, in particular because of the specific hydrological situation (not in all regions water production is influencing nature) and/or developments in related sectors in a region, such as agriculture. For example, it would not be very effective to end in a specific region the use of ground water for drinking water production, if that would mean that this same water would then be pumped away and discharged to surface water because of agricultural objectives (eg to increase soil stability to allow for the use of heavy machinery). The Commission advised to distil from the SEA for each specific region a framework of measures aiming at the protection or development of natural values (in as far as related to water production).

The competent authority concluded that the SEA influenced the decision making process. The results of the SEA were taken into account in policy formulation at the national level regarding future public water infrastructure in the Netherlands. Furthermore, it was mentioned that the methods developed as part of the SEA both stimulated and structured project-EIA's in the water sector, by this facilitating the taking into account of the National Plan in plan development at the regional level.

4. SEA FOR WASTE MANAGEMENT PLANS

4.1 SEA at the national level

Every three years the Waste Management Council (WMC) draws up a Ten Year Programme on Waste Management (TYP) to plan the technology and capacity needed for the final treatment of a number of waste flows: normal and coarse domestic waste, industrial waste, construction and demolition waste, office, - shop and services waste, waste from sanitation services, shredder waste, and (normal) hospital waste. The prevention and re-use⁴ of waste is outside the scope of the TYP. The WMC is a joint agency of the Environment Ministry, the Association of Provincial Authorities, and the Association of Dutch Municipalities. The actual management of waste treatment and processing is carried out by the members of the WMC.

First programme

During the preparation of its first programme for the period 1993-2003 the WMC decided to carry out a strategic EIA. This was carried out on a voluntary basis as it is not required under the Dutch EIA regulations; EIA is only compulsory for the provincial waste management plans.

In the EIS two scenarios were identified to help construct sound statements on the increase in the volume of waste:

- a scenario based on meeting the objectives set in the National Environmental Policy Plan for recycling and preventing waste - the 'policy scenario'
- a scenario based on a more pessimistic view of these topics - the 'head wind scenario'

Three alternatives for the current policy were studied for final consideration. In alternative I the existing situation remains more or less unchanged. In alternative II the main objective is to pre-separate as much as possible, after which each type of remaining waste is processed according to its type. Alternative III is also based on maximum pre-separation, but there will be no expansion of incineration capacity; the residual fractions will be landfilled.

The environmental **impacts** of the alternatives were described using a number of **indicators** representing certain environmental issues, based on those discussed in the Dutch National Environmental Policy Plan (NEPP). The EIS discusses how each policy alternative affects the chosen indicators. Table 1 shows the scores for these issues for each of the alternatives.

⁴ Re-use after the first separation near the source.

Table 1. Overview of the environmental impacts of the policy alternatives (Source: EIA, draft Ten-Year Programme on Waste Management 1992 – 2002, AOO Deventer, January 1992)

Issue NEPF/indicator	Current policy		Ref.Var	Alt I	Alt II	Alt III	Unit
	1990	2000	2000	2000	2000	2000	
		pre-separation minimum landfill	minimum landfill	minimum incineration	maximum pre-separation minimum landfill	maximum pre-separation minimum incin.	
Dispersion • Hg + Cd • PAH • Dioxin • COD	5427 62 147 792	5445 3.7 4.1 202	5696 3.3 4.3 211	3257 3.1 2.2 359	4632 3.4 3.3 228	2463 2.7 1.5 303	kg kg g ton
Acidification • acid equivalent	222	107	111	63	99	53	Meq.H
Disturbance • odour emission	17	55	43	45	9	9	10 ¹² ge
Climatic change • CO ₂ eq.	4349	-1496	-1525	-175	-1526	-494	kton
Energy • energy output	-6.2	20.9	21.5	11.4	20.1	-9.6	PJ
Removal • residual to be land-filled • chemical waste • residual to be recovered	220 118 637	398 164 1802	402 164 1891	548 76 1316	359 165 1502	896 49 1043	kton kton kton
Space occupied • space occupied	79	29	28	46	32	50	ha

It was possible to compare the different alternatives by comparing indicators. However, it is important to bear in mind that the result of the comparison will partly depend on the importance attributed to the various indicators. The EIS pointed out that pre-separation and digestion were the most favourable ways of processing waste from an environmental point of view, but the most difficult to realize in the short term as there is insufficient processing capacity and technical experience with large-scale digestion plants. The EIS suggested that this was the best long-term approach.

Regarding the quality of the EIS, the Dutch Commission for EIA^{5]} concluded in its advisory review that, in general, the EIS gives a comprehensive view of the potential environmental impacts of the alternatives described. The method chosen (the use of indicators for a number of environmental issues) was judged to be both clear and 'refreshing'. It was concluded that this method gives a good, although rough, insight into the different environmental impacts of policy alternatives. However, there was some criticism. One criticism was the fact that in the comparison between alternatives no weighting was made to reflect the relative importance of impacts in the light of general environmental problems in the Netherlands. This may lead to misguided conclusions. For example, the different scores allotted to alternatives for the 'climatic change' indicator are totally irrelevant in the light of total CO₂ and CH₄ production in the Netherlands. On the other hand the differences in dioxine production are very relevant, since waste incineration is one of the main contributors to this form of pollution.

Second programme

An SEA was recently carried out for the second Ten Year Programme for Waste Management in the Netherlands covering the period 1995–2005. To answer some of the criticisms of the impact prediction methodology used in the SEA for the first TYP – in particular criticism of the (limitations of the) indicators chosen, and the absence of importance weightings for impacts when comparing alternatives – the WMC decided to use a newly-developed method for impact prediction in the new TYP: life cycle analysis (LCA, see box for a short description of this instrument).

The Commission for EIA stated in its advice for specific guidelines that in its opinion the choice of LCA for the impact assessment instead of the use of indicators was justified. LCA has these advantages over the use of indicators:

- impacts in all phases of the life cycle of final waste processing are taken into account
- it avoids the restrictions of choosing a limited number of indicators
- the impact assessment is more comprehensive; not only are the changes in emissions determined, but also the contribution emissions make to actual environmental problems

However, the Commission recommended that particular attention be paid to the uncertainties accompanying the use of LCA; LCA is still being developed and has until now only been used for assessing the impacts of concrete products.

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The Dutch Commission for EIA is an independent advisory body which assists competent authorities in the scoping and reviewing phases of the EIA procedure.

Life Cycle Analysis

LCA is a standardised impact assessment method in which in five steps the total environmental impact of a certain activity (including the complete 'life cycle' of a good or service: eg collection of basic materials, product manufacturing, use of the product, processing of waste) is determined and translated into a so-called 'environmental profile' of the activity. This profile consists of scores on ten standardised environmental issues (or 'themes'):

- | | |
|--------------------|----------------------------|
| * human toxicity | * aquatic ecotoxicity |
| * soil ecotoxicity | * greenhouse-effect |
| * ozone production | * acidification |
| * eutrophication | * smell |
| * use of space | * use of natural resources |

These scores are weighted against the total existing environmental problems in a certain area. A very brief description of the five steps could be as follows:

step 1: goal definition and scoping

Firstly the basic objectives of the specific LCA are set and the subject (or 'unit') of the LCA is defined, eg 'one car' or 'a thousand milk bottles'. In the case of the SEA of the waste management programme this will be 'the final processing of one ton of integral waste'.

step 2: inventory analysis

- analysis of the total life cycle of the LCA subject. For example, the life cycle of 'incineration of 1 ton integral waste' would be:
collection of the waste - incineration of the waste - cleaning of emitting gasses - production of heat & electricity - production of re-usable metals - reuse of other residuals - storage of chemical waste.
- The life cycle of a product is thus made up out of a number of individual 'links' in a chain of activities. For each of these links the environmental impacts are predicted:
 - use of space
 - use of resources
 - emissions.
- By adding the predicted impacts of each link, the total impacts on the environment of the life cycle is determined.

step 3: impact assessment - classification

In this step the determined total of environmental impacts of a life cycle is re-calculated into scores on ten standardised environmental issues (see above). This is done by multiplying impacts with so-called 'classification-factors'. These factors take into account, for example, the transport-routes and -processes of a certain emission and the specific sensitivities of 'receptors' of that emission in the environment. The ten scores make up the so called 'environmental profile' of the activity.

step 4: impact assessment: evaluation

- the scores in the 'environmental profile' are first 'normalised', ie all put in the same unit. There may be several ways to do this, for example, scores may be recalculated as percentages of the total existing environmental pollution in a certain area. Another way may be to recalculate scores with respect to their contribution to objectives set for the environmental issue in legislation or environmental plans.
- After 'normalisation' the relative importance of scores is determined in the context of the decision that needs to be taken ('weighting' of scores). Again, several methods may be used here (the description of which is outside the scope of this case-study).
- Following 'normalisation' and 'weighting', all scores in an 'environmental profile' may be added, so that in the end one figure (the 'environmental index') describes the environmental impact of the activity or product.
- For all environmental profiles the uncertainty and validity of the end results is determined in a sensitivity-analysis.

step 5: improvement analysis

In the final step of LCA possibilities of improving an activity or product are investigated, on the basis of the results in the environmental profile.

The EIS and draft TYP 95 were published in June 1995. In the second TYP, scenarios for the final quantities of waste to be processed were brought up to date, **alternative techniques for final processing** were compared⁶], as were policy **alternatives for planning** the final processing. The environmental impacts of four policy alternatives were compared. These were:

- continuing the policy of the first TYP
- using new integrated techniques
- more emphasis on the use of biological techniques
- more emphasis on selective separation techniques

The SEA was published in June 1995. The lead authority concluded that the results of the LCA had significantly contributed to the development of the Ten Year Programme. In particular, it had become very clear that in deciding among alternative waste policy options the 'indirect' effects of options, ie the *avoided* emissions in primary production of iron, aluminium and electricity because of reuse of waste and production of electricity by waste incineration, are more important (often decisive) than the direct emissions (eg of waste treatment processes). The policy alternative with emphasis on selective separation techniques – leading to a maximum of reuse – therefore was concluded to be preferable.

In its review of the SEA the Dutch Commission for EIA underlined the value of the assessment as it succeeded in giving a first, broad insight into the environmental impacts of final waste processing at the national level. However, it was also concluded that the uncertainties in the final results (partly due to using LCA) had not been adequately identified and discussed in the TYP. On the basis of this advice, the lead authority decided that uncertainties should be taken into account and dealt with during the later stages of the planning process (at the regional level), as well as in the SEA for the next TYP.

4.2

SEA at the regional level

National policies on waste management are implemented by the regions, which make their own plans for waste management. These plans are, according to the Dutch Decree on EIA, the first (formal) plans that relate to the final disposal of waste, making EIA compulsory for these plans. So far, 15 EISs have been prepared for these regional plans since 1989. As the regions are responsible for implementing national policies for prevention and re-use, the EISs in most cases deal not only with alternatives for final processing, but also with policy alternatives for prevention and re-use and the environmental impacts of these alternatives. The EISs were only partially successful though, as difficulty has been experienced with describing the environmental impacts of different policies for prevention and re-use. With the appointment of the national WMC the planning of waste management is receiving more attention at the national

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Techniques for final processing were compared in the EIA, including:

- incineration techniques, pyrolysis followed by incineration, and pyrolysis followed by gassing;
- combination of techniques: separation – digestion – incineration; separation – landfilling of organic fraction – pyrolysis of RDF; selective separation of plastics, ferro, non-ferro and paper, followed by incineration.

level (by the WMC) than at the regional level. Although the WMC's decisions have no legal status, the participants subscribe to their decisions and so informally commit themselves to implement the policies agreed upon. This in turn restricts the possibilities for regional governments to formulate specific policies for their own regions.

It is felt by all actors in the field of SEA for regional waste management plans that legal arrangements will have to be made in future to replace the regional SEA with a (formal) SEA at the national level. Discussions are under way to decide what form of legal status should be afforded to the SEA for the Ten Year Programme on Waste Management.

5. LESSONS LEARNED

EIA for policies, plans and programmes faces its own difficulties, which can only be dealt with in practice. The following lessons have been learned:

1. SEA is **useful**. SEA can aid decision-making by describing useful policy alternatives.
2. In creating, discussing and comparing **alternatives** the most important contributions to be made by SEA are:
 - focusing the development of alternatives on concrete activities, such as techniques for waste management and planning capacity, choice of fuel for the generation of electricity, and site selection
 - the EIS should concentrate on alternatives that indicate the range of possibilities, including an alternative most favourable to the environment
3. SEA can identify the environmental impacts of policy decisions. Experience indicates that **sufficient methodology** is available to assess environmental impacts, including the use of indicators and multi-criteria analysis. However, attention should be given to:
 - the restrictions that go with the selection of indicators
 - the basis of the input to a model
 - information on the uncertainties and their possible impact on decision-making
5. The environmental consequences of an activity should preferably be approached by comparing the **relative contribution** made by each of the alternatives to the **established policy goals**. The 'distance to target' approach will logically link the decisions to be made to existing national policy goals.
6. Compiling an EIS for policies, plans and programmes should **not be too time-consuming**, as they can be rendered out of date by new policy developments. This means accepting gaps in our knowledge, keeping the EIS simple, and focusing on the pertinent problems.

7. Applying SEA at the national level could make SEA at the regional level **partly redundant**. A comparison of techniques for waste management at the national level can provide sufficient information for decisions on techniques to be used at the regional level. At the regional level the SEA can then focus on site selection for facilities.

Marja van Eck and Jules J. Scholten

Environmental impact assessment (EIA) is intended to provide decision-makers with sufficient and good quality environmental information to enable them to make balanced decisions. This paper draws on ten years experience with a legal EIA system in the Netherlands. It summarizes some of the results of a recent Dutch evaluation of EIA, and explains how added value can be determined and increased. Special attention is paid to its relation to decision-making.

1.

DUTCH EIA EVALUATED

Positive results

An evaluation of the operation of EIA is required by law every five years; after ten years of operation the EIA system in the Netherlands has recently undergone its second evaluation. Part of the study focused on the influence and effectiveness of EIA^{8]}. Questionnaires were sent to all actors in the EIA process - developers, public interest groups, competent authorities and their advisors - asking questions about the added value of a representative selection of 100 completed EIAs. The only limitation was that the elected national, provincial and municipal politicians who actually took the decisions on the selected EIA projects and plans were not interviewed, as they did not have time to respond or could not be reached. The results of the interviews show that in 79 cases the respondents agreed that EIA had produced a change of view (new relevant information) in relation to the activity, resulting in 52 cases in a changed proposal or a 'better' decision for the environment. In 71 cases EIA led to a more open general attitude towards environmental issues, which may bear fruit in future. Weighed against the input in time, money and effort EIA was considered to be highly effective in 14 cases, average in 21 cases, minor in 29 cases, and ineffective in 10 cases.

Current criticisms of EIA

These results were more positive than many would have expected. Decision-makers in particular sometimes claim that EIA takes too much time and is too expensive, while the information it produces is not sufficiently tailored to the decision. Furthermore, it is sometimes claimed that the rationality of the EIA approach does not fit into the way political decisions are usually taken. EIA starts by scoping the possible solutions that can be found for a well-defined problem. During this process the most relevant solutions are selected and compared using verifiable, generally accepted criteria. Finally, the best solution is chosen. The whole procedure is open and there are democratic safeguards,

⁷ Paper presented at the 1996 Annual Conference of the International Association for Impact Assessment (IAIA '96), in Portugal, 20-22 June 1996.

⁸ 'Doorwerking m.e.r.' Evaluatiecommissie Wet milieubeheer, May 1996.

such as provisions for public participation. In political decision-making it appears that alternative solutions are only considered up to the point when a more or less satisfactory solution can be identified. Informal negotiations seem to play an important part. Sometimes viewpoints are adopted early on; these views are then justified by argument afterwards. In these situations decision-makers may indeed regard EIA as a time-wasting and money-consuming obligation which has to be met before the plan can be put into effect.

Communication is needed

The apparently different view on its effectiveness taken by experienced EIA practitioners and others, including many government executives for whom EIA is not their day-to-day work, leads one to conclude that there might be a communication gap between these groups. As the effectiveness of EIA is mainly dependent upon the way decision-makers use the instrument, it is important to close the gap by pointing out the potential added value of EIA. This means, for instance, drawing attention to examples where added value is demonstrable. In the following section the added value of EIA is defined, and some examples are given.

2. EXAMPLES OF EIA ADDED VALUE

Added value has many facets

There are many different ways of defining the added value of EIA for decision-making. This paper adopts the view that carrying out an activity in a more environment-friendly way than originally proposed may be regarded as the most direct form of added value. Other main forms of added value are less direct. EIA can, for instance, be a useful learning process for future decisions, lead to the improvement of environmental regulations and standards, to new environmental research, to a growing environmental awareness, to the substantiation of environmental issues, or to streamlining procedures. Usually the 'broader' added value of EIA is not recognized as such and consequently not taken into account. The various forms⁹ are listed systematically in the following overview, while some examples drawn from real practice are discussed below.

direct added value	indirect added value
<ul style="list-style-type: none"> selecting a more environment-friendly solution, including: <ul style="list-style-type: none"> preventive measures mitigating measures compensating measures cancellation of a proposed action with significant negative impacts 	<ul style="list-style-type: none"> improving future decisions improving regulations or standards incentive for further research internalization of environmental awareness substantiation of environmental issues streamlining procedures

⁹ Examples of each form are briefly described in the paper 'Effectiveness of EIA in the Netherlands' by Scholten, J. and Van Eck, M., published in EIA-Methodology in the Netherlands, views of the Commission for EIA, 1994.

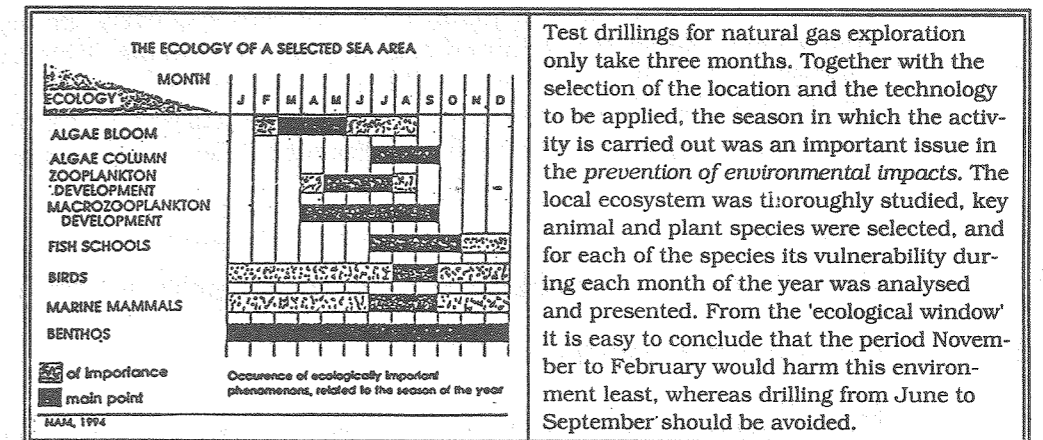
Substantiating environmental issues and improving future decisions

A major oil company in the Netherlands carried out one of the first EIAs in 1983, when the legal EIA system was still in the experimental stage.

The company wanted to establish a petrochemical installation in a non-industrial area. The local authority was in favour of the initiative because of the employment opportunities it presented, and its location in an underdeveloped industrial park. The local population and the Society for Chronic Lung Disease were worried because a substantial deterioration in air quality was expected. The results of the EIA (confirmed in the review by the Dutch independent EIA Commission) showed that the impact of the installation on air quality was relatively insignificant. After this *substantiation* the installation was licensed and established without any further delay.

Satisfied with their positive experience of EIA the company decided to apply EIA principles to all the internal investment decisions by carrying out internal environmental impact studies. Innovations, such as the 'ecological window', arising from these internal studies were later used in formal EIAs on exploratory drillings for natural gas in the Wadden Sea and North Sea coastal zones.

Preventing environmental impacts



Improving regulations and standards

Experience gained during the earlier EIA for Maastricht Airport was put to use in the EIA for the expansion of Amsterdam Airport by building a fifth runway. The EIA for Maastricht Airport resulted in *laying down regulations* for noise hindrance from air traffic in the night period. During the EIA for Amsterdam Airport these regulations were further *refined*.

The decision on the expansion of Amsterdam Airport had to deal with widespread concern about expected noise hindrance by air traffic, especially at night. In the existing regulations the night period lasted from 11.00 p.m. until 6.00 a.m.: in this period the use of runways is restricted. The EIA revealed that between 6.00 and 7.00 a.m. the runways are used particularly intensively by intercontinental and charter flights, and that this was expected to lead to an unacceptable level of sleep disturbance. Consequently, the night period was extended from 6.00 to 7.00.

Preventive effects of EIA

In Dutch practice, there are few examples of *cancellation* of a proposed activity by EIA, and these all occurred in the first years after the introduction of EIA. After the first EIA evaluation in the Netherlands, this 'lack of a result' seemed to some (journalists) to be a disappointing conclusion. Yet it focuses the attention on another potential added value of EIA: proposals that are not expected to stand the test of an EIA are much less likely to be put forward in the first place. An example of this preventive function of EIA is given below.

EIA revealed that to operate a compost processing installation in compliance with existing environmental standards had by then become possible only if the installation operated indoors instead of in the open air; but it was found too, that this was a fairly expensive solution. So another proponent started an EIA proposing a **new technology** operating in the open air but in which the process air was forced through the compost and extracted from underneath. This form of processing complied with environmental standards and proved to be much cheaper, and thus more feasible, than the indoor method.

These examples illustrate that EIA has many different effects and that 'learning by doing' is an important aspect. However, if some decision-makers are not aware of this and continue to justify decisions retrospectively, examples of bad practice may continue to counteract good practice, and may even bring about a negative spiral. The next part of this paper describes the opportunities for enhancing the added value of EIA. Special attention is paid to approaches that may bridge the gap between theory and practical decision-making.

3. HOW TO ENHANCE ADDED VALUE FOR DECISION-MAKING

3.1 Quality of information

EIA is intended to provide decision-makers with sufficient and good quality environmental information. Environmental information is usually laid down in various EIA documents. The following factors can improve their quality.

Access to previous experience

The quality of EIA documents can often be improved by making good use of previous experiences. In the Netherlands the Commission for EIA (with its library containing all EIA documents and its database system) functions as a central information desk, providing optimal conditions for making use of existing scoping documents, environmental impact statements, and other relevant documents and studies. International studies, such as the International EA Effectiveness Study, provide the opportunity to learn from experience gained in other countries.

Formal safeguards to control the quality of EIA documents

The quality of EIA documents can be further promoted by formal safeguards incorporated within EIA legislation. In the Netherlands, the EIA legislation prescribes which EIA products must be prepared and, for some products, contains minimum requirements concerning their content.

In the Netherlands the EIA-system requires the following written EIA documents:

- a preparatory statement or, formally, 'notification of intent' - developer or proponent
- advisory scoping guidelines - independent Commission for EIA
- specific guidelines for the content of the EIS - competent authority
- environmental impact study (EIS) - developer or proponent
- advisory review of the EIS - Commission for EIA
- motivation in the decision concerning the use of EIA information - competent authority
- programme for the post-decision analysis - competent authority
- post-decision analysis - competent authority.

The minimum content of the notification of intent and the EIS is legally prescribed.

Public participation and the involvement of independent expertise through the Commission for EIA, both in the scoping and in the reviewing stages, provide another legal incentive for the quality of the products. The public review is entitled to call for supplementary information if the EIS document fails to present essential information. If the review by the Commission for EIA, which follows the public review, calls for additional information covering essential shortcomings in the EIS, the competent authority usually accepts the recommendation of the Commission and requires that a supplement to the EIS be submitted.

Quality of EIA documents for decision-making

It should be clear that the politicians who must eventually make the decisions usually do not have the time to read all the documents that have been prepared. Therefore, it is important to mark two important moments in the EIA procedure when the decision-makers are actively involved. The first one is at the start of the procedure. Although the proponent is responsible for the content of the notification of intent, it is vital that the decision-maker indicates at this stage what the most crucial environmental issues are and how much leeway there is for the development of alternatives. Special attention should be paid to the status and consequences of earlier decisions. This scoping process can prevent an EIS being prepared that is not tailored to informing the decision. When the EIS is ready the decision-maker needs a clear and concise summary of the EIS in which the key issues for decision-making are clearly revealed. This enables him or her to become informed about possible choices, and their (environmental) consequences.

Proper use and good timing

Experience in the Netherlands shows that the quality of information is necessary but not sufficient to ensure effective EIA. It appears essential that decision-makers and their civil servant assistants are willing to make good use of the results of EIA, and are prepared to give EIA a proper place in the decision-making procedure. The Dutch evaluation study pointed out that the effectiveness of EIA was influenced more by good timing than by the quality of the EIA products. In the next paragraph some mechanisms to enhance a positive attitude to EIA are discussed: good timing and sufficient flexibility.

3.2 Willingness, timing and flexibility

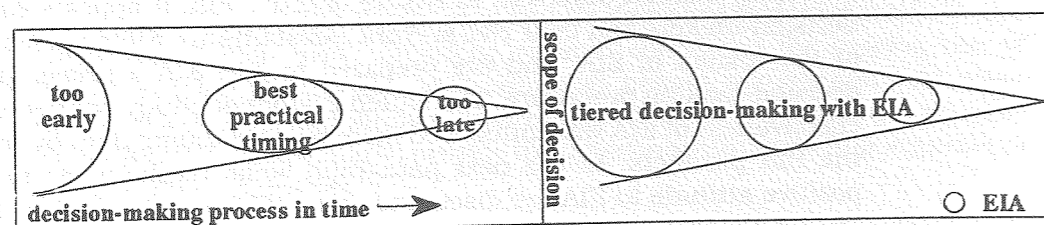
Willingness is hard to control

The willingness on the part of decision-makers to make positive and creative use of EIA is difficult to control. In the Netherlands, the legislator has laid down the following regulations to 'force' decision-makers to have an open mind towards the outcome of the EIA and pay attention to it. These regulations are fairly important as there is no formal obligation to choose the alternative that produces the least environmental impacts.

The first safeguard consists of a public review drawing upon independent expertise (the Commission for EIA). The second is the requirement to establish which information in the EIA was used when making the decision. The last is the mandatory post-decision analysis and the obligation for mitigatory action or changes to the decision if the impacts turn out to be more adverse in practice than predicted in the EIS.

Proper timing can only partly be regulated

A timely start with EIA can partly be promoted by making clear rules and regulations for EIA and its application. This includes identification of the types of actions and related decisions that must be subjected to EIA. Also, there must be procedural clarity as to when and how to start EIA. Besides this legislation, the following observation on timing and flexibility is also important: EIA should begin when there is enough information about the proposed activity to draw up possible alternatives and predict environmental impacts. Without this information the scope of the EIA may be too broad, resulting in a voluminous document including alternatives and environmental information not relevant to the decision. Individual participants, whose personal interests may be at stake, may not receive the required information to give an informed reaction because the plans are still too general, and in a worst case situation public participation may lead to irritation instead of more public support. Moreover, in the next stage of the procedure, decisions about important final details are taken without an EIA, as the EIA is already finalized. A legal system with a tiered system of EIA (for, successively, strategic, site-selection, and project-related decisions) can solve the problem of an early start, but these systems are not widespread.



As stated earlier on, more often than not EIAs are started too late. In these situations there is not enough **flexibility** in whether and how the proposed activity should be carried out. If an EIA is begun after the most important decisions have already been taken, retrospective justification in the EIA of these earlier decisions will be no more than an irrelevant waste of time and money for the decision-makers involved. These illustrations show that the problem of good timing is related to the fact that EIA is usually carried out in a fairly concentrated period of time¹⁰ within the whole decision-making process.

4.

CONCLUSION

Evaluation studies in the Netherlands show that EIA certainly provides added value for decision-making, especially if a broad view of added value is taken. Nevertheless, some decision-makers are not aware of the possibilities for better decision-making that EIA offers. This is not helped when EIA is used only for the retrospective justification of decisions, contributing only to a catalogue of uselessness. It is therefore important to communicate positive experiences with EIA. Furthermore, it is important to keep on trying to improve the effectiveness of EIA. Improving the quality of environmental information (it should be sufficient, correct, concise and relevant) that is presented to the decision-maker is necessary but not sufficient. Much depends on correct timing, and the willingness of the decision-maker to make good use of the opportunities and results EIA provides. This can be brought about only to a small degree through legislating for EIA; communication between experienced EIA practitioners and decision-makers seems to be the key for improvement in this field.

10 At least this is the case in legal systems in which the EIA procedure is fairly strictly regulated by law.

Stefan A.A. Morel¹¹⁾**ABSTRACT**

Environmental Impact Assessment (EIA) aims at balancing the environmental interest in the weighing of concerns in the decision making on planned activities. To fulfill this role, EIA-legislation in the Netherlands dictates that Environmental Impact Statements (EISs) have to present realistic alternative options, discussing the effectiveness of (additional) measures to mitigate adverse impacts. Among these alternatives, the so-called environmentally most favourable alternative (EMFA) has to discuss the most far-reaching measures to neutralize or reduce adverse environmental impacts of the proposed activity. To define alternatives three tools are available: *prevention*, *mitigation* and *compensation*. These should be applied in the given sequence. First the possibilities for *prevention* of negative impacts should be explored within the technical and administrative limitations. Prevention can be implemented for instance on the level of the dimension and the location/route of an activity and on the level of applied process technology. Second, if prevention is not (entirely) feasible, which occurs in most cases, the available measures for *mitigation* of impacts have to be determined. Mitigation can be adopted at the source (source approach) and at the place where impacts occur (effect approach). In case of insufficient effectivity of mitigation, finally one can establish possibilities for *compensation* of remaining impacts especially in case of impacts on vulnerable areas. One can consider physical and financial compensation.

In elaborating these steps, the so called 'twin funnels concept' may be applied in different ways. In almost ten years of experience with EIA in the Netherlands, good examples of prevention and mitigation have become available in EISs. Though there has been limited experience with compensation within the context of EIA so far, it seems to offer promising opportunities to alleviate impacts that still remain after mitigation. This paper discusses methods applied and results obtained.

Despite all available methods and guidance materials the presented cases in this paper show that these do not provide a guarantee for successful EIA-procedures. Common sense and a keen creative mind are even more important to obtain good results. And last but not least, even that is not a guarantee, as it is the responsibility of the decision maker to really do something with the results presented in an EIS. If he is not prepared to take this responsibility, EIA does not work. Therefore, it is of evident importance to present advantages of EIA to the decision makers continuously, to create a more positive attitude. This paper intends to add a small contribution to this effort.

11 With thank to colleagues who contributed to this paper.

1. INTRODUCTION

Environmental Impact Assessment (EIA) aims at balancing the environmental interest in the weighing of concerns in the decision making on planned activities. To fulfill this role, EIA-legislation in the Netherlands determines that Environmental Impact Statements (EISs) have to present realistic alternative options, discussing the effectiveness of (additional) measures to mitigate adverse impacts. The national Environmental Management Act comprises the following demands regarding alternatives in EISs:

Environmental Management Act, section 7.10, subsection 1, sub b:
An EIS shall contain a description of the proposed activity and the manner in which it will be carried out, and of the alternatives which should reasonably be taken into consideration.

Environmental Management Act, section 7.10, subsection 3:
The alternatives to be described.....shall in any case include the alternative which prevents the occurrence of adverse impacts on the environment, or, as far as prevention is not possible, makes use of the best means available to reduce those impacts.

This requirement for alternatives brings about two concepts in the development of projects, ie *prevention* and *mitigation*¹².

Recently, a legal provision on *compensation* came into force. Compensation can be defined as: *creating new values comparable with lost values that could not be saved by mitigation*. The concept of compensation is laid down in the law as follows:

Environmental Management Act, section 7.10, subsection 4:
If not all adverse impacts can be reduced, the competent authority can determine that the elaborated alternatives have to include possibilities to compensate remaining impacts by taking measures or provisions elsewhere.

The basic principle of the concept of compensation in the Netherlands is that there ought to be no net losses of nature values in sensitive areas, due to new activities. According to this principle, compensation refers to *physical* compensation.

In almost ten years of experience with EIA in the Netherlands, good examples of prevention and mitigation have become available in EISs at different tiers of decision-making. Experiences with compensation are currently being acquired. This paper will discuss in detail methods to deal with mitigation and compensation, exemplified with cases of good practice in different fields of application of EIA.

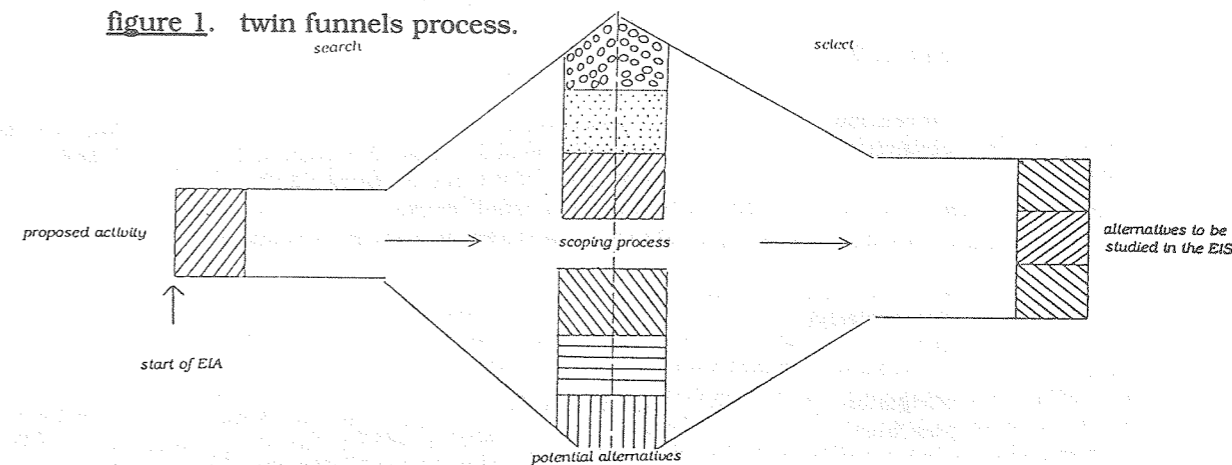
¹² Prevention aims at avoiding any influence that might be harmful to the environment, like prevention of noise hindrance. Mitigation is targeted at diminishing potential hazardous influences. Mitigation can take place at the source of the influence (source approach), eg construction of noise barriers along a road. Mitigation can also be enforced at places where the impact occurs, eg insulation of houses exposed to high levels of noise (impact approach).

2. PREVENTION, MITIGATION AND COMPENSATION OF ADVERSE IMPACTS IN ALTERNATIVES

The main purpose of developing alternative solutions is to present a range of solutions showing the decision makers the relationship between the layout of an activity in all its facets (eg choice of location, selection of process technology, design of installations) and the extent to which minimisation of adverse impacts is possible.

A well known concept in exploring alternatives is a broad stock-taking of possible solutions, followed by a motivated selection of one or more feasible alternatives. The principle of the composition of alternatives in the Netherlands is described as a 'twin funnels' process¹³. In this process, the proposed activity of a developer is the starting point. First, possible variants must be explored for elements of the activity. This step widens the number of possible options. Subsequently one combines variants to complete alternatives. This step of selection narrows the number of potential alternatives to the feasible options. Finally this process leads to few complete and consistent alternatives to the initiative.

figure 1. twin funnels process.



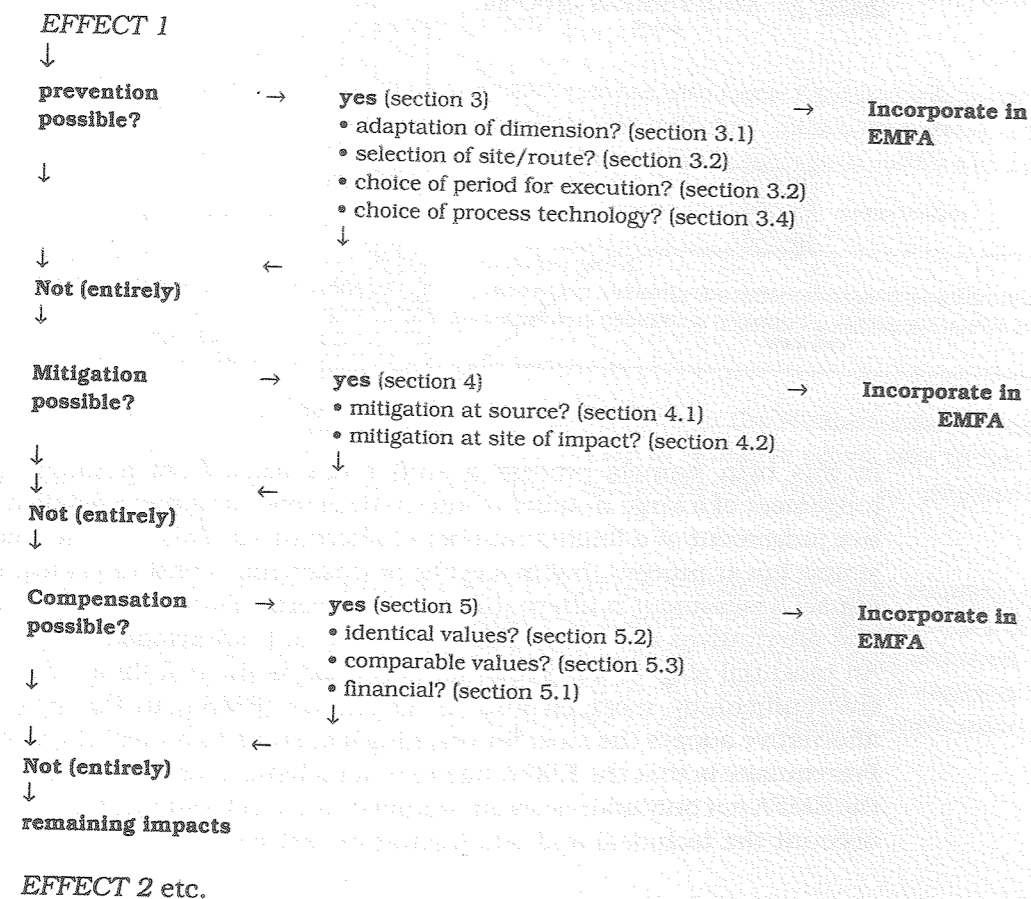
In this twin funnels process a shift takes place from a rough qualitative judgement of a large number of alternatives towards a more detailed quantitative judgement of a limited number of alternatives. This does not happen in a simple linear process, but in a cyclic process with a continuous feedback from impact assessment to alternatives and vice versa. During this process variants and alternatives are being added, excluded or (re)developed.

An essential step in the Netherlands context is the definition of the so called environmentally most favourable alternative (EMFA) to the proposal. This alternative adopts the most far reaching measures to protect the environment. Prerequisite is that the EMFA has to be a realistic alternative. This means that the EMFA not only addresses environmental considerations, but also takes into account the technical and administrative restrictions and requirements, like

¹³ This process is described in detail in:
Marja van Eck, Jules J. Scholten, Stefan A.A. Morel: EIA-methodology: scoping of alternatives. In: EIA-methodology in the Netherlands, Views of the Commission for EIA, June 1994.

former taken decisions on the activity in policy plans limiting the scope and adopted environmental standards. For example, the EMFA must built on proven technology on the desired scale for the proposed activity. Experience in the Netherlands shows that the development of the EMFA requires a creative attitude. The EMFA has surplus value in EIA if one searches actively for environmentally sound solutions, instead of considering some standard solutions one of which will be assigned to be the EMFA. Active search enables covering the total range of possible solutions. Therefore, when searching for alternatives and especially for the EMFA, the possibilities for *prevention* of negative impacts should be explored first within the technical and administrative limitations. Second, if prevention is not (entirely) feasible, which is likely, the available measures for *mitigation* of impacts have to be determined. In case of insufficient effectivity of mitigation, finally one can establish possibilities for *compensation* of remaining impacts in some cases. The following flow-chart shows this preferred sequence in exploring EMFA, referring to sections in this paper dealing with the specific step or topic.

figure 2. Developing the environmentally most favourable alternative (EMFA) in dealing with adverse impacts¹⁴⁾



14 In most EIA-procedures not all mentioned options are open at the same time. Some options have already been decided upon in a preceding stage, or will be opportune in a subsequent procedure.

In the Netherlands situation, EIA has demonstrated to be a helpful tool to show effectiveness of prevention and mitigation following the above systematic approach. Though it cannot be proved indisputably that the same environmentally favourable measures would not have been adopted without EIA, experience of participants in EIA-processes has learned that EIA contributes significantly in a gradual shift from the proposal towards a more environmentally friendly character. This can at least partly be attributed to the need for searching and comparing alternatives in EIA in the Netherlands. Less experience has been gained with compensation. Despite difficulties in application of this concept, compensation can have additional value in EIA. The following sections describe examples of all possibilities indicated in Figure 2. Though prevention, mitigation and compensation can be adopted in all alternatives, the examples mainly refer to the EMFA as this alternative represents the extreme end of the range for alternatives.

3. PREVENTION

3.1 Prevention: the dimension of activities

The first question to be raised in exploring possibilities for prevention is the rationale for the (chosen dimension of the) activity. In most cases the 'do nothing alternative (zero-alternative)' is not realistic. Nevertheless adaptation of the size may in some cases be feasible, for example in planning motorways.

Planning of motorways: which dimension?

In the first step the prognosis for the growth of traffic is examined. It has to be established which distribution of traffic over the proposed motorway and the available capacity of roads is effective to meet the expected growth, if one tries to diminish this growth by additional measures. Additional measures are for instance stimulating public transport and carpooling and reduced possibilities for parking. The distribution of traffic most favourable to the environment can be taken as the basic assumption for the dimension of the planned motorway.

A useful discussion on the dimension of activities requires proper tiering of decisions. This can be demonstrated with the 'decision-tree' on waste disposal in the Netherlands.

Tiering decisions is essentially in determining the dimension of activities

At the *national level* decisions are taken on the necessary capacity to dispose of waste streams with various technologies throughout the country, starting from different scenario's for waste production.

At the *regional (provincial) level* is decided which (extra) capacity for disposal is required and where it should be located, as a result of the decisions on the national level about estimated waste flows and preferred methods for waste disposal. On these two levels, the so called 'Lansink's ladder' is applied. Lansink's ladder is the preferential sequence for the removal of waste material as has been laid down in the Environmental Management Act. The preferential sequence is as follows:

- quantitative prevention
- qualitative prevention
- product reuse
- material reuse
- incineration with use of released energy
- incineration without use of released energy
- landfilling

Choices positioned on higher steps on the ladder represent environmentally more favourable solutions, resulting in more limited dimensions of activities on the *project level*.

Only when the necessity and dimension of activities are clear, the site or route of activities can be planned.

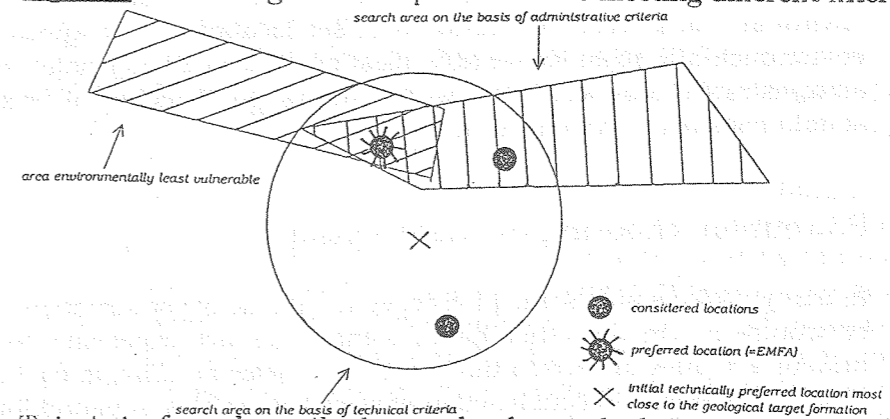
3.2 Prevention: site selection and routing

There is no single standard method for developing and evaluating preventive and mitigatory measures according to the *twin funnels process*. The approach on the implementation level is different from the level of routing and site selection. At the latter level technical, administrative and environmental criteria determine feasible locations or routes. Specially the sites complying with criteria from all three points of view are interesting for decision making, as these sites represent 'win-win-situations'.

developing locations, amongst which EMFA, starting from technical, administrative and environmental criteria

A Dutch oil company intends to carry out exploration drillings in vulnerable areas in the North sea close to the Wadden islands. The aim is to investigate whether or not the natural gas reserves present in the sedimentary strata are of sufficient quantity and quality to enable extraction. A *technical* prerequisite is that a bore hole should be located within a distance of ca. 3.5 km from the centre of the subsurface target formation. This resulted in circles determining the search areas for locating the platforms. Next, within these circles areas were selected preferred from a *administrative* point of view. Criteria were, amongst others, concession borders and closed areas for reasons of (rural) planning. Independent from this administrative selection, a team of independent experts determined by means of field visits the environmentally preferable areas. The outcome of this selection was supported by literature study. One of the applied environmental criteria was avoiding of areas with a waterdepth less than 6 metres to prevent dredging for bringing in the platforms. The selected areas from the three points of view could be drawn, to learn where overlap occurred. In almost all cases a location could be found complying with all criteria. Starting from the initial central location above the subsurface target, the search process widened the scope for locations by defining search areas, followed by a selection to only a few locations, with the help of several criteria. This resulted in a preferred alternative being the environmentally most sound location.

Figure 3. searching for overlap in locations meeting different interests



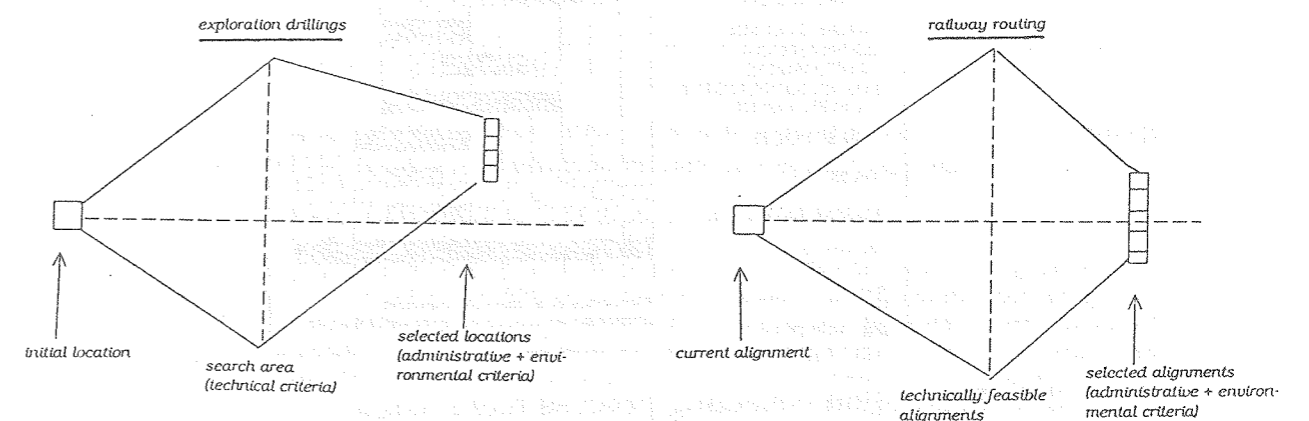
This twin funnels method can also be applied in routing of motorways or railways

Twin funnels method in routing of a railway

The first step in the search process was a field inventory by a technical railway expert resulting in a map with possible routes from a technical point of view. The search process was based on criteria like required width of the sand body carrying the rails, the length of curves and the presence of obstacles unable to pass by. Among these routes was the existing railway which, with adaptations, could represent a feasible solution. Subsequently the selection process started through limiting the number of routes with administrative criteria: routes with excessive cost were discarded, so were routes crossing areas which should be avoided anyway (eg nature protection areas, planned residential or industrial zones). The remaining alternatives (about 20) were screened in the EIS. This final selection resulted in about five routes to be compared in full detail in the EIS, amongst which the EMFA.

Figure 4 shows how in both examples the twin funnels were passed in a search and select process. In the case of the exploration drillings, the initial location was not included in the finally selected locations.

Figure 4. The selection of routes and locations following the twin funnels approach



A well structured search and selection process of alternatives, based on explicitly formulated criteria, envisages a sound weighing of interests, enabling the final selection of those alternatives which comply optimally with all those

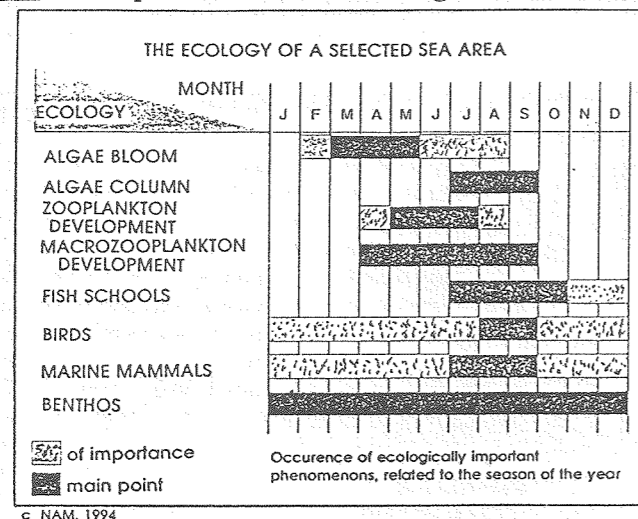
interests. Technical criteria set boundary conditions. Both administrative and environmental criteria are used to select locations. If it appears that the environmentally most favourable location is located (partially) outside the administrative bandwidth but within the range of technical feasibility, one should consider to widen the scope again.

3.3 Prevention: choosing the right season

In many projects only some phases, eg the phase of construction, burden the environment. On the other hand, some areas are especially vulnerable to human activities in certain time periods or seasons. This is for instance the case in underground construction of electricity cables. A period for construction should be chosen in which the area has the least sensitivity to the activities, for instance off season for hibernating birds sensitive to disturbance. Also in the case of the examples about natural gas exploration the chosen drilling season plays an important role.

Prevention of impacts by choosing the right season: 'ecological windows'
The test drillings for natural gas exploration take only 2-4 months. Together with the selection of the location and the applied technology, the season in which the activity would be carried out were important issues in prevention of impacts. In order to find the environmentally most favourable period, the developer analysed the local ecosystem. He selected some animal and plant species that play key roles in the foodchain of the ecosystem and investigated the period throughout the year in which these species were important would be particularly vulnerable to impacts from the test drillings. The results could be presented in so called 'ecological windows' (see below). From this data it was easy to conclude that the period November-February would harm the environment least, whereas drilling in the period June-September should be avoided.

Figure 5. example of a so-called 'ecological window'



3.4 Prevention: selecting process technology

At the implementation level of projects it is often noted that there is much complexity in the design and lay out of the project. To gain insight in the environmental relevance of activities on this level as a basis for exploring

variants and alternatives, it may be helpful to split the activity into subactivities and/or phases. Each of these parts and phases should be screened on its potential environmental impact. This preliminary qualitative screening can be performed by means of an activity-impact matrix, which shows the relation between the subactivity and potentially important environmental aspects (figure 6).

This rapid screening provides the first basis for searching preventing and mitigating measures for those subactivities that harm the environment. Carrying through the twin funnels process the activity-impact matrix will become more detailed. Following the inventory of possible variants in the first step, a more quantitative estimation of environmental impacts of potential measures is possible. To assess the effectivity of measures, the impacts must be checked against quantitative (environmental) criteria. This process leads to continuous skipping and adaptation of variants with low effectivity and development of more effective variants which can be combined into consistent environmentally sound alternatives to the initial proposal.

Figure 6. Part of an activity-impact matrix for road design as a basis for developing preventing and mitigating measures on the implementation level.

subactivity	env. aspect	env. impact	duration
Excavation road track	soil	physical disturbance/ removal of soils	permanent
	surface water	intercepting water streams	permanent/ temporary
	groundwater	lowering water table by drainage	temporary?
	people, fauna	noise hindrance	temporary
supplying sand	soil	soil subsidence	permanent
etc.			

Searching and selecting alternatives according to the twin funnel approach enables identifying prevention possibilities in a systematic way.

'Exhausting technological opportunities'
In recent years, many installations have been built for processing organic waste (vegetables, fruit and garden waste) to compost. Often the composting process took place in the open air (with or without enforced oxygen supply). Due to odour hindrance, many of the installations were roofed in and air was extracted and purified in filters. In one EIA-procedure, the developer suggested another method. Instead of covering the compost piles to mitigate stench, he suggested to exhaust air from below through the compost piles: this would have two advantages. First, the process could go on in the open air, as stench could not escape from the piles due to exhausting. Second, the forced supply of oxygen as a result of exhausting, would speed up the process, resulting in an increase of the capacity. EIA facilitated the discussion on this new technology, preventing stench to a large extent. A new EIA-procedure for expansion of the successful installation has started recently.

4. MITIGATION

4.1 Mitigation at the source

Complete prevention is not possible for most of the projects, which will result in adverse impacts if no further mitigating measures are foreseen. Preference should be given to investigate to which extent mitigation close to the source is possible, for example by purification of emitted air and process water. Mitigation can also be incorporated in projects with a large demand for space affecting nature.

Mining gravel: save the frogs!

EIA is carried out for a gravel borrow pit. The EIS contains amongst others a survey of existing valuable ecological elements. Local residents pointed out that the survey is incomplete, not describing the habitat of a rare species threatened with extinction (tree frog). In an adapted design of the activity it appeared possible to save nature values by constructing a bentonite screen, while still carrying out the activity. The open character of EIA and the role of the public in the procedure improved the quality of the activity.

In some cases, an EIS showed that far-reaching mitigating measures that were supposed to be effective before starting EIA, in fact turned out to be ineffective. EIA contributes in this way to a broader societal support for the activity, as the proponent has the opportunity to state in the EIS that he is doing already very well.

Further mitigation is not always effective

An international oil company in the Netherlands intended to build a so-called 'Hydrocracker' for the conversion of high-sulfurous gas oil fractions into lighter low-sulfurous products like diesel oil and kerosine. This would not only have environmental advantages, the refinery could also use its raw material more efficiently: so far part of the heavy fractions could not be processed. The EIS showed the environmental impacts of the new installations to be negligible in comparison to the impacts of the total existing refineries. Moreover, due to the significant reduction of the sulfur content of products of the new installation, the diffuse sulfur pollution was expected to decrease with ten thousands of tonnes yearly. In fact, the activity could be regarded as a prevention measure. The EIS stated clearly that a installation for denitrification of off-gasses ('deNOx-installation') would only slightly reduce the relatively low NOx-emissions, whereas the cost was high.

4.2 Mitigation: effect approach

If satisfactory mitigation at the source cannot be achieved, mitigation can try to alleviate the impacts at places where they occur. Good examples result from the EIA-procedures for airports concerning noise hindrance. In the plans for the extension of Amsterdam airport insulation of a large number of houses is foreseen.

5. COMPENSATION

5.1 Outline of the concept of compensation

The final step in alleviating the impact of activities is the search for physical compensation of lost values that could not be prevented or mitigated. Though the law allows application of the concept of compensation in all EIA-projects, it is felt that compensation may be especially convenient in vulnerable areas, specified in policy documents on national, regional and local level.

Compensation prescribed in policy documents for sensitive areas

For the Waddensea, a very valuable tidal area sensitive to disturbance by human activities, the concept of compensation is integrated in a framework to be applied in weighing the acceptability of new activities in this nature area. This framework comprises:

- establishing the societal necessity for carrying out the activity. This embraces two elements, ie showing the *societal importance* represented by the activity and the inevitability to locate the activity in the Waddensea (the so called *translocation principle*),
- if implementation in the Waddensea is deemed acceptable, the best practicable means to *prevent* and to *mitigate* negative impacts should be adopted, which calls for execution of the environmentally most favourable alternative,
- temporary and permanent impacts remaining after prevention and mitigation should be *compensated*.

In this weighing process, the best available information must be used, taking into account accumulation of impacts in the area.

In principle, two ways of applying compensation are possible, to be subdivided further:

Physical compensation 'in kind'

This form of compensation departs from the principle of 'no net losses'. Lost values have to be redeveloped. The most rigid form is to achieve development of identical values (see section 5.2). A more practical way in many cases is to aim at redevelopment of nature with comparable value (see section 5.3). The developer of the activity is responsible for the execution of both forms of compensation. If for whatever reason he is not able to do it himself, he can allocate and transfer funds to the competent authority to enable this agency to carry out the compensation.

Considering the first option, development of identical values, there are serious problems. This approach demands a detailed analysis of present values in the influenced area and the biotic and abiotic conditions determining these values. Another area with exactly the same size, abiotic conditions and ecological potential must be found to compensate fully the losses. Usually such an area will not be available. Besides, estimating values is very difficult as the complexity of ecosystems can hardly be expressed due to gaps in our knowledge. This forces the assessment to simplify ecosystems by identifying plant and animal species that may represent certain abiotic circumstances. The combination of those abiotic parameters and species indicate the value of an ecosystem. In the Netherlands a system is elaborated with about 130 representative types of ecosystems. An affected area must be classified according to this system. By assessing the impact of an activity on indicator species and on abiotic factors an indication of lost values can be obtained,

serving as a basis for compensation. However, one must realize that this approach does only cover a small range of impacts: landscape, cultural heritage and environmental hygiene and health for instance are not included. Thus, accurate assessment of values with the intention to compensate identical values elsewhere is almost impossible.

Compensation with the intention to redevelop other ecosystems with comparable values seems to be more promising in most cases. In this approach clearing a forest area for instance may be compensated by extension of adjacent valuable marshes. This less rigid approach may offer more possibilities. A disadvantage of any form of physical compensation is that it may present an acceptable excuse to carry out an environmentally harmful activity. One must not forget that the development of ecosystems usually takes many years to mature.

Financial compensation

Financial compensation by the proponent follows the concept of 'the polluter pays'. The money can be used by the competent authority for compensation elsewhere. However, in contrast to physical compensation, in financial compensation a place for compensation is not yet available. This raises the question who is allowed to decide spending the funds and for which purposes. It is obvious that the money is not intended to be used to finance regular policies. A suggestion in this case may be to establish a 'compensation fund'. A board comprising representatives of the competent authority and (environmental) interest groups could decide on allocating the available funds effectively to compensation projects.

The Netherlands government has decided to adopt the system of physical compensation, aiming at restoration of identical values according to the principle of no net losses of surface and quality of nature. According to the Netherlands point of view, compensation is in principle supplemental to, not a substitute for prevention and mitigation. Financial compensation is not preferred. A form of financial compensation not applied in the Netherlands is direct financial compensation of the public. In the coming years experiments have to be carried out, possibly followed by amendment of the law.

Recent experience has shown that a practical approach of compensation in which the principle of no net losses is treated not too rigidly, may have potential surplus value in EIS. These examples all concern nature values.

5.2 Physical compensation: achieving identical values

Whether or not compensation of identical values has to be achieved depends largely on the attributed value of the impacted area. The Waddensea in the Netherlands is one of these areas with irreplaceable values. In other words comparable values do not exist. For this reason, activities are only allowed if the main goal of the policy for this area, namely maintaining and strengthening of nature values, will not be jeopardized. This policy is outlined in section 5.1.

Compensation in the Waddensea: no net losses

Oil companies want to exploit natural gas reserves under the Waddensea. Though the oil companies have concession rights for exploitation dating back to 1960, exploration and exploitation was postponed through adoption of a moratorium. Last year this moratorium was lifted, allowing exploitation under strict conditions, following the weighing approach for judgement of new activities. Maximum prevention had to be applied. Amongst others this involved that production should take place from outside the Waddensea, through lateral approaching the geological targets. Remaining impacts should be prevented and mitigated by application of best available technological means, to be identified in project-EIAs. Unfortunately, the decision to lift the moratorium was taken without the application of EIA. Research indicates that despite adoption of all possible preventive and mitigatory measures there will remain impacts. The most important is supposed to be soil subsidence due to natural gas extraction. This would result in a loss of tidal sand flats. Those sand flats are of evident importance in the ecosystem. One of the preconditions in the agreement on lifting the moratorium was the obligation to quantify this impact exactly before starting exploitation. The oil companies are responsible to compensate this impact by supplying huge amounts of sand at a determined distance from the Waddensea. The sand has to be carried in by tidal movement to compensate for the soil subsidence.

5.3 Physical compensation: achieving comparable values

In case that the lost nature values are deemed less indispensable, a more practical solution for compensation can be achieved, by redeveloping other, more or less comparable values.

Negotiating compensation in an industrial zone

About 25 years ago, a building terrain for industrial purposes was raised with a sand in water slurry, situated in mainport area of Rotterdam (Maas-plain). Part of this plain had not been occupied with industry so far. In 25 years nature values could develop. Recently, industry was planned in this area. This would cause a complete loss of the values as the total area would be covered with industry. Obviously, prevention and mitigation could not help. Through negotiations, nature interest groups agreed with the proponent on allocating 3 million US dollars to compensate the lost values elsewhere. This money was spent on a few projects like creation of wet dune valleys and bird sanctuaries in tidal areas. Through these provisions the proponent prevented delay in the implementation of his industrial plans. It is interesting to note that two of the proposed compensation projects aimed at recovering nature values in an adjacent area. These nature values, eg a tidal area with sand flats and associated terrestrial coastal ecosystems, were previously created as a result of the construction of a large off shore repository for contaminated sludge from the Rotterdam port area. However, after an initially successful development of these man-made nature values, the development stagnated: it appeared that tidal movements were insignificant as the sand flats were too high, and differences in heights of the sand flats were too small. This new compensation project had to enable further development of this tidal zone.

In this example of the industrial area the agreement on compensation was reached before the start of the EIA-procedure, and was not a part of the approval of the project by the competent authority. In other cases, like some groundwater extraction projects, compensating measures are not yet defined at the moment of licensing. Sometimes the allowance is granted under the condition that provisions to compensate will be implemented in a later stage. This incorporates the risk that expectations will not be substantiated. Another risk is that compensation may come too late. In some occasions compensation of an ecosystem should take place before carrying out the activity. This occurs for instance in river dike improvements projects where the filling of water ponds should be compensated beforehand to enable the resident amphibians to

survive. These risks present a plea for a full integration of compensation in EISs to facilitate sound decision making. In cases where compensation was integrated in EISs, this was not always done correctly as shown in the following example of a cargo railway.

Cargo railway: more creative compensation

The Netherlands ministry for traffic and public works proposed to design a wetland strip 20 metres wide along a new cargo railway, to compensate for the loss of nature and landscape values. An additional advantage for the minister would be that establishment of such a bufferzone facilitates the purchase of land and houses to create sufficient space for the railway. When reviewing the EIS, the Commission for EIA concluded that the environment would benefit more by creating more large scale nature in areas with better potential for compensation. It was also suggested to develop more differentiation in nature values instead of just a wetland strip. The decision on the railway has not been made yet, but the intention is to spend about 35 million US dollars for compensation.

Compensating with a creative mind can also mean that in the decision the preferred sequence prevention - mitigation - compensation will be abandoned. To illustrate this the railway may be considered again. To save a silence area close to the alignment of the railway, noise barriers are needed with a major impact on the landscape. In this case compensation of the area elsewhere can be preferred instead of mitigating the impact.

This last example touches actually on the essence of developing alternatives in EIA, which is that common sense and a keen creative mind are even more important for obtaining good results than whatever theoretical method or guidance.

Rolf-Jan Sielcken, Jules J. Scholten and Marja van Eck

ABSTRACT

In the EIA process in The Netherlands there is a special and formal role for the Commission for EIA as an independent advisor to the competent authority in each EIA-procedure. One of the legal tasks of this Commission is to determine whether EISs provide adequate environmental information in support of decision-making about the activity for which the EIA is required. This paper discusses the approach to reviewing EISs that the Commission has developed since the formal introduction of EIA in 1987. At first, the Commission carried out reviews against the requirements of the Environmental Management Act and the scoping guidelines adopted by the competent authority. These reviews contained only a record of errors and omissions in the EISs. However, this type of review was not very helpful because it was often not clear what the implications of these inadequacies were for the decision-making. Therefore, since 1992, the Commission reviews EISs according to 'the main criterion': "does the EIS provide sufficient information to take the decision?". A number of operational criteria were developed from actual practice to make a distinction between essential and non-essential deficiencies. Essential deficiencies should be remedied before the decision can be taken. The review criteria listed cannot be deemed to be exhaustive and will evolve with the progression of time. The four major operational criteria distinguished so far are:

1. "The description of the proposed activity (the preferred alternative) and its environmental impacts is adequate."
2. "The description of the alternative most favourable to the environment (AMFE) and its environmental impacts is adequate."
3. "The description of the other alternatives and their environmental impacts is adequate."
4. "The comparison of alternatives is adequate."

The application of the review criteria is illustrated with examples from EIA-practice in the Netherlands.

¹⁵ Paper presented at the 1996 Annual Conference of the International Association for Impact Assessment (IAIA '96), 20-22 June 1996, Lisbon, Portugal.

1. THE DEVELOPMENT AND IMPORTANCE OF THE REVIEW CRITERIA

1.1 Introduction

In the environmental impact assessment (EIA)-process in The Netherlands there is a special and formal role for the Commission for EIA^{16]} as an independent advisor to the competent authority in each EIA-procedure. One of the legal tasks of this Commission is to review all environmental impact statements (EISs) that are produced in the course of the EIA-procedures.

The Commission establishes whether EISs "contain sufficient information to allow environmental interests to play a full role in decision-making". This is one of the main goals of EIA underlying the EIA-regulations in the Netherlands environmental impact assessment (EIA).^{17]}

The guidelines for reviewing EISs are determined by the requirements for the content of EISs set down in the Environmental Management Act, the scoping guidelines adopted for each individual EIA by the competent authority, and the requirement that an EIS contains no incorrect information.^{18]} In order to assess whether EISs contain sufficient information to inform the decision-making, the Commission has developed a number of review criteria which are more specific than those laid down by the law.

1.2 Development of the review procedure

The Commission is required, as a public body, to substantiate its advices, which means that it has to state which criteria have been applied in its reviews. The Act lists the points to be reviewed by the Commission.^{19]} During its early years (from the moment of formal introduction of EIA in 1987 up to 1991) the Commission restricted itself to reviewing the information against the requirements of the Act and the scoping guidelines adopted by the competent authority. The reviews undertaken during this period contained a record of errors and omissions in the EISs - but this type of report was not very helpful to the competent authorities because it was often not clear what the implications of these inadequacies for the decision-making were. To rectify this, and improve the value of its reviews, the Commission decided to include in its advisory reviews a judgement on the adequacy of EISs in support of decision-making. This judgement makes a distinction between essential deficiencies - which need to be made good before taking the decision for which the EIA was required - and those which are also relevant for assessing the environmental impacts, but which can be remedied simultaneously when the decision is taken or during the post-project analysis.

16 The Commission for EIA in The Netherlands is referred to in this paper as 'the Commission'.

17 See the Explanatory Memorandum to the EIA bill, Second Chamber 1980-1981, 16814 nr. 3, p.5.

18 See the Environmental Management Act, articles 7.10, 7.15, and 7.23 clause 2.

19 Article 7.23 clause 2 states that comments arising from the advisory review may only relate to the EIS not meeting the requirements for content, not adhering to the adopted guidelines, and to errors made. Article 7.26 clause 1 states that art. 7.23 clause 2 applies to the Commission for EIA.

In 1992 the Commission began reviewing EISs explicitly according to the main criterion "does the EIS provide sufficient information to take the decision". This strikes at the heart of the purpose behind EIA, namely "to guarantee that environmental interests can play a full role in the decision-making". For each project a working group of experts assesses the accuracy of the information, the review criteria providing a means for justifying their judgement. The operational criteria listed in Chapter 2 are derived from actual review procedures adopted to date, and so they cannot be deemed to be exhaustive.

The advisory review concentrates primarily on those areas for which additional information or further research are required. However, it has happened that even after the EIA has been concluded with a positive judgement from the Commission, new research into issues raised by objectors or local government was still wanted. This is understandable considering the uncertainties which often surround the prediction of impacts and other developments. That's why the Commission's advice increasingly states whether important or contentious issues are properly discussed in the EIS.

1.3 Review policy

Review practices follow the procedural guidelines issued by the Environment Minister. These make a distinction between essential and non-essential deficiencies^{20]}, and state that should the competent authority consider essential information to be missing - based on advice or submissions received during public consultation - the relevant parts of the EIS must be revised before the project decision can be taken. These procedures have arisen in practice, but there has been no political desire to legislate for them.^{21]}

In addition to the legal requirements, scoping guidelines are used to aid the assessment of the correctness and completeness of EISs. These are not designed to reveal the seriousness of any deficiencies in the EIS, and so specific guidelines for an EIS cannot replace the review criteria.

1.4 Application of the review criteria

The relationship of the Commission to the competent authority

In reviewing EISs according to the main criterion "sufficient information to take the decision" the Commission is careful not to usurp the role of the competent authority. The Commission does this by assessing the correctness and completeness of the information, irrespective of the possible outcome of the eventual decision. The different responsibilities of the Commission and the competent authority are illustrated by the following example. The Commission considers the EIS to be adequate, except for one alternative, and advises that supplementary information be provided on that alternative. The competent authority,

20 See the letter from the Environment Minister concerning the Additional Guidelines, 10 January 1995.

21 Parliamentary Papers II 1991/92 22608 nr. 11.

however, decides that this alternative is no longer a realistic option (perhaps due to a parallel decision-making process), making any supplementing unnecessary.

Moreover, not only the competent authority, but also other government departments, the developer, local residents, pressure groups and often the Environmental Appeals Tribunal, are all involved in the decision-making. The EIS must provide all the environmental information that these participants will need. The outcome of the public consultation round may cause the Commission to recommend that more information be gathered than the competent authority initially thought necessary. It is therefore important for the Commission to clarify the criteria underlying its judgement, and point out where the results of the public consultations have influenced that judgement.

Review procedure

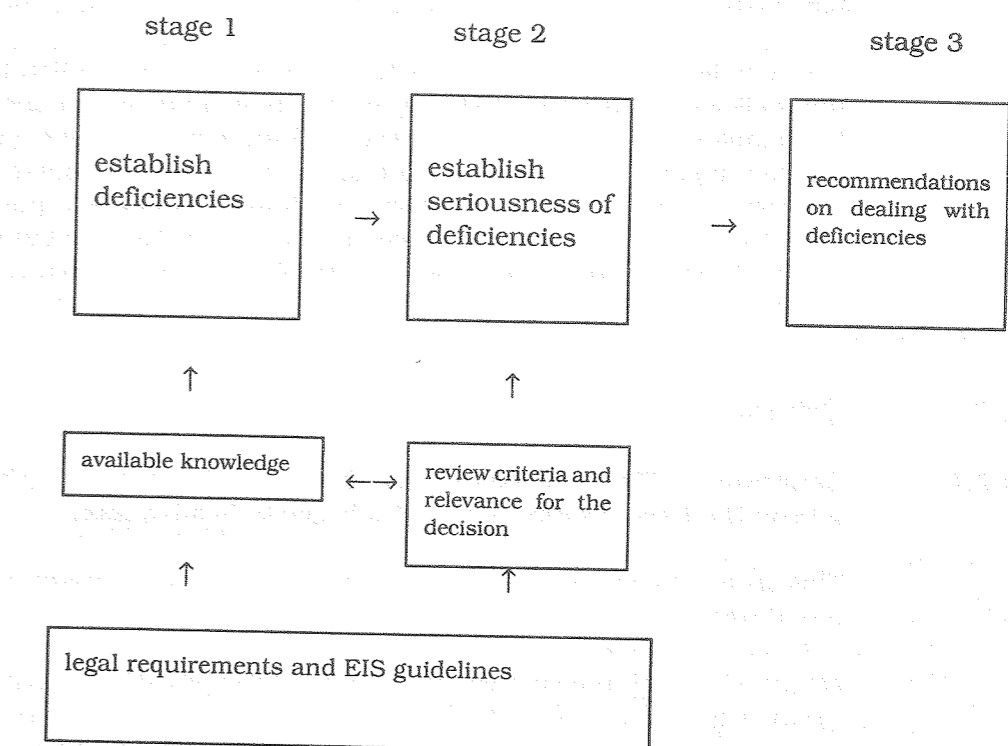
The review of an EIS by the Commission takes place in three stages.^{22]}

In the *first stage* the working group assesses the EIS against current knowledge, according to the legal requirements (including the specific project guidelines). Correct and incorrect passages are identified.

In the *second stage* the working group assesses the seriousness of the deficiencies in the light of the possibilities for environmental interests to play a full role in the decision-making. Three categories can be identified: essential omissions, non-essential deficiencies which are relevant for further decisions, and shortcomings which are not relevant.

In the *third stage* the results of the review are recorded in a report to the competent authority. In this report the Commission indicates which important aspects are described well, and makes recommendations concerning the significance of the deficiencies. The Commission recommends that essential omissions are made good by acquiring the relevant environmental information *before* the decision requiring the EIA is taken. For non-essential deficiencies relevant for the realization of the project, the Commission recommends gathering the information at a later stage of the decision-making requiring the EIA or in support of subsequent decisions or during the post-project evaluation. Shortcomings considered not to be relevant are sometimes included in the Commission's advice if they could be of use when dealing with knowledge gaps in other projects.

These three stages can be represented graphically as follows:



22 See also J.J. Scholten and M. van Eck in "EIA Methodology in The Netherlands; Views of the Commission for EIA", June 1994.

2. THE OPERATIONAL REVIEW CRITERIA

2.1 General

The complexity of projects for which an EIA is compulsory often leads to multiple deficiencies in EISs, and failing to meet more than one criterion. Moreover, the complexity of cause and effect relationships may mean that one single error can have important implications throughout the EIS. For example, an incorrect description of environmental impacts may influence the description of alternatives, the comparisons between them, or the choice of alternative most favourable to the environment. In these cases the Commission indicates where these chains of errors begin.

2.2 Criteria

2.2.1 Criterion 1: 'The description of the proposed activity (the preferred alternative) and its environmental impacts is adequate.'

This criterion consists of four elements. These elements, described below, are based upon

- a) the legal requirements for the content of the proposed activity,^{23]}
 - b) the legal requirements for the description of the current situation,^{24]} and
 - c) the legal requirements for the description of the environmental impacts.^{25]}
- Aspects of the initiative relevant to the environment include emissions to the atmosphere, water, and soil as well as traffic movements, waste disposal, risk and safety, changes to the landscape, cultural heritage and the ecology.

The criterion under d) is based upon the legal requirement that the EIS contains realistic alternatives.

The preferred alternative is here defined as the proposal as it is described in the licence application or the (preliminary) draft plan. The preferred alternative in the EIS is generally the same as the eventual proposal in the licence application or (preliminary) draft plan, but for a number of different reasons this is not always the case. The Commission must ensure that the environmental information in the EIS covers the proposal (preferred alternative) in the application or (preliminary) draft plan, also taking into account any additional information in the explanatory memorandum accompanying the (preliminary) draft plan or the licence application. Should the information provided be inadequate for the eventual preferred alternative, the Commission will issue a nega-

23 Article 7.10 clause 1 under b: "a description of the proposed activity and the way in which it will be carried out".
24 Article 7.10 clause 1 under d: "a description of the current situation of the environment, in so far as this could be affected by the proposed activity, and any expected developments without the proposed activity (the preferred or any other alternative) taking place".
25 Article 7.10 clause 1 under e: "a description of impacts on the environment caused by the proposed activity or its alternatives, and an explanation of the way these impacts have been identified and described".

tive review and recommend additional information be gathered. However, it is not compulsory for the eventual preferred alternative to be the same as that described in the EIS. After the EIA has been completed the developer might, for example, decide to adopt the alternative most favourable to the environment, or the proposal might ultimately be composed of elements from more than one alternative.

The four elements are:

- a) *The description of environmentally significant aspects of the proposed activity is adequate.*

Example: **Vitesse Eurodrome football stadium, Arnhem (222)^{26]}**

The Commission concluded that visitor numbers warranted more parking places than envisaged in the EIS. The additional study resulted in changes to the proposal with provisions for more parking places in an overspill area.

- b) *Environmentally sensitive elements which could be affected by the proposed activity are adequately described.*

Example: **Landfill 't Klooster, Nieuwegein (388)**

The highly variable portions of sand, clay and peat in the soil underlying the landfill were not adequately mapped. This information was of great importance because the varying soil composition would lead to differences in the degree of compaction of the substrate. The chances of the impermeable bottom sheeting tearing, with consequent damage to the drainage system under the landfill, would then be too high. The supplementary study supplied this detailed information, which resulted in the proposal being amended to include not only pre-compression to reduce differences in settling rates of the soil, but also the application of bentonite clay and extra drainage, in order to achieve the required level of protection for the soil and groundwater.

- c) *The important environmental impacts of the proposed activity are adequately described.*

Environmental impacts are very often described in terms of (legal) thresholds and norms. Where strict standards which preclude any significant environmental impacts apply, and the proposal complies with these, it will not generally be relevant (for the decision) to describe the impacts in detail.

Should environmental thresholds be significantly exceeded and the EIS does not indicate how the project can meet the required standards, this will be an essential omission, and the proposal cannot be considered realistic. In certain specific cases (see for example Amsterdam and Maastricht Airports) the EIS only describes impacts which are within legal thresholds, but where significant environmental impacts are nevertheless to be expected. The law demands that the EIS contain a description of all important impacts which are to be expected. Indeed, this information is important for the decision-making; the competent authority has to consider all the significant environmental impacts, irrespective of whether they are within, or exceed, particular thresholds or standards (see article 7.35 of the Act). Ignoring this fact can lead to essential omissions in the EIS.

26 The numbers in brackets refer to project numbers used by the Commission for EIA.

Example: **Integral EIS for the Amsterdam Airport area** (334)

In the EIS the impacts of night flights (sleep disturbance) were calculated according to the assumptions made in the standard applied, ie with closed bedroom windows and a night-time period of just seven hours (between 23:00 p.m. and 06:00 a.m.). The Commission was of the opinion that an assessment based on a partially opened bedroom window and a night-time period longer than seven hours would give a more realistic picture of the actual impacts, and recommended that this be provided in a supplementary report. This was carried out, and resulted in the night-time flight regime being extended from 06:00 a.m. to 07:00 a.m.

- d) *The proposed activity (preferred alternative) and other alternatives described are realistic.*

The proposed activity is not realistic if it is not practicable using current knowledge and available techniques, or if it would be unreasonably expensive to do so. In addition, the Commission will consider a project to be unrealistic if it is contrary to government standards for environmental protection. However, standards and policies are by no means always rigid and clear; government authorities may even adjust policy because of information in an EIS. In these cases the Commission adopts a discretionary approach. Besides, the Commission must be careful not to interpret government regulations itself when applying this criterion.

Example: **Radioactive waste storage facility ECN, Petten** (494)

The EIS on the storage of radioactive waste at The Netherlands Energy Centre in Petten contained, according to the Commission, no justification of the need for this facility; government policy is to develop just one storage facility at the Central Storage Facility for Radioactive Waste (COVRA) in Borsele. The Commission recommended that a supplement be prepared. In this supplement the alternatives were redrafted as temporary storage facilities for material awaiting transport to COVRA in Borsele, and their environmental advantages brought to light.

Example: **Integral EIS Amsterdam airport** (334)

Consistent with the Fourth Policy Document on Spatial Planning, the notification of intent for this project contained an Action Plan setting out a number of related objectives for the development of Amsterdam airport into a 'mainport', and for improving the living environment in the area. The objectives were endorsed by all the authorities involved. The Commission noted in its advisory review that none of the alternatives completely satisfied the environmental goals, but did not recommend that a supplement be prepared on this point because there appeared to be no other possible alternative which could meet all the objectives at the same time.

2.2.2

Criterion 2: 'The description of the alternative most favourable to the environment (AMFE) and its environmental impacts is adequate'.

The requirements applying to the preferred alternative listed above also apply to the alternative most favourable to the environment (AMFE), which in principle must be developed to the same level of detail as the preferred alternative. The criteria under a), b), and c) are exactly the same, but refer to the AMFE (see criterion 1)²⁷:

27 As far as possible the Commission determines to what extent the alternative most favourable to the environment is represented in the EIS. An unequivocal judgement, however, is not always possible. A recommendation to prepare a supplementary EIS can vary from investigating one or two measures to fully developing a new alternative. There is a desire for practical criteria to adequately cover this range of possible conclusions. (See criteria under d), e), f) and g).)

- a) *The description of environmentally significant aspects of the AMFE is adequate.*
b) *Environmentally sensitive elements which could be affected by the AMFE are adequately described.*
c) *The important environmental impacts of the AMFE are adequately described.*
d) *The AMFE adequately covers all relevant preventive measures to protect the environment.*

When judging which preventive and mitigating measures are possible in the AMFE, the Commission takes due account of current technology, the costs involved, and any possible negative impacts the mitigating measures themselves could have on the environment.

Example: **Combined heat and power station UNA in Diemen** (365)

The possibilities for discharging cooling water from this power station are severely constrained. The temperature of the Amsterdam-Rhine Canal is already adversely affected by current high discharges of cooling water. The alternative body of surface water, the Lake IJ, which could be used for cooling is ecologically too valuable. The EIS contained no alternative making use of both bodies of water; nor was there an environmental alternative to discharging chlorine, used to remove algae, into the lake. The Commission recommended that a supplement be prepared which describes these options as full alternatives. This supplement now forms the basis for the discharge licence which prescribes both of these measures.

- e) *The choice of alternative most favourable to the environment from the alternatives described in the EIS is correct.*

The Commission might conclude from incorrect information or comparisons between alternatives that one of the other alternatives in an EIS should be the AMFE. Sometimes the EIS has just one (preferred) alternative; if this is at the same time the AMFE, then devising another AMFE is, in principle, superfluous.

- f) *Of all the alternatives in the EIS, at least one qualifies as the alternative most favourable to the environment.*

It is also possible that the developer proposes one alternative, but in a number of variations, the most 'environment friendly' being made the AMFE. Should this rather 'passive' method of identifying the AMFE preclude other potential AMFEs from being considered, then the Commission recommends that this be rectified in a supplement. The justification for this is the Commission's reading of the Act, in which an active search for an AMFE is required. Sometimes it is felt that there is a more likely candidate for the AMFE than described in the EIS. If the feasibility of such an alternative cannot be properly assessed, the Commission must clearly justify why it thinks another alternative should be the AMFE.

Example: **Westerschelde estuary crossing** (114)

The EIS considered only bridges and caisson tunnel constructions, but not bored tunnels. The justification for this was that such tunnel-boring techniques had not yet been perfected, and would be too expensive. However, a bored tunnel construction would have the least en-

vironmental impacts, and was even the most popular option in the tenders for contract. The EIS clearly had to be broadened to include bored tunnels. The decision has been made in favour of a bored tunnel.

Example: **Eemland Golf Course in Eemnes** (377)

Both the proposed golf course and the AMFE cut through a 150 year-old wood. The Commission was convinced, on the evidence of another proposed layout, that the whole wood could be avoided and the golf course accommodated in the open areas. The Commission then advised that the best AMFE had not been considered in the EIS. The supplement contained a new AMFE which spared the wood, and forms the basis for the resulting land use plan.

g) *The alternative proposed as most favourable to the environment is realistic.*

If an AMFE is not feasible, exceptionally costly, or does not meet the developer's objectives, the Commission recommends that a more realistic one be drawn up. This can then be assessed as a full alternative during the decision-making.

Example: **Urban expansion sites assessment, Utrecht Regional Physical Plan** (390)

The design of the AMFE was split between three development concepts which could not be expected to form a coherent new urban district. Too little attention had been paid to finding environmentally sound solutions to a number of constraints, including access to public transport, the protection of valuable historic and landscape features, and the fragmentation of the area by transport infrastructure. The competent authority did not follow the Commission's advice; no supplement to the EIS was prepared.

2.2.3 **Criterion 3: 'The description of the other alternatives and their environmental impacts is adequate'.**

If both the preferred alternative and an alternative most favourable to the environment have been correctly developed and assessed, there must be exceptional reasons to consider the absence of any other alternatives to be an essential omission. Such a reason may lie with the EIS guidelines, or it might be that without exploring further alternatives environmental interests cannot be fully represented in the equation. So the EIS must meet two specific criteria.

a) *The alternatives put forward in the guidelines have been adequately described in the EIS.*

The competent authority may be prompted to include an alternative in the guidelines as a result of public consultations, advice received, or on the basis of the authority's own views. The proponent must then develop the alternative in the EIS, or justify why it would not have been useful to do so. Should the Commission consider the alternative described, or the reason for not including it, inadequate, then it will in principle recommend that a supplementary EIS on its environmental implications be drawn up.

Example: **A58 Motorway, Schoondijke - Sluis** (269)

The guidelines explicitly required that a new alternative route be developed. This was not taken up in the EIS because it was claimed to be unrealistic. The Commission judged the argumentation to be unsound. The supplement prepared by the Department for Public Works and Water Management revealed that the alternative was realistic, but did not perform significantly better than the other alternatives in terms of environmental impact.

b) *The environmentally more attractive alternatives are adequately described in the EIS*

EISs sometimes contain a preferred alternative and a very ambitious AMFE, while other, less far-reaching but environmentally advantageous alternatives which also meet the developer's objectives are not included. This can also be an essential omission.

Example: **Urban expansion sites assessment, Utrecht Regional Physical Plan** (390)

The project proposal included only one option for relocating the greenhouse complex from Vleuten-De Meern to the Harmelerwaard area, which required a net area of 180 hectares. The Commission recommended the addition of two alternatives which would provide respectively only for 60 and 120 hectares in the Harmelerwaard. These were not elaborated.

Example: **Ten Year National Waste Management Plan 1995** (599)

The EIS described and compared only general waste-processing techniques. The Commission advised that for certain fractions of the refuse more specific treatment processes permitting a greater degree of recycling were available. The ten year plan concluded that additional information would be made available for subsequent decisions at a later stage if necessary.

2.2.4 **Criterion 4: 'The comparison of alternatives is adequate'.**

The Commission applies this criterion in two steps. In the first step the Commission assesses whether any methodological errors have been made in the comparisons. The second step involves checking whether rectifying these errors would lead to a change in the order of preference for the alternatives. The conclusions from the first step might be that the comparisons cannot be properly verified because insufficient information and analysis have been provided. The Commission will then recommend that the missing information be provided in a supplementary report (criterion 4a). If the supporting information and analysis are sufficient (either in the EIS or a supplementary report) they might reveal that the order of preference should be altered; the Commission will then recommend that a new comparative assessment be carried out (criterion 4b).

a) *The comparison of alternatives and the resulting rankings are verifiable.*

Example: **Choice of a sanitation sludge disposal system for the northern provinces** (509)

Multiple criteria analysis (MCA) was used in the EIS to carry out a comparison between different treatment techniques, but the criteria used to evaluate the environmental impacts were not stated, making verification of the comparisons impossible. The criteria were later provided and explained in a supplementary report. According to these criteria, the differences revealed by the MCA were so small relative to the margins of uncertainty that no firm conclusions could be drawn from the resulting ranking of alternatives.

b) *A correct comparison of alternatives does not yield results significantly different to those supplied in the EIS.*

Example: **Integral EIS for the Amsterdam airport area** (334)

Various different assumptions were made in the EIS for calculating noise levels and individual risk factors. The Commission recommended a supplementary assessment because using the same assumptions for both sets of calculations could lead to a different ranking of alternatives. This additional analysis did reveal that one of the environmental indicators changed from positive to negative when the same assumptions were used throughout, but that the final ranking of alternatives was not affected.

Example: Eindhoven Landfill sites assessment (South-East Brabant) (428)

The Commission found the scoring of impacts to be flawed because different assessment criteria had been used. A correct comparison of alternatives in the supplement led to a significantly different ranking order than was originally presented in the EIS.

2.2.5 Other criteria

In addition to the above-mentioned criteria, a number of others have been derived from the provisions of the Act, but have not yet been put into practice.

Criterion 5: 'The project's objectives are not so narrow that more environmentally favourable alternatives are by definition ruled out'.

The motivation for this criterion can be found in the Explanatory Memorandum.^{28]} With this requirement the Government wants to ensure that all the alternatives which can reasonably be investigated are brought within the scope of the EIS. In practice, this requirement almost always plays a role in drawing up the EIS-specific guidelines, but it might also arise during the review stage, for example if the Commission considers that not all environmentally promising alternatives or AMFEs have been investigated (see criteria 2f and 3b).

Criterion 6: 'The EIS contains sufficient information on the gaps in knowledge'.

This criterion is based on article 7.10 clause 1 under g, which provides the principle by which the Commission assesses the gaps in knowledge.^{29]} There are two possible situations. In the first, the EIS does not include a statement on the gaps in knowledge. In the second situation, the gaps in knowledge are indicated but their implications and importance are not. In the first case, the Commission can bring to light any gaps in knowledge, whether they are essential, relevant, or irrelevant, in its review report. In the second case the Commission can indicate the significance of specific gaps in knowledge for the decision at hand. In both cases the competent authority will be in possession of the information it requires in order to involve the environmental aspects fully in the decision-making.

It might be the case that information stated in an EIS as being unavailable to the authors is in fact obtainable, but has not been used. The Commission must then establish whether the missing information is essential enough to warrant the preparation of a supplement. The significance of any omissions is assessed against the criteria listed under 1 and 2 above. The competent authority can then decide if supplementary work should be done, and by whom (the developer or the authority itself).

28 See also article 7.10 clause 1 under a: "a description of that which the proposed activity sets out to achieve".

29 The article states that the EIS should provide an overview of gaps in knowledge about the current situation of the environment, and the environmental impacts of the proposal related to the missing information.

Criterion 7: 'Despite any changes to the situation the EIS contains sufficient information to allow a decision to be taken'.

This criterion is derived from article 7.27 clause 2. It is clear from the text of the Act and Explanatory Memorandum that this provision only applies to EISs that have been formally accepted by the competent authority. The Commission therefore only applies this criterion when changes take place after the EIS has been accepted and then submitted to public review and scrutiny by the Commission. Should any information prove to be outdated before the EIS is accepted, this fact will need to be assessed by the competent authority according to the criteria described above.

Jules J. Scholten^{31]}**1. INTRODUCTION**

This article describes the role played by environmental impact assessment (EIA) in the decision making about the siting and licensing of radioactive waste facilities in the Netherlands.

In the Netherlands EIA is applied as a tool in decision making about large-scale activities and major policy-decisions that may have significant impacts on the environment. EIA in support of such decisions came into force in 1987. This took place also in response to the requirement by the European Commission for the member states of the European Union to incorporate EIA in their individual national legal systems by July 1988.

In the Netherlands, EIA must be applied to decisions about radioactive waste facilities if such facilities are designed to store waste for periods longer than ten years.

The EIA-process in the Netherlands has adopted the following characteristics in order to guarantee that in decision making the interest of the environment is considered of equal importance next to social, economic and financial interests:

- Formal legislation prescribing the procedure for incorporating EIA in the decision making and indicating quality requirements for the substance of environmental impact statements (EISs), resulting in specific guidelines for each EIS.
- Scoping pertinent environmental issues prior to preparation of the EISs, resulting in specific guidelines for each EIS.
- Requirement to develop alternatives in addition to the proposed activity offering equivalent solutions to the developer or the proponent of the activity. Among the alternatives there has to be an alternative which is friendly to the environment in terms of site conditions, mitigating measures and best technical means. Also, the "do-nothing situation" must be investigated for its possible potential in achieving the objective.
- Public participation during the scoping phase and the review of EISs.
- Advice by an independent Commission for EIA during the scoping and review phases.
- Requirement to include in the decision's record a statement which use has been made of the environmental information produced by the EIA and of the remarks and recommendations submitted by the public and the independent Commission for EIA.

30 Paper presented at the international Seminar on EIA and its role in connection with the final disposal of nuclear waste, Luleå, Sweden, 24-26 October 1994.

31 The author acknowledges the valuable comments on this paper received from dr. Hans Codée, deputy-director of the Central Organisation for Radioactive Waste in the Netherlands.

- Requirement to monitor the implementation of activities and to adjust decisions if need arises from the post-project analysis.

By 1994 more than 500 EIA-procedures have started in the Netherlands and more than 200 decisions were made with the help of EIA. Thus considerable experience has been gathered in the application of EIA since 1987. It can be stated that the added value of EIA to decision making has been confirmed by most parties involved in EIA: the government (both central and local government), private enterprises, the public and environmental pressure groups.

Researchers view EIA as an instrument that helps focusing attention on applied research topics.

In connection with the disposal of radioactive waste several EIAs have been carried out since 1985. In the following (paragraphs 3 through 6) these EISs are briefly described and their impact on the decision making is indicated as well as any obvious drawbacks and flaws that have influenced their application.

However, before that is done, the EIA-procedure applied in the Netherlands is briefly explained (chapter 2).

2. EIA-PROCEDURE IN THE NETHERLANDS

Legislation concerning EIA was introduced in the Netherlands after a period of about ten years of experimentation. According to the legal framework which came into force in September 1987, EIA has to be carried out for decision making about activities and plans with possibly significant impacts on the environment. The pertinent EIA-obligatory activities and plans as well as the related decisions are listed in a General Administrative Order which forms part of the legislation. Most EIA-obligatory proposed activities and plans must exceed certain threshold values in order to qualify for submission to EIA (eg licensing nuclear power plants generating a power output of more than 1 Kilo-watt). The list of activities and plans for which EIA is compulsory, is updated every five years.

The EIA-procedure starts by publishing an initial document (*notification of intent*) on the proposed activity or plan by the *proponent (developer)*. The *competent authority* invites the public and the independent *Commission for EIA* to prepare comments and recommendations on the content of EIS. The Commission for EIA takes into account in its advice the results of the public participation. This round of public participation and advice by the Commission for EIA prior to the preparation of the EIAs by the proponent is known as the *scoping phase*. The competent authority completes the *scoping phase* by establishing *specific guidelines for the EIS* which are handed to the proponent. Altogether the scoping phase may not exceed 9 weeks from the date of publication of the notification of intent. The EIS is compiled by the proponent or by a consultant hired by the proponent. The proponent draws up a license application or a draft plan simultaneously. There is no time limit for the proponent to complete the EIS, license application or draft plan. Once these documents are completed they are submitted to the competent authority for publication and *public review*. The Commission for EIA is requested to prepare a review of the EIS

incorporating in the review the results of the public participation. The Commission for EIA carries out the review by addressing the following questions:

- Is the EIA scientifically correct and are all significant environmental impacts covered?
- Does the EIS comply with the specific guidelines and the general legal requirements?
- Does the EIS provide the competent authority with sufficient environmental information allowing the competent authority to make a sound decision?

The acceptability of the proposed activity or plan is not judged by the Commission for EIA in its review. The public review including the review advice of the Commission for EIA must be completed within two or three months from the date of publication of the EIS. If the advisory review by the Commission for EIA concludes that the EIS is seriously lacking in substance, the competent authority must consider supplementing the EIS. If the competent authority decides to accept such a conclusion from the Commission for EIA, the proponent will be requested to *supplement the EIS*. In that case, the supplement to the EIS must be subjected to an additional round of public review and advice by the Commission for EIA and thus the time span for the review is extended. Next, the competent authority decides about the licence request or draft plan taking into account all environmental information generated by the EIA. The results of the EIA must be reflected in the *decision's record*. The decision also must include a programme for *post-project analysis* which has to be carried out when implementing the proposed activity or plan. If the execution of the post-project analysis yields information pointing out that the actual environmental impacts are more detrimental than predicted in the EIS, the competent authority must consider *mitigation* of the activity or plan.

3. HISTORY OF DISPOSAL OF RADIOACTIVE WASTE: ADOPTION OF A DUAL APPROACH

Before 1983 the Netherlands together with the United Kingdom, Belgium and Switzerland dumped low and medium level radioactive waste in the Atlantic Ocean in accordance with an international agreement that allowed these countries to get rid of this waste in this way. However, dumping at sea was stopped in the face of rising public objections against this method of disposal and in view of the emerging notion that radioactive waste should be disposed of by observing measures concerning insulating, controlling and monitoring for all types of waste processing. Therefore, a policy had to be developed to store radioactive waste on shore either at the surface or in geological formations. This policy also had to accommodate the disposal of high level radioactive waste, including spent fuel from nuclear power plants that has been shipped to France and the UK over the years for reprocessing. The government decided to adopt a dual approach in that a temporary and central surface facility would be built simultaneously with developing a concept for the definitive disposal in suitable geological formations either within the country or abroad. The Central Organisation for Radioactive Waste (COVRA) was established particularly for

the development and implementation of the temporary and central surface facility.

The policy was adopted in 1984 prior to the formal introduction of EIA in 1987. Therefore, no EIA was carried out for the policy decision and its first move in implementing it. However, the next steps in implementing the dual approach to the disposal problem were planned with the application of EIA. In particular, this included the following:

- EIA for the development of a set of criteria for the suitability assessment of deep geological formations for the definitive disposal of all types of radioactive waste.
- EIA for the licensing procedure for a central surface facility to store all types of radioactive waste for a period between 50 and 100 years prior to definitive disposal possibly in deep geological formations.

4. EIA FOR DEVELOPING CRITERIA GOVERNING THE SUITABILITY ASSESSMENT OF DISPOSAL IN DEEP GEOLOGICAL FORMATIONS

In the Netherlands a research programme was adopted to investigate rock salt formations in the north and east of the Netherlands as potential repository for radioactive waste. In this programme, the development of a set of criteria for the assessment of the suitability of deep geological formations for disposal of radioactive waste was announced. The development and adoption of the set of criteria would be accompanied by an EIA-like process of public participation and independent reviewing starting in September 1987. The intention was to benefit from the openness and carefulness that characterize EIA, however without applying the legal EIA-procedure in full. It was not clear why this somewhat ambiguous approach was adopted. However, it is apparent that, although at that time the application of EIA to specified activities and decisions had just come into force, experience was still limited and therefore doubts prevailed about the advantage of applying EIA to its full extent to activities and decisions that were not included in the list of EIA-obligatory activities and decisions. In this particular case, the EIA-like process became a disappointment and was abandoned about a year after its inception. What did actually happen and what did cause its failure?

The starting document that had to kick off the procedure and that had to inform the public about the development of criteria was so complicated that only few persons as well as experts in the fields of geology, geochemistry, waste management and risk assessment could grasp the gist of it. The public was invited to comment on the starting document and to make recommendations on the types and levels of criteria that should be observed in assessing the suitability of sites and geological formations. Also, the independent Commission for EIA was invited to prepare comments and recommendations. The round of public consultation almost entirely failed to meet expectations of the competent authorities for a constructive dialogue. The public was not willing at all to discuss types of criteria. The public simply stated to be against any form of subsurface disposal in view of uncertainties with regard to contaminating the biosphere and threatening human health for many future generations. The Commission for EIA in its advice left aside the largely emotional reactions

of the public and attempted to approach the subject in a constructive and scientific way. The Commission for EIA reasoned that the set of criteria should have a hierarchical structure starting at a high level of generalization progressing downwards to levels with increasingly more detail. At the highest level of generalization two criteria were placed:

- Distinction between those radioactive wastes from facilities and scientific institutions on the one hand to which the Dutch society has committed itself already (such as the two existing nuclear power plants, hospitals and industrial laboratories) and those radioactive wastes on the other hand from facilities that are not (yet) accepted and decided upon by the society (eg new nuclear power plants). According to the Commission for EIA this distinction would elucidate the necessity and size of a facility for the definitive disposal of radioactive waste. In addition, it also would act as a guiding principle in the public discussion on expanding activities and facilities producing radioactive waste.
- Retrieval of the stored wastes and reversibility of the activity as a factor determining environmental control of the site as well as public acceptability of the repository. Retrieval of waste and reversibility of the activity are co-determined by the factor time and the decay in radioactivity of the stored wastes.

The Commission for EIA reasoned that these two general criteria would help to determine the general suitability of repositories in any deep geological formations. Once such criteria can be specified satisfactorily, more detailed and site-specific criteria can be developed concerning geology, mining, geohydrology, radiology and storage technology which determine the suitability of repositories in specific geological settings such as those in the rock salt domes occurring in the deep subsoil of northern and eastern regions in the Netherlands.

Following the recommendations of the Commission for EIA, the government was indecisive about the way how to proceed with the initiative specifically and with the problem of deep geological disposal in general. It became clear that more time was needed to develop a concept for deep geological disposal that can be made acceptable socially and technically. Therefore, it was decided to shelve the initiative about the development of a set of suitability criteria for an unspecified period in view of the fact that the parallel approach of temporary surface storage of radioactive waste for a period of 50 – 100 years will provide a satisfactory solution for the time being. The research into the geological, mining, geohydrological, radiological and technical characteristics of disposal in deep rock salt formations will continue as desk studies but without urgency. Thus, the EIA-like procedure for the development of a set of suitability criteria was stopped and the public interest in the matter cooled and gradually subsided. The failure cannot be ascribed to any inherent shortcomings of EIA. It was caused by the highly technical approach adopted by the central government and the fact that the Dutch society was simply not ready to initiate and entertain a dialogue about the merits of storing radioactive waste in deep geological formations.

5.

EIA FOR THE LICENSING PROCEDURE FOR A CENTRAL SURFACE STORAGE FACILITY

The EIA-procedure in support of licensing a central surface facility started in 1985 before the EIA legislation came into force. This resulted in a somewhat complicated and unsatisfactory arrangement for EIA in the decision making. The EIA would be carried out in two phases:

- In the first phase a general EIS would be made for temporary surface storage not taking into account site-specific issues. The site selection would not be included in the EIA-procedure and would be dealt with by a special commission appointed by the central government for this particular occasion. This commission would only look into policy and physical planning factors governing the site selection. Environmental considerations that could influence the site selection would not be contemplated by this special commission.
- In the second phase a site-specific EIA would be prepared for the site(s) selected by the special commission.

The entire procedure lasted from 1985 till 1989 when the licenses for the COVRA facility were granted. The following observations and remarks can be made about the role of EIA in this procedure.

- ① The arrangement by which the actual site selection took place mainly on the basis of policy and physical planning considerations yielded an unsatisfactory situation for the environmental interest. The result was that the special commission appointed for the site selection earmarked three locations as suited because the pertinent municipal governments were willing to co-operate and because the pertinent municipal physical plans would not preclude the establishment of a temporary storage facility. Due to this approach the fact was overlooked that all three candidate-sites were located in coastal areas where risks occur from flooding by seawater. The site selection did not take into account any potential sites which are free from such risks.
- ② The actual choice between the three potential sites was left to the proponent, ie COVRA. The second phase in the EIA concentrated on the preparation of an EIS for the site preferred by COVRA with comparison of this site with the other two potential sites. However, the license application prepared by COVRA concentrated only on the preferred site. In the review of this EIS public participation severely criticised the preferred site as it would be too closely located to a village. Subsequently, the competent authorities decided to move the proposed site two kilometres away from this village onto an industrial park belonging to the port area of Vlissingen (Flushing). This particular site had not been considered before in the procedure and hence a new EIS and a new license application had to be drawn up by COVRA. This new development demonstrated once more that the site selection should have been included in the EIA-procedure from the very beginning.
- ③ The EIS and license application by COVRA included the storage of radioactive waste which could be produced according to three different scenarios.

The first scenario dealt with the production of radioactive waste from existing facilities in the Netherlands whereas the other two scenarios took into account the installation of new nuclear power plants in the Netherlands. Towards the end of the EIA-procedure the Chernobyl disaster happened in the former Soviet Union. This disaster caused the Dutch Government to postpone indefinitely imminent plans to install new nuclear power.

Additionally, it was also recognized that granting COVRA a license covering the most ambitious scenario including the storage of radioactive waste from new nuclear power plants would foster a positive decision on the construction of such nuclear power plants. The advices of the Commission for EIA and remarks by the public drew attention to this effect. Therefore, the licenses for the new site within the Flushing port area were granted only for the storage of radioactive waste that is produced by facilities in the Netherlands to which Dutch society has committed itself already.

- ④ At the start of the second phase which concentrated on the preparation of the site-specific EIA for the preferred site by COVRA, the Commission for EIA recommended to appoint a group of representatives from the public and industry to accompany the procedure and to guide along public participation. As this recommendation was not taken up by the competent authorities, the Commission for EIA repeated the recommendation in the review of the EIS on the second proposed activity in the Flushing port area in order to avoid any further misunderstandings between the competent authorities, the proponent and the public. The group of representatives could then follow the construction and implementation of the activity in the framework of the post-project evaluation. When the competent authorities eventually decided in favour of the Commission's recommendation, the public had lost trust in the initiative and the initiative was abandoned. The lesson which can be learnt from this experience is that a good opportunity was lost to establish a good relationship between the competent authorities, the proponent and the public in the area surrounding the activity. The performance of such a group of public representatives could have helped in easing tension between the various parties concerned about an activity which was viewed controversially by most people in the vicinity of the activity.
- ⑤ The EISs for the two successively selected sites described clearly that the environmental impacts from the implementation of the activity probably will be minor and fully manageable if the activity is carried out by COVRA as professional agency with the application of state-of-the-art technology. The reviews by the Commission for EIA confirmed this unmistakably. Following the license granting, appeals were made against the decisions requesting nullification of the licenses on the basis of the claim that the EIS was seriously lacking in substance and had failed to present the required information. In 1992 the Council of State rejected these appeals on the ground that the review by the Commission for EIA concluded that the EIS provided sufficient and relevant good-quality information. This experience demonstrates the importance and influence of independent reviewing in EIA, particularly concerning controversial activities. The review of the Commission for EIA and the judgement by the State Council put an end to a discussion which otherwise would have continued to the detriment of solving a national environmental problem.

6. RECENT DEVELOPMENTS

COVRA completed in 1993 the construction of the structures for the storage of low and medium level radioactive waste. The concrete buildings for the storage of high level radioactive waste still have to be constructed. Meanwhile, COVRA experienced considerable changes in the nature, composition and quantities of the radioactive waste that is and will be on offer for storage. These changes deviate from the predictions which were made in the license request and EIS for the facility. They have necessitated the start of a new procedure in 1994 for a change in the license with the compulsory application of a new EIA-procedure. It is obvious that the new EIS does not need to duplicate most of the adequate environmental information which was presented in the previous EIS. Instead, the new EIS must concentrate on the changes that triggered the new procedure and their significance for the interest of the environment. For example, COVRA will be asked to accept large quantities of (very) low level radioactive waste produced by the ore and petrochemical industries. Upon decay of the radio-activity of these waste products, the COVRA facility would become a repository for what in essence is hazardous chemical waste.

Meanwhile, the National Energy Research Centre (ECN) in the Netherlands which is located in a coastal dunes area 50 km northwest of Amsterdam has kept a limited facility to temporarily store radioactive waste generated by a small nuclear reactor and related laboratory activities which are operated by ECN for research purposes as well as radioactive waste from the adjacent European Research Centre. In order to update the license for this facility, in 1994 ECN submitted a new license application accompanied by an EIA-procedure. The central issue in this EIA-procedure focused on the question whether ECN can operate a storage facility in line with the policy of the central government that COVRA should be solely responsibly for the operation of one centralized facility for all types of radioactive waste in the port area of Flushing in the southwestern part of the country. The EIS which was prepared by ECN dealt with this issue insufficiently and the impression was created that ECN wanted to operate a separate facility for mainly its own radioactive waste. The review of this EIS by the Commission for EIA and by the public noted this essential deficiency and recommended the preparation of a supplement to the EIS. The recommendation was accepted and ECN prepared the supplement. The public review of the EIS had brought about a change in policy of this research centre in that it decided to transport most radioactive waste directly to the COVRA facility except for that type of high level radioactive waste which will decay within a period of five years to low and medium level radioactive waste, after which shipment can take place to COVRA. Storage of such waste at the ECN-facility for periods up to five years has advantages from the environmental point of view. The supplement to the EIS clearly described this change in policy by ECN and the environmental consequences. This was confirmed explicitly in the review of the EIS and its supplement by the Commission for EIA. Hence, the license for the limited ECN-facility probably will be granted accordingly without further problems.

This experience clearly showed the added value of EIA in that it harmonizes the environmental interest of limited and short term storage of a specific type of

radioactive waste by ECN with the national policy emphasizing centralized storage by COVRA.

7.

CONCLUDING REMARKS

Since 1985 environmental impact assessment has been applied to the decision making about activities related to the disposal of radioactive waste in the Netherlands. Although the results of the application were not always entirely successful, the overall impact is favourable. The added value of EIA could have been greater if EIA had been applied to the site selection for the central surface facility concerning temporary storage for all types of radioactive waste in the Netherlands. A second lesson learnt is that public involvement is a sensitive but necessary requisite. It should be organized carefully, preferably with the assistance of a group of representatives from the public in the area of the proposed activity to guide public inputs. Lastly, it can be stated that independent reviewing helps focusing issues on relevant matters in line with high level political decisions. Also, independent reviewing can assist in settling controversial disputes between the competent authorities, the proponent and the public concerned.

7.1 CASE STUDY EXPANSION OF AMSTERDAM AIRPORT^{32]}

Jules J. Scholten

SECTION 1 - DESCRIPTION OF THE PROPOSAL

1. INTRODUCTION

Amsterdam international *airport* (Schiphol) is the fourth largest airport in Europe. The number of passengers arriving, departing or transferring between flights has grown steadily for many years, and recently more dramatically (from 15 million passengers in 1990 to 23.5 million in 1994). In order to achieve sustained growth and maintain Amsterdam's position among the major airports of Europe a number of decisions have been reached concerning the addition of a fifth runway. An environmental impact assessment (EIA) was carried out to support these decisions. The expansion will impact on the surrounding densely populated area and a number of nearby outdoor recreation areas.

The EIA was carried out in *tiers*. At first, EIA was applied at the *planning level*, concentrating on the decision whether to expand the airport or not. At the same time a second EIA was carried out for improvements to the present four-runway system to accommodate the growth in aircraft movements for the period up to 2003. When it became clear that a positive planning decision on the fifth runway would be reached, a third EIA procedure was started on the introduction of a five-runway system from 2003 onwards. This case study deals only with the EIA for the initial planning decision.

Before the start of the EIA for the planning decision two objectives were adopted as prerequisites for the formulation of alternatives:

- the alternatives must allow the airport to develop into a so-called 'main port', stimulating economic development and employment in the Netherlands which heavily depends on distribution services
- the environmental quality of the area around the airport must not be degraded, and opportunities for improvement considered

These two objectives conflict. The EIA had to demonstrate whether there were any options which could satisfy both objectives in a harmonious and compatible way.

The EIA procedure started with the publication of the notification of intent in September 1991. The specific guidelines for the environmental impact statement (EIS) were established in February 1992. The EIS was subsequently published in January 1994 and a supplement to the EIS was published in

32 Case Study prepared for the International Environmental Assessment Effectiveness Study.

December 1994. The major planning decision to expand the airport was made by Parliament in June 1995, following a Cabinet decision in February 1995.

This case study addresses the following: *defining the problem, scoping the environmental issues, consideration of alternatives within the project, impact identification and prediction, the significance of the impacts, public participation during the EIS review, the EIS review, and decision-making.* During the EIA many *specialist studies* were carried out. Two of these studies resulted in the adoption of *standards for aircraft noise disturbance during the night* and for *external individual risk* around the airport. One study concentrating on *health aspects* was set up as an ongoing study to monitor developments in public health around the airport.

2. NATURE AND SCOPE OF THE ISSUES

The major issue dominating the EIA and the decision on the proposed expansion of Amsterdam Airport concentrated on the question Can Amsterdam Airport be developed into a so-called main port while at the same time improving the quality of the environment around the airport? This challenging question was hotly contested by the many stakeholders and interested parties.

Party/Stakeholder involved	Position in the procedure	Reason for involvement and interest
The Ministers for Transport, Public Works and Water Management, and for Housing, Spatial Planning and the Environment; Parliament; the provincial government of North Holland	competent authorities	sustained economic growth of the main port and concern for environmental quality; improvement of landside infrastructure (road and rail)
The Ministers for Transport, Public Works and Water Management, for Housing, Spatial Planning and the Environment, and for Economic Affairs; the provincial government of North Holland	proponents	preparation of the EIS and the study on economic development
Amsterdam Airport	interested party (and proponent for the EIAs at the implementation level)	sustained growth of the airport and maintenance of major position in Europe
KLM Royal Dutch Airlines	interested party	KLM uses Amsterdam Airport as its home base

Party/Stakeholder involved	Position in the procedure	Reason for involvement and interest
Netherlands Railways	interested party	Amsterdam Airport has a direct rail connection to Amsterdam, The Hague, Rotterdam, Brussels, and other major cities, and will be a major stop in the European High Speed Train network.
Private enterprise represented by Chambers of Commerce	public participants	economic growth and business incentives
Population residing and working in and around the airport	public participants	environmental concerns; employment opportunities
Environmental groups	public participants	environmental concerns varying from local to global issues
Commission for EIA	independent adviser to the competent authorities	legal requirement to prepare advice on specific guidelines for the EIS and to review the EIS
Experts and scientists	advisers to the competent authorities, the proponents and the public participants	preparation of the many studies and comments on the studies

The main port objective was developed and specified during a separate study running parallel to the EIA about the economic development of the airport (see Chapter 5.2). The main port principle is based upon the assumption that in the near future international flights will serve only a limited number of airports (main ports). Intercontinental travellers will first have to take regional flights to a main port and then transfer to intercontinental flights. The environmental objective was developed and specified in the course of the EIA in terms of four major environmental aspects: noise – particularly aircraft noise, air pollution, smells, and external safety (see chapter 5.4 of this case study).

3. PROCESS AND PROCEDURAL CONTEXT

3.1 Legal framework

The Dutch EIA system is based on law as laid down in the Environmental Management Act and the EIA Decree. Compliance with the process is mandatory for all proposed actions listed in the EIA Decree according to threshold levels (eg construction of a new runway for an airport exceeding a length of 1800 meters and resulting in a change in the noise zone around the airport). The main objective of the application of EIA as stated in law is to guarantee equal importance for environmental interests in decisions about activities likely to have significant impacts on the environment. Additional objectives are to create and promote an environmental attitude among stakeholders in the decision-making process and to streamline decision-making procedures through co-ordination. Although the application of EIA to certain designated actions and activities is mandatory, the results of the EIA have an advisory character and are not binding upon the decision.

Topics addressed in EIA include *environmental / bio-physical aspects, health matters, external risks, cumulative impacts and biodiversity effects. Landscape* (scenic beauty) and *heritage* (including archaeology) are also considered to be part of the environment. *Economic impacts* were excluded, and consideration of *sustainability* concepts is not mandatory. A study of *alternative solutions* to the proposed activities including *mitigating measures* is obligatory, and an alternative most favourable to the environment must be presented.

The EIA legislation provides for the application of EIA to all levels of decision-making, including *approval of certain plans and programmes, site selection, and licensing*. For certain actions and activities a *tiered assessment* is required, in particular for waste management and disposal and for the planning and implementation of physical infrastructure.

The EIA process includes *public scoping and review*. There is an *independent Commission for EIA* to advise the competent authority in each EIA procedure during the scoping and reviewing phases. There is a *right of appeal* for all stakeholders and interested parties in matters dealing with the EIA and alleged malpractice.

The Ministers for Environment and for Nature Conservation are responsible for the EIA legislation and regulations. In each EIA procedure the competent authority is the government body responsible for the decision for which the EIA is carried out. Competent authorities can therefore be either central and/or local government bodies. The EIA is linked to either the planning consent or site selection, or to the determination of applications for the relevant licenses.

3.2 The case study

In the case study the competent authorities are Parliament, the Minister for Transport, Public Works and Water Management, the Minister for Housing, Spatial Planning and the Environment, and the provincial government of North Holland. The proponents are these same two ministers, the Minister for Economic Affairs, and the provincial government of North Holland. The pertinent decisions in the case study are the partial revision of the National Structure Plan for Civil Aviation and the partial revision of the regional land use plan.

The EIA for the Amsterdam Airport expansion is the first attempt to obtain integrated planning consent for all the major development components: a new fifth runway (01LL-19RR, see Figure 1), two-directional approach and take-off for the fourth runway (01L-19R, see Figure 1), extension of the third runway to the south-west (06-24, see Figure 1), development of a new passenger terminal for the fifth runway, development of industrial areas, and planning of landside infrastructure for improved road and rail connections including a stop for the European High Speed Train linking Amsterdam to Brussels. The expansion of Amsterdam Airport is a major development costing billions of guilders.

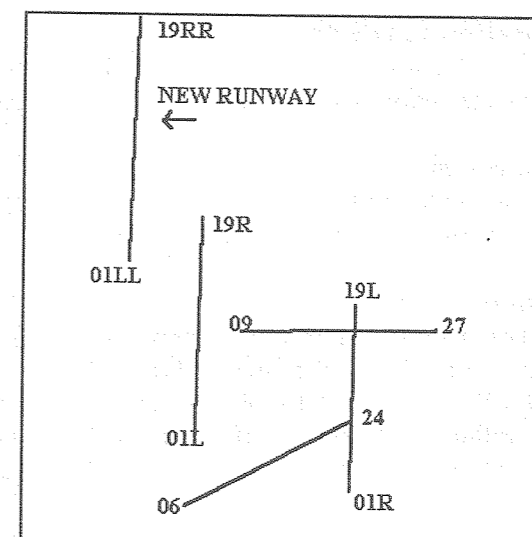


Figure 7. Runway layout Amsterdam Airport

SECTION 2 - CASE ANALYSIS

4. APPROACH TAKEN

Altogether seven stages can be distinguished in the case study:

Stage 1: Adoption of the two major objectives

Development and adoption of the two major objectives concerning main port development and the quality of the environment prior to the start of and during the economic and EIA studies.

Stage 2: Separate economic study and EIA, and integration of results

Separate studies on the economic aspects and environmental impacts, with continuous integration of the results and using economic data in the EIA.

Stage 3: Tiered decision-making and EIA

Tiered decision-making starting with EIA for the planning consent, followed by the issue of permits for the four-runway and five-runway systems.

Stage 4: Public scoping

Public scoping of the environmental objectives, alternatives, and environmental concerns.

Stage 5: Preparation of the EIS

Preparation of the EIS and comparison of all alternatives and criteria for the two major objectives, expressed as far as possible in quantitative terms.

Stage 6: Public review

Public review and, following the preparation of a supplement to the EIS on essential shortcomings, a second public review.

Stage 7: Decision-making

Following the two rounds of public review the decision was taken by the Minister for Transport, Public Works and Water Management, the Minister for Housing, Spatial Planning and the Environment, and the provincial government of North Holland, followed by the approval by Parliament of the partial revision of the National Structure Plan for Civil Aviation.

Each stage will be discussed briefly in terms of its efficiency in contributing to the clarity of information provided to aid decision-making.

5. RESULTS AND IMPLICATIONS

5.1 Stage 1: Adoption of the two major objectives

Prior to the start of the entire decision-making process for the expansion of Amsterdam Airport it was realized that clear objectives had to be set which could be used as a yardstick for testing the acceptability of the proposal. As this had to be done for both economic development and environmental concerns two major objectives were adopted:

- development of Amsterdam Airport into one of the few main ports of Europe
- no deterioration, and preferably an improvement, in the environmental quality of the area around the airport compared to the situation in 1990

The adoption of the two objectives clarified the position to all stakeholders from the start. The agreement on the objectives was prepared and concluded by the competent authorities, proponents, and some of the other stakeholders, including KLM and some local authorities in the planning area. The main port objective is elaborated in paragraph 5.2; the environmental quality objective is dealt with in paragraph 5.4.

5.2 Stage 2: Separate economic study and EIA, and integration of results

In this stage it was decided to carry out separate studies on the economic and environmental aspects of the proposed expansion, but to continuously integrate the results of the two studies. In order to achieve this the proponent set up two study teams with one supervisory management team. The economic study assumed three development scenarios: the 'European renaissance scenario' occupies the middle ground between a pessimistic scenario ('Business as usual') and an optimistic growth scenario ('Balanced growth'). The European Renaissance Scenario was considered to be the most likely to occur, and ensures a place for Amsterdam Airport among the few main ports in Europe. This scenario predicts that in the second decade of the 21st century Amsterdam Airport will accommodate about 40 million aircraft passengers (plus at least 5 million passengers via the European High Speed Train network), and that it will handle about 3 million tonnes of freight (1.2 million tonnes in 1994). The corresponding number of aircraft movements is estimated at about 430,000 annually (274,000 in 1994) of which about 23,000 (10,600 in 1994) by night, that is, between 23.00 p.m. and 06.00 a.m.

The criteria determining the main port character for Amsterdam Airport were defined in terms of airside capacity and punctuality during peak hours:

- during peak hours at least 100 take-offs and landings per hour under (almost) all weather conditions (using three runways)
- at least 70 landings per hour (using two runways)
- less than five per cent of the peak hour landings delayed for more than 15 minutes

Furthermore, the environmental study stipulated that additional terminal capacity (in total, at least 125 gates) and an improvement of landside infra-

structure (road and rail) are needed, including a stop for the future European High Speed Train.

The assumptions of the European renaissance scenario and the main port criteria were used as inputs to the EIA. In doing so, the competent authorities and proponents narrowed down the potential number of alternative solutions for the expansion to a manageable number of options. During the remainder of the decision-making process the adoption of the European renaissance scenario and the main port criteria were not seriously contested. However, most environmental groups maintained that the 'pessimistic' scenario should be adopted and adhered to in order to put an end to economic growth and reduce environmental pollution and its associated problems.

5.3 Stage 3: Tiered decision-making and EIA

Before the start of the process it was agreed that decision-making would be tiered and carried out in phases, as explained in Chapter 1. The planning decision is the most important as it permits the expansion while imposing major limiting conditions. The implementation decisions on licensing the four-runway and five-runway systems define the operational details and, in addition, provide an opportunity to elaborate any shortcomings that were not covered at the planning level. The license for the four-runway system must detail the improvement over the present situation up to 2003, when the fifth runway is due to be operational. The license for the five-runway system covers the situation from 2003 to 2015.

5.4 Stage 4: Public scoping

During the public scoping for the EIA for the planning decision the environmental objective was further elaborated, the alternatives defined, and the environmental concerns about impacts listed. It also became clear that standards would have to be developed for noise disturbance during the night and for external risk around the airport. The public were actively involved in the scoping, and the independent Commission for EIA also took part. The scoping resulted in specific guidelines for the content of the EIS.

The guidelines stipulated that the objective concerning the principle of no deterioration, and preferably improvement, in environmental quality around the airport is governed by criteria for four aspects: noise, air quality, smell, and external safety. Air pollution^{33]} (emissions from aircraft, road traffic and industry), smell^{34]} (mainly due to kerosine odour), and external safety^{35]} (related

33 The compounds and substances influencing air quality within a radius of 10 km around the airport are carbon dioxide, carbon monoxide, nitrogen oxides, sulphur dioxide, volatile organic substances and black smoke.

34 In the Netherlands the standard for exposure to odour is expressed as the average hourly concentration in 'odour units' per cubic meter. Contours are calculated and plotted for 98 and 99.5 percentiles for 1 and 10 odour units per cubic meter. However, there is no clear correlation between these contours and the percentage (continued...)

to aircraft crash risks in populated areas) should not rise above the 1990 level. The amount of noise disturbance must be reduced from the 1990 level. This led to the following criteria:

- a reduction in the number of existing dwellings inside the 35 Ke contour^{36]} from 15,000 in 1990 to 10,000 from 2003 onwards
- considerably fewer people inside the 20 Ke contour are highly disturbed by aircraft noise
- considerably fewer people inside the $L_{Aeq} 26$ dB(A) contour often disturbed in their sleep by night-time flights

The specific guidelines placed the alternatives in two main categories:

- alternatives improving the present four-runway system^{37]}, either as a temporary solution until 2003 or as a definite solution also after 2003
- alternatives including a five-runway system as a definite solution after 2003

All alternatives must aim to meet the two major objectives; as a minimum at least the alternative most favourable to the environment must meet the environmental objective. During the scoping, the public raised their concerns about public health in the area. The scoping guidelines therefore recommended that a public health survey and monitoring programme be started to investigate the potential relationship between public health and airport operation. The programme was scheduled to continue into the post-decision stage of the procedure.

34 (...continued)

of persons residing within these contours affected as this is dependent upon both the sensitivity of individuals and the type of odorant.

35 For external safety individual and group risk are calculated. Individual risk is the annual chance that a person permanently residing in one place will die as a result of an aircraft crash. Individual risk is expressed and plotted in IR (individual risk) contours: 10^{-5} , 10^{-6} and 10^{-7} . In the case of airports in the Netherlands the 10^{-5} IR contour is the main standard for external safety. Group risk is defined as the annual chance that a group of persons permanently residing in one place will die as a result of an aircraft crash. Group risk cannot be expressed in contours but is expressed in FN diagrams (F = chance, N = Number of terminally wounded victims).

36 By law, a 'Ke-noise zone' and a separate ' L_{Aeq} night noise zone' have to be drawn around each airport in the Netherlands. The noise load related to disturbance caused by aircraft is expressed in 'Kosten-units' (Ke). This unit takes into account the maximum A-weighted noise levels (LA_{max}) of aircraft, the total number of fly-overs per year, and weighting factors for early morning, evening and night-time flights. The percentage of the population highly disturbed by aircraft noise roughly equals the Ke value minus 10 (eg at 35 Ke 25 per cent of the population suffers high noise disturbance). Ke contours are computed for values of 20 Ke and higher. The outside limit of the Ke noise zone around airports is the 35 K contour. The construction of new housing is prohibited within this contour. Buildings inside the smaller 40 Ke contour will be insulated. The noise load related to sleep disturbance caused by night-time flights was determined in a study running parallel to the EIA. It is expressed in the A-weighted equivalent noise level (L_{Aeq}) caused inside bedrooms (windows closed) by aircraft movements between 23.00 a.m. and 06.00 p.m. during the course of one year. The limit for the night-time noise zone is set at $L_{Aeq} 26$ dB(A) inside bedrooms (which equals about 48 dB(A) outside). At this level, about 20 per cent of the population often experience sleep disturbance by overflying aircraft. Inside the night noise zone, but outside the 40 Ke contour, only bedrooms will be insulated. These noise zones have been computed according to the expected use of the airport. Actual noise levels will be monitored, and will not be allowed to exceed the computed levels indicated by the contours within the two noise zones.

37 Four runways appears to be high for the size of Amsterdam Airport. It must be noted, though, that most runways are not (fully) used in both directions owing to environmental limitations. The airport is surrounded by major residential areas, some of which are very close.

The scoping generally satisfied most stakeholders and participants because it clearly focused on the major issues, concerns, and potential alternative solutions.

5.5 Stage 5: Preparation of the EIS

The EIS, which was published in January 1994, presented most of the information asked for in the specific guidelines in a clear manner, with lots of tables, diagrams and maps. The most useful part of the EIS are the tables comparing all alternatives with the 1990 bench-mark year and the situation which would develop over the years if no action is taken. However, due to its volume and complexity the mass of information was overwhelming, and the non-specialist could easily lose track of its significance.

The EIS clearly stated that the combination of main port and environmental objectives cannot be met at all by the present four-runway system, and that an additional runway is needed. This fifth runway will reduce the need to use approach and take-off routes over densely populated areas, mainly Amsterdam and its suburbs (to the north-east, east and south-west of runway 09-27, and north of runway 01L-19R). A fifth runway would also allow the closure of runway 01R-19L, which is close to the town of Aalsmeer, during the night-time period.

In the EIS it is reported that only two of the four criteria for the environmental objective differ substantially between the various alternatives: noise and external risk. There is no significant differences for air quality and smell. At the start of the EIA the preferred alternative (see Figure 1) scored well with regard to noise disturbance from aircraft (also during the night-time) and to smell. However, a standstill in air pollution (no increase on 1990 levels) appears only to be possible if emissions from road traffic can be reduced; this seems rather unlikely. External risk can only be improved within the 10^{-5} individual risk zone around the ends of the runways if a small number of houses within this contour are demolished. The number of people living within the individual risk contours 10^{-6} and 10^{-7} will increase. Some of the other alternatives, including of course the alternative most favourable to the environment, perform somewhat better in 'improving the quality of the environment', but they require more space and are more expensive than the preferred alternative. None of the alternatives is able to meet all the criteria for the environmental objective. The preliminary results of the survey looking into the potential relationship between public health and airport operation did not yield any significant correlation, with the exception of sleep disturbance and related health problems associated with night-time flights.

5.6

Stage 6: Public review

The public review of the EIS for the planning decision started in January 1994 and lasted until August 1994. The review included several public hearings at various locations. In spite of the impressive amount of information it appeared that the EIS still had some serious shortcomings. The Commission for EIA listed these shortcomings in a review report published in August 1994, recommending that a supplement be prepared on these subjects before proceeding with the decision. In the first place, the shortcomings concerned noise disturbance from night flying. In the EIS the noise impact from night flying was only described for conditions pertaining to the standard – the period between 23.00 p.m. and 06.00 a.m., and assuming that bedroom windows are closed. The Commission recommended describing noise impacts and related sleep disturbance for a longer night period (from 22.00 p.m. until 08.00 a.m.) with slightly opened bedroom windows. According to the Commission, the longer night period and open bedroom windows is a better representation of the real situation. Moreover, the Commission noted that different assumptions were used in the calculations for the noise contours and for the IR contours. The Commission recommended that the IR contours be recalculated using identical assumptions. The Commission also recommended describing two more alternative five-runway systems put forward by environmental groups and the public.

The recommendations were accepted by the competent authorities and the requested additional information was presented in a supplement to the EIS. The supplement was published in December 1994 and subjected to a second round of public review. The supplement and the review triggered a discussion about the length of the night period for the airport, as the supplement to the EIS showed a considerable increase in noise disturbance with a longer night period. The recalculations for the IR contours in the supplement to the EIS revealed that all IR contours for the preferred alternative showed adverse results compared to the situation in 1990, whereas in the EIS it was predicted that the IR contour 10^{-6} would show an improvement. The two additional alternatives that were added to the range of alternatives did not show an appreciable advantage over the preferred solution or any of the other alternatives.

5.7

Stage 7: Decision-making

In June 1995 Parliament eventually decided in favour of the proposed activity: extension of the third runway (06-24) by 250 meters, dual approach and landing facilities for the fourth runway (01L-19R), and construction of a fifth runway (01LL-19RR) for operational use in 2003. The following conditions were set:

- An absolute ceiling to the growth of the airport (approximately 40 million passengers annually, but not exceeding 44 million).
- An absolute ceiling on the number of dwellings (10,000) located within the 35 Ke-noise zone.
- An absolute ceiling on the number of people (43,000) living within the 20 Ke-noise zone suffering a high level of disturbance from aircraft noise.

- Extension of the night period from 06.00 to 07.00 a.m. During the night period there is restricted use of runways. The extended night period will be tested for three years after which a decision will be made about formalizing the extension³⁸].
- Expansion of the 'no construction zone' outside the 35 Ke noise zone, where in principle no new construction will be allowed. The outer limit of this zone coincides approximately with the 30 Ke contour and the 10^{-6} individual risk contour.
- Establishment of an external safety zone delimited by the 10^{-5} individual risk contour. Inside this zone some existing houses will be demolished in order to meet the standstill principle.

6. LESSONS LEARNED

1. It proved valuable to aim for quantitative objectives prior to the start of the decision-making procedure. Additional clarity was achieved by specifying and quantifying the objectives, both in terms of economic development and environmental aspects. The decision to separate the economic analysis from the EIA, but to continually integrate the results of both studies, also turned out to be a good approach.
2. The scoping proved to be an essential exercise as it specified the objectives and the alternatives, and it triggered the special study on the relationship between public health and airport operation.
3. The EIA process, the review of the EIS, and the supplement to the EIS demonstrated that execution of the preferred alternative will reduce most current environmental impacts. Accounting for the fact that from 2002 only the least noisy aircraft will be permitted to operate in Europe, and that construction of the fifth runway will allow a noise-preferential use of runways, the number of existing dwellings within the 35 Ke zone will be reduced by one third compared to 1990, despite the expected growth in air traffic. Also, the number of dwellings within the L_{Aeq} 26 dB(A) night zone will be reduced compared to 1990 and the principle of standstill will be met with respect to disturbance by odours (smell). Nevertheless, the EIS revealed that no alternative exists that is able to fully satisfy all the criteria for the environmental objective. Maintaining air pollution at the 1990 level can only succeed if there is a reduction in emissions from road traffic. The standstill principle for external safety cannot be met for the areas within the IR contours 10^{-6} and 10^{-7} , and can only be achieved for the area within IR contour 10^{-5} by demolishing some buildings. It can therefore be concluded that the aim of meeting all criteria for the environmental objective was too ambitious.
4. The environmental objective stimulated the stakeholders to actively search for mitigating measures. The most important of these measures is the extension of the night period from 06.00 until 07.00 a.m., during which the

38 The period between 06.00 and 07.00 a.m. is an important part of the day for Amsterdam Airport; many intercontinental flights land at the airport during this hour.

use of the runways is restricted. This was also due to the insistence of the Commission for EIA and many pressure groups that a night period from 23.00 p.m. until 06.00 a.m. was too short, and unrealistic. Furthermore, it is important that the EIA and the review of the EIS helped to set absolute ceilings on the growth of the airport and thereby on the level of environmental impacts affecting the area around the airport.

5. The EIA generated long-term benefits in that it questioned the methods of calculating noise disturbance (both the Ke and the L_{Aeq} method). Work has started on improving these methods, and a new method for assessing noise disturbance to outdoor recreation is being developed as well. As a result of the EIA a long-term survey was started to investigate the potential relationship between public health and airport operation. This was, and still is, a major concern of the population in the area.
6. A tiered application of EIA, first addressing the planning decision followed by EIA for the licensing decisions, proved to be a good approach. The planning decision was the most important as it focused on the principle of airport expansion. The EIA for the planning decision proved to be the essential step in the consideration of environmental impacts.

SECTION 3 - REFERENCES

7. KEY REFERENCES AND INFORMATION SOURCES

Project classification: Transportation, airport

Effective features of the EIA:

- a. EIA components: definition of the problem, scoping the environmental issues, consideration of alternatives, impact identification and prediction, significance of impacts, public consultation during EIS review, EIS review, decision-making.
- b. Specialist studies: bio-physical (with emphasis on noise disturbance, external safety, air pollution and smell), socio-economic (carried out separately from the EIA), public health aspects.
- c. Other aspects: tiered application of EIA at the planning and implementation levels, matters of sustainability and cumulative impacts (particularly from different sources of noise).

7.1 Project details

Date of preparation of case study: October 1995

Project name: Expansion of Amsterdam Airport

Project location: urban/rural

Project sector: public

Project Funding

Agency: Central government

Project proponent: The Ministers for Transport, Public Works and Water Management, for Housing, Spatial Planning and the

Environment, and for Economic Affairs; the provincial government of North Holland.

Organization
producing the EIS: PMMS – *Project Mainport en Milieu Schiphol*^{39]} (Project Main Port and Environment Schiphol) Address: c/o Ministry of Transport, Public Works and Water Management, P.O. Box 30945/600, 2500 GX The Hague, The Netherlands.

7.2 Relevant published papers

1. Expansion of Amsterdam Airport, Advice for Specific guidelines by the Commission for EIA, Utrecht 4 December 1991. Available from the Commission for EIA at the above address (in English).
2. Specific Guidelines for the EIS Expansion of Amsterdam Airport, February 1992. Established by the co-ordinating competent authority the province of North Holland. Available from the Province of North Holland, P.O. Box 123, 2000 MD Haarlem, The Netherlands (in Dutch).
3. EIS Expansion of Amsterdam Airport, main report, executive summary and technical reports, January 1994, PMMS. Available from the Ministry of Transport, Public Works and Water Management at the above address (in Dutch).
4. Supplement to the EIS Expansion Amsterdam Airport, December 1994, PMMS. Available from the Ministry of Transport, Public Works and Water Management at the above address (in Dutch).
5. Advisory review of the EIS and the supplement to the EIS, 23 August 1994 and 30 January 1995, Commission for EIA, see above address (in Dutch).
6. National Spatial Planning Key Decision (*Planologische kernbeslissing*), Expansion of Amsterdam Airport, Part 3 and 3a Cabinet Decision, February and June 1995. Available from the Ministry of Transport, Public Works and Water Management at the above address (in Dutch). The Parliamentary approval, Part 4.
7. Partial Revision of the Regional Plan Amsterdam Noordzeekanaal Gebied (Haarlemmermeer/Schiphol) 1995. Available from the Province of North Holland at the above address (in Dutch).
8. F.W.J. van Deventer. 1995. Schiphol Airport-Mainport and Environment. Paper presented at the Environmental Management Workshop of the Airports Council International, Pacific Region from 8-10 August 1995, Vancouver B.C., Canada. Available from F.W.J. van Deventer, Ministry of Housing, Spatial Planning and the Environment, P.O. Box 30945, 2500 GX The Hague (in English).

39 Schiphol is the name of Amsterdam Airport.

7.2

CASE STUDY NEW RESIDENTIAL AREAS IN ZAASTAD, THE NETHERLANDS^{40]}

Marja van Eck

SECTION 1 - DESCRIPTION OF THE PROPOSAL

1. INTRODUCTION

In January 1992 Zaanstad, a town to the north of Amsterdam, had 130,000 inhabitants, 52,000 houses and provided 45,000 jobs. 5000 new homes were still planned, but the space for all this new development and its associated infrastructure still had to be found. Since the eighties the municipality of Zaanstad has had clear ideas about the direction new residential developments in their town should take. Nevertheless, there was opposition and much discussion about alternative options, particularly involving nature conservation interests.

In 1992 the provincial government decided to close the debate by carrying out an EIA for the decision to revise the Regional Development Plan (*Streekplan Amsterdam-Noordzee-kanaalgebied*) for the Zaanstad area. As this was the third EIA for residential areas the province of North Holland would carry out, they decided to draft the EIS without the help of an external consultant. The EIA procedure was completed in the summer of 1994, when the partial revision of the Regional Development Plan was adopted.

The focus of this case study is on:

- training, education, and communication
- selecting and comparing alternatives
- decision-making (selecting the best level for EIA)

2. THE NATURE AND SCOPE OF THE ISSUES

Environmental issues

The rural area around Zaanstad is of well-known ecological, scenic and heritage value. Noise pollution is an issue because of the site's proximity to Amsterdam International Airport. Car use was also an important consideration; some sites had better access to public transport than others.

The parties involved

Five main groups were party to the EIA process:

- the provincial government of North Holland as proponent

40 Case Study prepared for the International Environmental Assessment Effectiveness Study.

- the provincial government of North Holland as competent authority
- the population residing in and around the area of Zaanstad, interested environmental groups (NGOs), and other municipal councils involved as public participants
- the Commission for EIA as independent adviser to the competent authority, with the legal duty to advise on specific guidelines for the EIS and to review the EIS
- the Inspectorate for Environmental Protection and the Directorate for Agriculture, Nature Management and Recreation (regionally organized government institutions under the responsibility of the Ministries for Environment and Nature Management) in their capacities as other legal advisers in the EIA procedure

3. THE PROCEDURAL CONTEXT

Dutch EIA procedures are laid down in the Environmental Management Act and the associated EIA Decree. The Ministers for Environment and Nature Management are responsible for the EIA legislation and regulations.

The main objective of the application of EIA as stated in law is to guarantee that environmental interests receive due consideration when decisions are taken on activities likely to have a significant impact on the environment. Additional objectives are to create and promote an environmental attitude among the stakeholders in the decision-making process, and to streamline the decision-making process by adopting a co-ordinating role. Although EIA is mandatory for certain designated activities, the results of the EIA are advisory and not binding upon the decision.

In each EIA procedure the competent authority is the government body responsible for determining the application for which the EIA is carried out. These competent authorities can be from either central, regional or local government.

Compliance with the process is mandatory for all proposed actions listed in the EIA Decree, according to a set of threshold criteria. In the Netherlands there is no separate screening phase as this is incorporated in the EIA Decree.

Each EIA procedure starts with the publication by the project proponent of the 'notification of intent', a document defining the proposed activity or policy. The competent authority (which can in some cases be the same government body as the proponent) gives the Commission for EIA the opportunity to recommend specific guidelines for the content of the EIS. The Commission, an independent scientific and advisory body funded by the Ministers for the Environment and Nature Management, takes the result of public participation into account when formulating its advice. This is regarded as the scoping phase of the procedure. The competent authority, having considered the Commission's advice, then adopts the final guidelines for the EIS, informing those contributing to the public participation process of the reasons for their decision.

The EIS is compiled by the proponent, usually in practice being undertaken by a consultant commissioned by the proponent. A draft plan or license application containing relevant information on the proposed activity or plan is drawn up at the same time. These documents are jointly published for public participation after an initial screening by the competent authority. The Commission for EIA submits an advisory review of the EIS to the competent authority, incorporating the results of public participation. The Commission reviews whether the EIS provides sufficient information to allow environmental interests to be fully represented in the final decision; the acceptability of the proposed activity as such is not judged by the Commission. The competent authority decides on the proposal, taking into account the information contained in the EIS, the advice given by the Commission for EIA, and the results of public participation. The final decision must also contain a programme for post-project analysis to be carried out after the proposed activity or plan has been implemented. There is a right for appeal for all interested parties in matters dealing with the EIA and alleged malpractice.

Issues addressed in an EIA may include environmental, biological and physical aspects, health matters, external risk, cumulative effects, and biodiversity impacts. Landscape (scenic beauty) and heritage aspects (including archaeology) are also considered part of the environment. Consideration of sustainability concepts is not mandatory, and economic impacts are not included. Alternative solutions to the proposed activities must be studied, including mitigating measures, and an 'alternative most favourable to the environment' must be identified and described.

The EIA legislation provides for the possibility of applying EIA to all levels of decision-making, including the adoption of certain plans and programmes, site selection, and license applications. For certain activities there must be a hierarchical system of assessment, particularly for waste management and disposal and the planning and implementation of physical infrastructure.

In the case of residential areas the EIA Decree sets a threshold value of 4000 dwellings in formally designated urbanized areas and 2000 dwellings elsewhere. Although EIA could be useful to support the design decisions taken at the local level as well as helping with site selection at the regional level, Dutch law makes EIA mandatory for 'the first formal spatial plan' that deals with a new residential area. This means that EIA is carried out only once, but while there is still enough flexibility to choose the appropriate level for EIA. (See also Section 2, Approach 4.)

SECTION 2 - CASE ANALYSIS

4.

APPROACHES TAKEN

Approach 1: In-house EIS

EIA was carried out according to normal Dutch EIA practice with only one exception, the most interesting features of this case study. The provincial government decided not to hire an external consultant to compile the EIS but to commission its own employees to do the job instead. As pointed out earlier, this was the third EIA for residential areas within this province, and the former EIAs appeared to have caused considerable turmoil and irritation between consultants and civil servants, and also between the planning and the environmental departments within the provincial administration. By co-operating well on the design, the EIS staff from different departments and disciplines grew to understand one another better. As the provincial government was both proponent and competent authority in this EIA - and also the author of the EIS - the Commission for EIA's job of ensuring objectivity and monitoring the quality of information in the EIS was particularly important.

Approach 2: Range of alternatives

The provincial Director for Agriculture, Nature Management and Recreation strongly opposed the idea that ecologically important sites be considered in the EIS as possible areas for future residential development. Other parties thought the value of these sites could well be measured against other relevant environmental aspects in the EIS, and saw no reason to exclude these areas beforehand. In the Zaanstad case no alternatives were excluded beforehand, the competent authority maintaining an open mind towards the outcome of the EIA.

Approach 3: Methodology for constructing and comparing alternatives

Plans for urban development are usually based on well-known principles of land use planning, such as concentration, dispersion, ring, ribbon, honeycomb et cetera. With the introduction of EIA for these projects, there was a widely felt need for a more environment-based approach to be used alongside, or instead of, the usual design models, especially for the creation of environment-friendly solutions.

The first step in such an approach consists of identifying all possible locations suitable for future development. Ideally, the total area identified is three times larger than that actually needed for the planned houses, facilities and industry. This allows enough room for a range of solutions. In the second step, sub-areas with similar characteristics are distinguished. Scores are attached to the sub-areas for a number of factors indicating their suitability for urban development. A computer programme for multi-criteria analysis can sometimes be a helpful tool in more complex situations. The suitability criteria are organized around environmental objectives such as:

- preservation of ecological and scenic values
- quality of life for existing and future residents
- control over mobility
- consumption of economic space

Sub-areas with high scores on each of the objectives are combined in different environmental models, for example 'mobility control model'. Each model indicates a possible future development, assuming priority is given to that particular environmental objective. Further analysis and discussion will lead to the construction of one or two environment-friendly models, combining areas with high scores on several aspects. These models are to be further elaborated and optimized by adding extra mitigating measures to counteract the remaining expected environmental impacts. Models resulting from this approach often differ fundamentally from the models proposed earlier based on land use planning principles or local authority agreements.

To illustrate, an example is given of criteria that have been used in a multi-criteria analysis for a site-selection EIA. The criteria are drawn from a comparable EIS for the region Eindhoven-Helmond (March 1994) as these are more recent and also more generally applicable than the ones used in Zaanstad.

List of criteria and relative weights:

Conservation and development of scenic and heritage values (100%)

- a1. loss of areas/elements/structures of geomorphological/ geological interest (20%)
- a2. loss of variety in landscape (30%)
- a3. loss of cohesion in scenic structure (30%)
- a4. loss of heritage and archaeological values (areas and elements) (20%)

Soil and water (100%)

- b1. influence on groundwater, excessive drainage (40%)
- b2. dispersion of pollution in groundwater and soil (20%)
- b3. risk of damage through subsidence of the soil (10%)
- b4. situation in or near groundwater conservation areas (30%)

Nature conservation and development (100%)

- c1. loss of areas that are valuable for (avi)fauna (12.5%)
- c2. loss of areas that are valuable for flora and vegetation (12.5%)
- c3. disturbance in valuable areas (40%)
- c4. fragmentation of ecological structures (35%)

As these three groups of criteria are often interrelated, usually one model is constructed dealing with all the above-mentioned values.

Quality of life (100%)

- d1. noise disturbance (traffic, industry, airport) (30%)
- d2. scenic surroundings (20%)
- d3. safety (20%)
- d4. access to services (20%)
- d5. disturbance to existing residents from new housing estates (10%)

Mobility (100%)

- e1. distance to train station (25%)
- e2. distance to other public transport (15%)
- e3. distance to main road (10%)
- e4. distance to employment (20%)
- e5. distance to educational facilities (10%)
- e6. distance to shops (20%)

Land use (100%)

- f1. loss of farming land (40%)
- f2. effects upon underground cables and pipes (20%)
- f3. loss of recreational areas (40%)

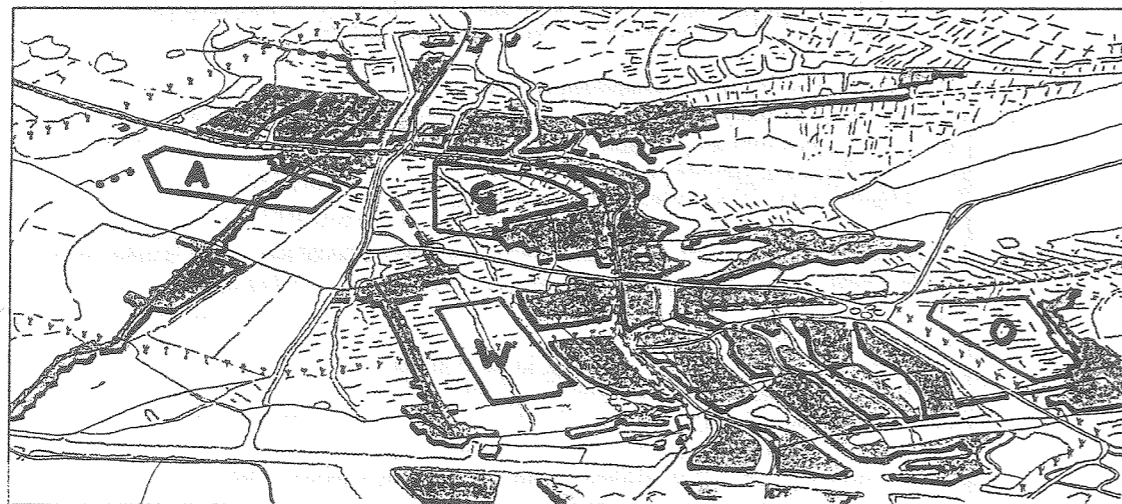
The following factors dealing with sustainable development may also be added (used in the strategic EIA for urban development at the national level, 'VINEX Update', March 1996):

Economic use of resources

- g1. possibilities for the sustainable use of energy
- g2. possibilities for the sustainable use of water
- g3. construction material (sand) for preparation of the building site
- g4. economic land use
- g5. flexibility for future decisions concerning sustainability

Each criterion can only be measured after defining the parameters that lead to negative or positive scores. For instance, the criterion 'distance to railway station' is measured by circles on the map: a distance of less than 1 kilometre gives a positive score (+), 1 to 4 kilometres a neutral score (o), and more than 4 kilometres a negative score (-).

In Zaanstad four main development trends for urban development were considered feasible: Assendelft-Noord, Guisveld, Westzijderveld, and Oostzanerveld (see illustration). The designated areas were divided into three sub-areas, each with about 1500 houses. Multicriteria analysis was applied to study each possible combination allowing the construction of 5000 new houses.



Approach 4: Level of decision-making

In the Netherlands, plans for future urban growth are usually not restricted to the area of only one local authority. Some municipalities are faced with a lack of space for further growth, so they depend upon neighbouring authorities to supply new residential or industrial areas. Consequently, EIA for new residential areas is usually carried out at the regional level, the provincial government acting as both proponent and competent authority. In the case of Zaanstad the provincial government acted as a mediator in the discussion between the municipalities and the other parties involved.

5.

RESULTS AND IMPLICATIONS

In-house EIA

The task of preparing an EIS 'in house' leads to a better recognition of environmental issues in the planning department. There is much more experience of the use of EIA within the civil administration at provincial level, allowing the provision of more effective support to the decision-makers. However, it should be noted that this can only be of lasting benefit if several EIAs are in the pipeline; in other situations it is better to hire consultants for expertise on EIA matters. There must also be a way to safeguard the objectivity of information in the EIS. In this case this task was performed by the independent Commission on EIA.

Alternatives

In the final comparison of alternatives the province decided to give priority to ecological values, as impacts on these values would be irreversible and difficult to mitigate. The following relative weights were used:

- scenic and heritage values (20%)
- soil and water (20%)
- nature conservation and development (40%)
- quality of life (10%)
- mobility (10%)

As a result, the alternatives affecting important nature values (Guisveld, Oostzanerveld and to a lesser extent Westzijderveld) proved to be second best. But the preferred alternative (Assendelft) also has important drawbacks to be dealt with relating to its proximity to Amsterdam Airport. Sensitivity analyses proved that Guisveld and Oostzanerveld were not attractive under almost any combination of weights. Combinations of sites were regarded disadvantageous because these would affect two areas instead of one.

Support for decision-making

The open attitude adopted in this case towards alternatives facilitated the discussion among all the parties involved. The decision taken met with improved general (public) support.

Because the EIA was carried out and the decision was taken at the provincial level the dispute between the local authorities was settled.

6.

LESSONS LEARNED

The approach taken in the EIA for Zaanstad was the result of earlier lessons from other regions in North Holland. The first EIA for residential areas (for the town of Purmerend) was carried out at the provincial level, although one of the potential sites had already been adopted in a municipal local plan as the preferred location. Formally, this municipal plan was not subject to the EIA regulations as it was presented as a so-called 'sketch plan' and not as a formal local land use plan. In practice, it proved difficult for the provincial government to convince the local authority to choose another site, especially as the EIS showed that there was little difference between the alternatives on environmental grounds. Indeed, many people viewed this EIA as a waste of time because the decision had apparently already been taken.

The second EIA in North Holland for residential areas (in the region of Alkmaar, Heerhugowaard and Langedijk) was timed better. The EIS was compiled by a consultant and accepted by the provincial government. Then it was shelved while the provincial planning department worked on a completely new layout for the area, which was then incorporated into the draft development plan. When the Commission reviewed the EIS, it noticed that this design was not covered by one of the alternatives in the EIS, and that consequently the environmental impacts had not been described. The Commission recommended that a supplement to the EIS be prepared; this was not satisfactorily completed. The Regional Development Plan was eventually adopted almost unchanged.

Although compared to these earlier experiences, the EIA for Zaanstad was generally regarded as being successful, the following remarks can be made. In the Zaanstad EIA the municipalities had no formal role in the EIA process and the decision-making. Their only possible influence was through public participation. In more recent EIAs (for example in Eindhoven-Helmond) another approach was adopted: the EIA proponent is represented by a group of government bodies in which the provincial government and the municipalities are represented. In this situation the municipalities have a formal role as proponent, whereas the final decision is taken by the provincial government. This is a generally more satisfactory approach as the municipalities will eventually be responsible for realizing the plans.

The Zaanstad case also provides a methodological lesson. Multicriteria analysis was considered useful to deal with the complexity that was introduced by subdividing the selected areas into three parts, thus creating a multitude of possible alternatives. If the conclusion in Chapter 5 that combinations were considered to be disadvantageous was reached earlier, the use of MCA might not have been necessary.

The other 'lessons learned' have already been discussed above in (5) Results and implications.

SECTION 3 - REFERENCES

7.

KEY REFERENCES AND INFORMATION SOURCES

Project classification: Residential land use

Date of preparation of case study: March 1996

Details of the project:

Project name: Residential areas Zaanstad

Project location: Zaanstad, The Netherlands

Project region: Urban and rural

Project sector: Public

Project funding agency: Government

Project proponent: Provincial government of North Holland

Organization/company: -

Contact address: Postbus 6090, 2001 HB Haarlem, The Netherlands

Author of EIS: Project team MER-Onderzoek, provincie Noord-Holland

Name of organization: *idem*

List of relevant published papers and other source material

- Startnotitie m.e.r. Zaanstad, provincie Noord-Holland, March 1992
- Advies voor richtlijnen voor de inhoud van het milieu-effectrapport woningbouwlocaties partiële herziening streekplan Noordzeekanaalgebied, Commissie voor de milieu-effectrapportage, May 1992
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Reinoud Post

1. INTRODUCTION

The independent Dutch Commission for Environmental Impact Assessment (the Commission for EIA) was appointed in July 1993 to advise the Directorate-General for International Co-operation (DGIS) of the Netherlands Ministry of Foreign Affairs. The Directorate is the authority competent to decide on funding or co-funding of bilateral and multilateral projects, and has been applying environmental impact assessment (EIA) for international development projects since 1991. The responsibility for scoping and reviewing the environmental impact statements (EISs) therefore also lies with the Directorate.

The Commission for EIA was created by law in 1986 as an independent body charged with guaranteeing the scientific quality and completeness of the EISs which are prepared in accordance with Dutch legislation. Although no legislation governs the use of EIA for development projects, and so consequently there is no legal basis for involving the Commission, the DGIS has decided to make use of the Commission's expertise. Co-operation between the Ministry and the Commission is based on an agreement entered into in July 1993 and covering a period of three and a half years. During 1996 the DGIS will evaluate the experience gained with EIA in international co-operation, and decide whether to extend the agreement. The Commission provides advice on scoping guidelines and the evaluation (review) of EISs, and on a more informal basis on screening projects for EIA.

This paper describes the composition and functions of the Commission and its work in the field of international co-operation. It then discusses the characteristics that distinguish EIAs carried out under one set of legislation from those for projects requiring co-operation between donor countries or international funding organizations on the one hand and recipient countries on the other. Finally, it reviews the Commission's initial experiences as a consultant for the DGIS.

To date, fifteen advisory reports have been submitted on twelve projects. Of these fifteen reports eight are advisory reviews of EISs. A full EIA cycle has been completed for only two projects so far, and so the utmost caution should be exercised when drawing conclusions on the effectiveness of EIA.

41 Paper presented at the 1996 Annual Conference of the International Association for Impact Assessment (IAIA '96) in Portugal, 20-22 June 1996.

2. THE INDEPENDENT COMMISSION FOR EIA

2.1 What is the Commission?

The Commission is founded on two principles: expertise and independence. The required expertise is of course also available within the other parties involved in the decision-making process: the competent authority, the proponent, and the public. However, it is the combination of expertise and an independent position which allows the Commission to review all environmental information in an unbiased way. In order to achieve this, the Commission has been granted a formal status in the national legal framework; it has a presidium consisting of a chairman and several deputy chairmen, and a secretariat which includes about 30 staff members, including 15 technical secretaries. The Commission has about 200 members and 200 advisers: experts in all environmental fields ranging from air, soil and water pollution to ecology, hydrology, geology, archaeology, radiation, acoustics, visual landscape impacts, including expertise on the technical and physical planning aspects of activities subject to EIA. In addition, the Commission can call upon experts from a range of related fields including environmental law, social psychology, environmental economics, land reclamation and consolidation, transport, waste disposal, energy generation and consumption, and environmental health. If the knowledge required to assess a specific problem is not readily available amongst the members and advisers, other specialists can be called upon, if necessary from abroad. In short, the Commission is able to field any expertise required for any EIA. In July 1993 a department for development co-operation was formed in the secretariat which now has a file of approximately 425 experts in the Netherlands and abroad with experience in development co-operation.

2.2 Procedures for EIA in international co-operation

The Commission's advisory role on EIA in the Netherlands is governed by legal requirements. The Commission must report within nine weeks of a formal request for advice. For international co-operation projects the Commission adheres to a term of 12 weeks from receipt of the request for advice to the date of its submission. The secretariat forms a multidisciplinary working group containing the expertise specifically required for the type of project concerned. In most cases one or more experts from the recipient country are asked to participate in the activities of the working group, which is chaired by one of the deputy chairmen of the Commission. In addition to chairing the meetings, the chairman co-ordinates the collection of scoping information. The technical secretary and the chairman put together the working group, and organize a site visit if this is appropriate and feasible. If the requests for advice on scoping guidelines (or 'terms of reference') the working group may visit the site(s) of the project and hold discussions with stakeholders and other interested parties prior to submitting recommendations. A site visit may also prove necessary if the request concerns the review of an EIS for which the terms of reference were not based on advice from the Commission. The competent authority is always given the opportunity to comment on the draft report prior to its submission.

The procedure followed by the Commission has both advantages and disadvantages. Experience to date confirms the following advantages:

- The involvement of a chairman adds credibility and objectivity to the advice.
- The chairman and technical secretary provide a collective memory, ensuring consistency in reporting.
- The format also ensures coherence between recommendations, particularly if the experts are not EIA specialists. The experts can focus on their field of expertise and not bother about the structure of reporting and editing, which is taken care of by the secretary.
- The inclusion of local expertise in the working group has opened up sources of information which would not otherwise have been available to a working group of exclusively donor country experts.
- The site visits (generally taking one to two weeks) have provoked such intense interaction between the members of the working group and the people they talked to that a collective and well-balanced line of thinking develops, which is in turn reflected in the final advice submitted by the working group.

A disadvantage is that the format of the working groups – consisting of a chairman, technical secretary and experts – might be considered excessive, and a site visit involving the complete working group is relatively costly.

3. CHARACTERISTICS OF EIA PROCEDURES IN INTERNATIONAL DEVELOPMENT CO-OPERATION

3.1 Complex decision-making: who decides what?

International co-operation projects by nature involve more than one competent authority. In these projects the decision whether or not to proceed is made at the very moment when agreement on the project and procedures has been reached between the countries or international funding agencies concerned. On the basis of experience so far five decision-making structures can be distinguished:

- In the first structure there are only two partners in the project: the recipient country and a donor country. Both of them decide on the parts of the project they fund.
- In the second, there are more than two partners involved in the project, each of them deciding on the elements they fund, and may require an EIS which conforms to their own national legislation or any specific EIA requirements of the donor organization.
- The third model involves multilateral funding agencies in which many governments are represented, deciding on (partial) project funding. In all cases possible co-funding partners accept this agency as the leading partner (the development banks).
- A fourth model concerns projects in which a decision has to be made by the DGIS on providing guarantees for a commercial bank loan for project funding. Funding itself is not requested.

- The last decision-making structure concerns assistance with plan development and requires no more funding than that required to carry out the EIA. The decision concerns the choice of a strategy or the definition of a plan. Decision-making on these issues is the sole competence of the recipient government. In these projects the DGIS simply assists the recipient government in collecting the necessary information and safeguarding its quality.

- The Keralapitya land reclamation project in Sri Lanka was submitted to the Dutch Government for partial funding after the Sri Lankan Government approved the remaining funds.
- The project to restrict environmental pollution caused by the tannery industry in the city of Kasur in Punjab, Pakistan was proposed for co-financing to the Government of Pakistan, UNIDO, the Norwegian Agency for Development (NORAD) and the DGIS. For all co-financing partners the decision concerned whether to proceed or not. Two of the co-financing partners use EIA to support decision-making.
- Decisions on loans for the Arun run-off river hydroelectric plant in Nepal and for the Ghazi Barotha hydroelectric project in Pakistan, for which EISs were drawn up, were to be made by the World Bank. The Netherlands is a sizable contributor to the World Bank and is represented on the board of directors as president of an election panel. The Dutch representative asked the DGIS to provide an advisory review of the EISs for the above mentioned projects.
- The Tout Lui Faut oil refinery project in Surinam is being financed with a commercial bank loan. The bank required a guarantee from the Dutch Government and indicated that an environmental impact assessment would be necessary. Staatsolie Surinam, the project proponent, asked the Dutch Government for assistance in carrying out the EIA. In this particular case neither the DGIS nor any other competent government authority had a part in the decision on funding. The competent authorities in Surinam may have based their licensing decisions on the results of the EIA.
- The EIA for the river Paute region in Ecuador is to support a decision on the selection of a development strategy for the region. Although the cost of the EIA is born by the Dutch Government, the decision is the sole responsibility of the Ecuadorian Government. The DGIS may, however, later decide whether to fund projects within the framework of the chosen development strategy.

Box 1: Examples of the five structures of decision-making in bilateral and multilateral development co-operation

3.2 Screening practice: for which projects is EIA needed?

Legal provisions which unequivocally indicate the obligation to carry out EIA for a specific project or initiative do not exist for development projects. The DGIS determines the need for EIA by means of a screening test (the *O-test*, or 'Development Test') performed by Dutch embassies or diplomatic offices, using the OECD Development Assistance Committee's Creditors Reporting System codes (DAC/CRS-codes). The DAC/CRS codes are indicative only, and their correct interpretation in the screening test requires a great deal of (environmental) expertise. This places great demands upon most embassy staff. Moreover, embassy staff must be convinced of the contribution EIA can make to the quality of decision-making. On several occasions the DGIS has asked the Commission for EIA to advise on screening.

3.3

Which EIA procedure will serve the purpose of all parties concerned?

In the case of project proposals DGIS decides upon, advises upon, or assists in preparing an EIS, the EIS must comply with the DGIS's requirements, which are based on those of the OECD and the World Bank. Many other international donors and funding agencies conform to the same or similar requirements. Efforts to streamline EIA procedures applied by donor agencies have recently been completed (the EIA Coherence project of the OECD, chaired by Mr Gordon Beanland). The international

banks have been invited to follow this initiative. The result of these efforts has been that participating donor countries intend to adapt their EIA requirements in order to agree a common format for EISs. The final objective is that an EIS that serves the purposes of one donor country will serve the purposes of other donor countries as well. If, however, the EISs are also meant to assist the competent authorities in the recipient country in coming to a decision – which is one of the DGIS's objectives – then the EISs must comply with the national EIA legislation of the recipient country as well. In some countries there is no EIA legislation. In other countries EIA legislation is in place, but is not operational;

the institutional infrastructure to implement EIA is not in place or not yet functioning. The DGIS acts according to the legislative and institutional situation prevailing in the recipient country, but if the EIA procedure is intended to support the decision of one of the development banks, the bank's EIA procedures usually take precedence over the recipient country's system.

- In the Occupied Territories of the West Bank and the Gaza Strip there is as yet no EIA legislation. The scoping guidelines for the EIS for the Gaza Sea Port complied only with the DGIS EIA requirements.
- Pakistan has EIA legislation in place. However, according to recent information (IUCN Pakistan) no national EIA procedures have been executed until now due to the absence of an institutional infrastructure. In its advice on scoping guidelines for the Korangi Industrial Estate Environmental Management Plan (Karachi, Pakistan) the Commission referred to the DGIS EIA requirements.
- Sri Lanka possesses both EIA legislation and the required institutional infrastructure. The scoping guidelines for the EIS for the Keralapitya Land Reclamation Project in Negombo Lagoon near Colombo have been formulated by the Sri Lankan government. The DGIS has reviewed the EIS according to the scoping guidelines as formulated by the Sri Lankan government. In a second step the EIS was reviewed according to a review framework complying with DGIS EIA requirements.
- Executive summaries of the World Bank's EISs for Arun III and the Ghazi Barotha projects have been reviewed according to the World Bank's generic guidelines and the DGIS EIA requirements.

Box 2: EIA systems as observed by the DGIS

4. EXPERIENCES

4.1 Number of advisory reports submitted

Seven advisory scoping guidelines had been submitted by May 1996. Two of the seven EISs have been reviewed. The majority of the eight requests for reviews therefore concerned EISs for which the scoping guidelines were not prepared by the Commission, and were in most cases prepared prior to the agreement between the DGIS and the Commission.

4.2 The scope of EIA

As EIA carried out for international development co-operation projects is not governed by legislation issues which often cannot be tackled by national EIAs can be addressed; there is a tendency towards widening the scope of EIA. The World Bank, OECD, the European Union and individual donor countries freely address social, socio-economic and institutional issues in scoping guidelines and generic guidelines for EIA, in addition to commonly observed environmental aspects. This may be a consequence of the perceived need to assess the risk factors for the failure or sustainability of project – an ever increasing need in the light of the growing failure to meet project targets.

The alleviation of poverty is the main objective of Dutch international development co-operation. Environmental sustainability is the starting point. The Commission implements these principles by addressing the concepts of environmental, social and institutional sustainability in its advice. For example, gender aspects are considered to be part of the social sustainability concept, and if a Gender Assessment Study (GAS) is required by the DGIS, the Commission seeks to co-ordinate both studies.

Review of the executive summary of the EIS for the Arun III run-off river hydroelectric plant in Nepal (a project that included the construction of a 112-kms-long access road in the inhospitable terrain of the Arun Valley) raised a number of observations on the lack of information for assessing the environmental and social sustainability of the project and its institutional feasibility. The Commission observed that:

- a catchment-based approach was lacking
- the international aspects of watershed exploitation had not been addressed
- the balance between national costs and benefits and local costs and benefits had not been made
- the ecological impacts of improved accessibility of the Arun Valley had not been assessed;
- the descriptions of mitigating measures for environmental and social impacts were insufficiently detailed
- the institutional and organizational infrastructure needed for project management, realization and funding was insufficiently described

Moreover, the review raised the question of selecting alternatives prior to EIA on the basis of economic criteria only.

Box 3: Implementation of the concept of sustainability

4.3 Timing

The importance of timely application of EIA needs to be emphasized. International co-operation projects, with the exception of turnkey projects, go through phases of identification, formulation, appraisal/commitment, implementation/monitoring, and evaluation/conclusion. EIA is thought to be most appropriately introduced in the identification phase. The later EIA is introduced the less effective it is.

- The request to review the 'EIS' on the Staatsolie oil refinery project in Surinam was made even before an EIS in the accepted meaning of the term had been prepared. The 'EIS' consisted of a project proposal with additional environmental information. The site of the refinery was determined by the location of existing tanker infrastructure. No alternative sites were considered. From the site visit it was clear that there was a residential district only 100 metres away. The review resulted in a recommendation to provide supplementary information on variants producing fewer emissions. This information was soon supplied and the review completed. On the basis of the EIS the alternative most favourable to the environment was chosen. In this case project funding approval depended on the result of EIA, and the EIS was reviewed at a stage when modifications to the project design could still easily be made.
- The request to review the EIS for the Kerawalapitya Land Reclamation Project in Sri Lanka was made when the contracts for implementation had been signed. It was hoped that the advisory review would provide recommendations for mitigating measures, monitoring and evaluation. Among the Commission's observations was that the information contained in the EIS was insufficient to formulate sound recommendations. The Commission does not know if and how the information contained in the EIS, or its advice, has been used, but the EIA was probably executed too late in the project cycle.

Box 4: Timing of EIA

4.4

Experiences with EIA for various forms of assistance

The range of characteristics displayed by different development co-operation packages is reflected in the EISs, and partly determine how effective the EIA can be.

International funding agencies (development banks)

The projects with which the Commission has been involved have all been initially selected according to financial and economic criteria. Project alternatives have not been considered in these EISs, and environmental and social criteria only appear in design alternatives. As EIA normally includes consideration of project alternatives the Commission may in these cases advise that alternatives discarded on the basis of economical criteria only be reconsidered.

Dutch bilateral funding

a) *Special programmes*

- The Dutch International Development Co-operation budget can be used to finance up to a maximum of 40 per cent of the transaction value, goods and services delivered by Dutch enterprises. These must be relevant to the development of the recipient country, and commercial funding must be impossible to obtain.

- A similar programme exists focusing on sales contributing to environmental improvements in the recipient country.

Some of the projects submitted for funding under these programmes examined by the Commission have not been placed within their broader context. Alternative solutions have not been considered. In these cases the Commission promotes the concept of sustainability, encouraged by the DGIS, and advises that alternatives which take a broader view of the problems be examined.

b) *Standard bilateral development co-operation programme*

The DGIS has many bilateral development co-operation projects. So far the Commission has been asked to advise on EIA for two types of activities:

- EIA for projects

The projects implemented under the standard assistance programme are diverse in nature and no specific common features of EIA for these projects has been identified so far.

- EIA for plan development

So far the Commission has submitted two scoping guidelines for strategic EIAs. From experience it is clear that difficulty is experienced in achieving the correct level of abstraction within expert

teams. A clear definition of the objectives of the EIA and firm guidance of the expert team are essential for EIA with a strategic character.

A proposal was submitted for a pilot project to line a small stretch of the Ismailia irrigation canal in Egypt. The objective of the pilot project, for which an EIA must be carried out, was to establish the effectiveness of a proposed lining technique. The eventual project concerns lining the major part of the canal in order to diminish water losses through infiltration into the ground. In its scoping advice the Commission observed that the EIS should not only address the environmental impacts of the lining method but primarily the environmental and socio-economic impacts of the overall project: to reduce the amount of infiltration.

Box 5: A case from the special programmes

When the scoping guidelines for the Rio Paute Catchment Development Plan were being drawn up the objectives of the EIA were still not known. The resulting guidelines were therefore rather elaborate, and did not at first fully meet the expectations of the competent authority.

Box 6: A case of Strategic EIA

4.5 Bottlenecks in preparing an adequate EIS

Review practice shows that there are serious factors hampering adequate EIS preparation for international co-operation projects:

- On the bilateral level the requirement to carry out EIA is still fairly recent. Competent authorities, including recipient country governments, are sometimes not yet fully convinced of the benefits of EIA and are not yet used to reserving enough time and resources to carry this out.
- In developing countries baseline information is often lacking or inaccessible because there are no central registration and documentation systems, and

this data then has to be collated. This usually has considerable financial and scheduling consequences.

- Competent authorities and EIS practitioners are not yet familiar with the quality standards applied by donor countries or the Commission for EIA.
- The financial consequences of a negative review can be considerable.

The above-mentioned factors may discourage consultants from tendering for EISs.

5.

CONCLUSIONS

Accepting independent, professional and public screening of project proposals and economic activities for their social and environmental sustainability through EIA involves making a quality check on the analyses that have led to these proposals. It also implies increased democratic control over decision-making, and consequently the loss of part of the development agency's autonomy. It is therefore understandable that this loss of autonomy is not accepted unconditionally. EIA must prove that it leads to better decision-making before it can be fully accepted. A clear parallel can be seen with the acceptance of EIA in the Netherlands, which has grown with time.

Review of project proposals for their environmental and socio-economic sustainability and institutional feasibility is demanding; in many cases it has proved to be too demanding. Experience indicates that sustainability checks must be integrated into the analyses preceding project identification. This integration is more easily done for projects under the standard bilateral development co-operation programme than for projects under the special programmes. Project preparation for the latter type of projects is often controlled by the recipient country and consulting or contracting firms. These projects are mostly submitted for financing in the advanced stage of tendering. Experience shows that review of EIAs for projects under the special programmes often result in a review advice that asks to position the project in the broader context of sustainability.

Clearly defined objectives and firm guidance of the Commission's working groups are needed when the EIA concerns plan development.

Although initial experiences and results are encouraging, and the impression is growing that EIA and the Commission's activities do indeed contribute to improved decision-making, definitive conclusions about the effectiveness of EIA and the Commission's own role cannot yet be drawn. This will be possible when more EIA project cycles have been completed and their impacts on final decisions assessed.

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