

Environmental Impact Assessment in Geological Disposal of Radioactive Waste and in Decommissioning of Nuclear Facilities

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1. INTRODUCTION

This report is based upon a document prepared under contract with the European Commission¹, Directorate-General Energy and Transport, that formed the basis for discussions at the "Club of Agencies" meeting at Oskarshamn, Sweden, on 22-24 October 2001. The author is grateful to the Commission's services for the permission to present the information also to the NEA's Working Party on the Management of Materials from Decommissioning and Dismantling (WPDD) meeting in Paris on 5 December 2001.

The report discusses the results of two major studies undertaken for the European Commission (DG-Environment) on the application of environmental impact assessment to the development consent process for the following projects in the nuclear field: (1) geological repositories and long-term storage facilities (2) the decommissioning of nuclear power plants.

The first study² was undertaken during 1998 and the first half of 1999 by the following consortium of companies: Nirex (UK), University of Wales Aberystwyth (UK), ENRESA (Spain), SKB (Sweden) and ONDRAF/NIRAS (Belgium). The second study³ was undertaken during 2000 and the first quarter of 2001, by the European Economic Interest Grouping Cassiopee, together with the University of Wales Aberystwyth and ECA Global (Spain). Both studies were managed by UK Nirex Ltd.

2. BACKGROUND TO STUDIES

The European Council Directive 97/11/EC⁴ of 3 March 1997 reinforced existing requirements⁵ on Member States to undertake an EIA for a wide range of projects with the potential to impact the environment, including:

¹ The views expressed in this report are those of the author and do not necessarily reflect those of the European Commission - neither the European Commission nor any person acting on behalf of the Commission is responsible for the use that might be made of the following information.

² *Environmental Impact Assessment and Geological Repositories*, Report EUR 19152, October 1999. (<http://europa.eu.int/comm/energy/nuclear/synopses.htm#19152>).

³ *Environmental Impact Assessment for the Decommissioning of Nuclear Installations*, Report EUR20051, June 2001. (<http://europa.eu.int/comm/energy/nuclear/synopses.htm#20051>)

⁴ Official Journal No. L 073 of 14/03/1997, P. 5 - 15

- nuclear power stations (both for initial construction and for their eventual decommissioning);
- repositories designed for permanent disposal of radioactive waste; and
- off-site facilities for the long-term storage of radioactive waste.

Other installations designed for the processing or storage of waste may also be subject to EIA, at the discretion of individual Member States. An unofficial consolidation of the two Directives is given in the appendix to this report. The EIA process as set out in the amended Directive is shown in Figure 1 of this report.

Member States were required to incorporate the Directive requirements into domestic legislation by March 1999. In addition, those countries applying to become members of the European Union (EU), must ensure that the requirements are reflected in domestic legislation as part of the accession process.

The Council Directives set out the broad principles of the environmental assessment system, leaving the procedural details to the Member States. Aspects over which there is discretion include:

- (1) although an EIA must be undertaken before development consent is granted and the results taken into account in the consent procedure, the precise role of the EIA in the decision process is not defined;
- (2) the Directive is not specific about the interpretation of the impacts to the environment and to human beings which should be taken into account (e.g. impacts on human beings need to be considered, but whether these include socio-economic impacts is subject to interpretation by the Member States), though in practice most Member States include a very wide range of impacts;
- (3) requirements for the involvement of the public in the assessment process are not specified, beyond a requirement that the public concerned are given reasonable opportunity to provide views before consent is granted;
- (4) the Directive is concerned with the assessment of impacts, taking account of measures envisaged to avoid or mitigate adverse effects. It does not include requirements as to the arrangements for enforcing these measures; and
- (5) the role of the competent authority in reviewing the adequacy of the EIS (Environmental Impact Statement) is not addressed.

⁵ Council Directive 85/337/EEC of 27 June 1985 (Official Journal No. L 174/40 of 5/7/85)

Against the above background the Commission⁶ was concerned about the possibility of there being significant variations in how the Directives were implemented in different Member States, particularly as regards how much information on the environment should be collected, analysed and presented to the authorities and the public. There was therefore the possibility of different financial burdens being placed on those responsible for undertaking an EIA in different Member States and the risk that the completeness and hence validity of assessments could be called into question.

To address the above concern both studies were required to include a comprehensive review of the legal framework in the Member States and in the applicant countries, particularly in the context of the role, scope and definition of EIA requirements for the relevant facilities. As a corollary to this the studies were also required to consider how the requirements were being implemented in practice. In order to illustrate the potential benefits of greater harmonisation of approaches it was suggested that the studies include a 'model' EIA based on best practice considerations.

The Commission also noted that the EIA process could be a useful tool for communication with the public. The studies were required to consider how the role of the public, non-governmental organisations and consumer groups in the process could be enhanced.

3. APPLICATION AND SCOPE OF EIA

In terms of the legal frameworks in the Member States and in candidate countries the studies found that, with few exceptions, the legal frameworks already reflected the key requirements of the amended Directive. By autumn 1998 most Member States had begun the process of fully transposing the amended Directive into national legislation. But, as mentioned earlier, the Directive allows significant discretion to Member States on aspects of implementing the general requirements and it is clear that a variety of approaches are being taken as regards these aspects, as discussed below.

3.1 Role of EIA in the consent process

The Directive requirement is that, in effect, the Environmental Impact Statement (EIS) should be made available to the public and that the public is given an opportunity to express an opinion before a development is initiated. In some States this is interpreted to mean that the EIS addresses the short-term implications for the physical environment of the 'development phase' of the project and is therefore one of a package of documents provided by a developer to the authority responsible for deciding the consent application. Other considerations, such as the long-term implications of the project for human health and safety are addressed in other documents that may have a higher profile in the decision process.

In other States the EIS is used to draw together all the main arguments supporting the consent application, with (for example) safety reports being subsidiary documents.

⁶ At that time, radioactive waste management and decommissioning policy was the responsibility of Directorate-General Environment. This responsibility has since been transferred to Directorate-General Energy and Transport (DG-TREN).

This approach normally also involves greater involvement of the public in the EIA process, as it enables a unified approach to be taken to the full range of public concerns – environmental, safety and socio-economic. This latter approach was favoured in the two studies and it was suggested that the EIS could be presented as an hierarchical document with progressively more detailed information at lower levels of the hierarchy. The implications for the process of public involvement is discussed further below.

3.2 Which impacts should be assessed?

The amended Directive (Article 3) requires that the environmental impact assessment shall

'identify, describe and assess in an appropriate manner ... the direct and indirect effects of a project on the following factors:

- *human beings, fauna and flora;*
- *soil, water, air, climate and the landscape;*
- *material assets and the cultural heritage;*
- *the interaction between the factors mentioned in the first, second and third indents.'*

An environmental impact assessment for any nuclear installation will differ substantially from an assessment for a non-nuclear facility due to the nature of the hazard presented by the presence of radioactivity. Where the installation includes facilities for long-term storage or disposal of radioactive waste the potential impact will last significantly beyond the operational period of the plant. In all the countries surveyed it was intended that an environmental impact assessment for the development (and decommissioning) of a nuclear installation should address the potential short-term and long-term effects of radioactivity on the environment and on human beings.

In most (though not all) countries it was also intended that the assessment would not be restricted to physical impacts on the natural and built environment and on human beings: that is, social, economic and health effects would also be considered. Potential social impacts will include effects on population demographics, social structure, and community image and cohesion. Potential economic impacts include effects on community services, employment, housing and business development. Potential impacts on community health may include psycho-social effects. This latter approach is compatible with the methodology for environmental impact assessment adopted in the United States, Canada and Australia.

3.3 Requirements for involvement of the public

The greatest diversity of approaches to environmental assessment concerned the issue of public involvement. The Directive requires (Article 6(2)) that:

'Member States shall ensure that any request for development consent and any information gathered pursuant to Article 5 are made available to the public

within a reasonable time, in order to give the public concerned the opportunity to express an opinion before the development consent is granted.'

In many countries this is interpreted to mean that there should be a public notice announcing the existence and availability of an Environmental Impact Statement for viewing and inviting comments to be sent to the competent authority for its consideration. In some other countries, notably the Nordic States, the public is generally given the opportunity to be involved at an earlier stage of the assessment. For example, the environmental impact assessment process for a geological repository in Finland included publication of an 'EIA programme' report which outlined the impacts that were planned to be assessed and invited comments on these.

The European Council and European Parliament are currently considering a Commission proposal⁷ to modify the EIA Directive in order to bring the requirements into line with the Aarhus Convention⁸, entered into force in October 2001. The intention is to modify the existing text such that Member States are required to:

'take the necessary measures to ensure that the public concerned are given early and effective opportunities to participate in the development consent procedure'.

The revised Directive will indicate the minimum requirements such as providing copies of the main reports and advice issued to the competent authority during the development consent procedure. The 'public concerned' is taken to include anyone affected by or having an interest in the development consent procedure, including NGOs promoting environmental protection.

It may be expected that, following the adoption of the revised Directive, there will be a general move towards developing mechanisms for earlier public involvement in the assessment process including a more structured approach to the scoping phase of the assessment. For example, this could involve the publication of a scoping report setting out the impacts intended to be assessed, such that the main assessment could take account of responses to the scoping report. This aspect is discussed later in this report.

3.4 Mitigation of impacts and choice of alternatives

The Directive includes a requirement (in Article 5(3)) that:

'The information to be provided by the developer ... shall include at least:

- ...

⁷ Proposal for a Directive ... providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment and amending Council Directive 85/337/EEC and 96/61/EC, COM (2000) 839 (<http://www.europa.eu.int/comm/environment/eia/eia-legalcontext.htm>).

⁸ *Convention on Access to Information, Public Participation in Decision-making and Access to Justice on Environmental Matters*; United Nations Economic Commission for Europe (UNECE); (<http://www.unece.org/env/pp/>)

- *a description of the measures envisaged to avoid, reduce and, if possible, remedy significant adverse effects*
- *an outline of the main alternatives studied by the developer and an indication of the main reasons for his choice, taking into account the environmental effects*
- *a non technical summary ... '.*

As regards mitigation measures, the Directive does not include requirements relating to how these are implemented in the event of development consent being granted, i.e. the Directive is concerned with the development consent phase of a project. The studies suggest that a monitoring plan should be developed as part of the EIS, to show how the residual impacts identified will be tracked and to ensure that the proposed mitigation measures are working adequately. If unexpected impacts do arise, this would give an opportunity to take remedial action. The mechanisms for ensuring that remedial action is taken are outside the scope of the Directive.

Prior to 1997 the EIS was only required to include information about alternatives to the proposal for which consent is being sought '*where appropriate*'. This caveat was removed by the amending directive in 1997, the practical implication being to make it obligatory for a developer to study alternative options to that being proposed in the application for development consent, unless there clearly are no real alternatives. The EIA process must therefore be integrated closely into the process of site selection (in the case of geological repository development) and in the process of selection of a preferred decommissioning strategy (in the case of applications for consent to proceed with decommissioning of nuclear power stations).

As regards geological repositories in particular, the requirement to provide information about the alternatives considered will also apply to the selection of the preferred waste management process (as well as to the selection of a preferred site). Some countries may choose to address the latter issue by means of a process of strategic environmental assessment prior to site selection. The EC Directive on environmental assessment of plans and programmes is discussed later in this report.

The studies found a difference of approach between Member States and applicant countries in the context of alternatives, with the requirement to integrate the EIA process with the selection of alternatives being more generally accepted in Member States.

3.5 Role of the competent authority

In terms of the EIA Directive the competent authority or authorities are those designated by Member States as being responsible for determining applications for development consent for projects within the scope of the Directive. There is no strict requirement that the authority should review the completeness of the EIS or the technical adequacy of the EIA process, though it is implicit that, were insufficient information presented on the impacts from the project, more detail should be sought from the developer.

Following the grant of development consent for nuclear installations it is normally a requirement that consents must also be obtained from nuclear safety and/or environmental authorities before proceeding with construction. In most countries, these authorities will thenceforth undertake the ongoing supervision of the project.

4. A MODEL EIA PROCESS

An important part of the second study (on EIA for decommissioning of nuclear power plants) was the development of a suggested methodology for the overall EIA process. This is reproduced in Figure 2 below. Although developed in the context of decommissioning projects the methodology is generally applicable to projects in the nuclear field.

The process can be broken down into four main phases. The initial phase involves the identification of stakeholders, and then (through consultation with key stakeholders) the development of decision-making procedures and the identification of technically feasible alternatives. The second phase involves a preliminary assessment (scoping) of the feasible alternatives with the aim of arriving at a preferred alternative or alternatives for detailed assessment. At the end of this phase it is suggested that a 'scoping report' be prepared for public discussion.

The third phase involves the environmental impact evaluation for the preferred alternatives. This involves the determination of baseline information, prediction of impacts and assessment of their significance, the identification of mitigation measures and the development of a monitoring plan to enable actual impacts to be measured and controlled in due course.

The fourth phase involves the preparation of the EIS and the review process overseen by the competent authority. This could involve the preparation of a draft EIS (as in the United States) which is then subsequently revised to take account of public comments. Where a consultation phase (about the terms of reference for the impact assessment) is included this latter step will not normally be necessary.

The model process proposed in the study addresses directly the requirement in the Aarhus Convention that the public is given early and effective opportunities to participate in the development consent procedure. The incorporation of a structured approach to scoping the impacts to be assessed is particularly important in this respect. The proposal involves continuous interaction with an identified group of stakeholders with wider opportunities for public involvement prior to the detailed assessment and during the review of the EIS.

The study on EIA and geological repositories considered how the EIA process should interact with the main stages of a siting process recommended by the IAEA: concept and planning, national and area survey, site characterisation and site confirmation. A key consideration is the requirement (discussed above) to integrate the EIA process with the selection of alternatives. The study concluded that the application for development consent should be made on completion of the site characterisation phase, i.e. at the point at which a preferred site is selected for detailed (underground) investigation as a preliminary phase to repository construction. The consent

application should therefore provide the information on the basis of which the preferred site (or sites) was selected.

The extent to which alternative waste management options should be considered at the development consent stage of the process would depend on whether this issue had been addressed at an earlier stage. For example, a strategic environmental assessment of different management options might be undertaken during the concept and planning phase and, when not addressed elsewhere, this should be discussed in the documentation supporting the consent application.

The study also considered whether the requirements of the Directive applied to borehole investigations. It was concluded that these should be regarded as Annex II projects, being:

'Deep drillings, in particular:

- *geothermal drilling,*
- *drilling for storage of nuclear waste material, drilling for water supplies with the exception of drillings for investigating the stability of the soil.'* (Annex II, 2(d))

On this basis these are projects for which an EIA could be required though this decision is the responsibility of individual Member States.

5. THE 'STRATEGIC ENVIRONMENTAL ASSESSMENT' DIRECTIVE

Directive 2001/42/EC⁹ on the assessment of the effects of certain plans and programmes on the environment has been in force since July 2001. The Directive should be transposed into domestic legislation in the Member States before 21 July 2004. It establishes similar requirements for plans and programmes to those established by the EIA Directive for 'projects' and is concerned particularly with plans and programmes which set a framework for future development consent of projects listed in Annex I and II of the EIA Directive.

For the purposes of the Directive 'plans and programmes' are those:

- *which are subject to preparation and/or adoption by an authority at national, regional or local level or which are prepared by an authority for adoption, through a legislative procedure by Parliament or Government, and*
- *which are required by legislative, regulatory or administrative provisions.'* (Article 2)

The above definition appears to limit the strict requirement to apply the Directive in the context of radioactive waste management to waste management plans developed by national or regional government, providing these plans establish a framework

⁹ Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment, Official Journal L197, 21 July 2001.

within which specific waste management projects are proposed. The development of government *policy* on waste management (as opposed to more detailed *plans* or *programmes*) is outside the scope of the Directive. That is, a plan produced by government identifying areas where certain types of waste management facilities will be based may come within the scope of the Directive, if the need for such a plan is required by law. On the same basis, a policy statement that certain strategies will be followed for the management of certain waste types would be outside the scope of the Directive.

Regardless of the precise legal requirement (which will differ according to the legal framework in individual countries) the Directive offers a mechanism for consultation with stakeholders on issues that may be better addressed before a site selection process is commenced. In principle, the approach is similar to that required by the EIA Directive, in so far as an environmental report is prepared in which the likely significant effects on the environment, and of reasonable alternatives to the proposed plan or programme, are identified, described and evaluated. The public is given an early opportunity to comment on the draft plan/programme before it is adopted. The Directive also envisages consultations with neighbouring States when there are potential transboundary issues, as does the EIA Directive. In this respect the Directive takes account of the requirements of the Espoo Convention¹⁰.

When the relevant authority makes a decision, a statement summarising the results of consultations, together with the reasons for choosing the plan or programme as adopted in the light of the other alternatives is circulated. It is also a requirement that measures for monitoring significant environmental effects are described and, subsequently, that these effects are monitored by Member States.

6. POTENTIAL ISSUES FOR FURTHER CONSIDERATION BY THE COMMISSION

The issues that may be appropriate for further consideration by DG-TREN in the light of the two studies are discussed below in the context of policy considerations and technical considerations.

Role of EIA in site selection/decommissioning including selection of alternatives

An impact of the Aarhus Convention will be to strengthen the requirements of the EIA Directive in terms of a need for the public to be given early and effective opportunities to participate in the development consent procedure (as discussed above). A key aspect of this is the role of the EIA/SEA process in the selection of alternatives, whether that is the selection of repository sites, or for strategies for decommissioning or for management of waste. This suggests the need for a formalised approach to the scoping phase of the assessment. Guidance from the Commission on these aspects, taking account of the implications and different legal and cultural frameworks in Member States and applicant countries, should be considered.

¹⁰ United Nations Economic Commission for Europe, Convention on Environmental Impact Assessment in a Transboundary Context (<http://www.unece.org/env/eia>).

Responsibilities of participants in the EIA process

There is currently a lack of clarity on the role of different participants in the EIA process as described in the Directive, particularly at review stages. Indeed the competent authority for the decision on development consent is not explicitly responsible for reviewing the EIS either as regards technical content or procedural approaches, nor are there any specific requirements for review by others. Although, in practice, shortcomings may come to light during the general review process, it would be helpful to have more specific guidance on this issue, particularly to encourage the development of common approaches to procedural aspects of EIS preparation and review in all Member States.

Requirements for monitoring environmental impacts

There are no requirements in the EIA Directive for monitoring actual impacts on the environment. This is in contrast to the SEA Directive, which does explicitly require Member States to monitor the environmental effects of the implementation of plans and programmes, in order that remedial action can be taken at an early stage in the event of adverse effects. This aspect should be given consideration by the Commission, including relevant responsibilities.

Extent of information in Environmental Impact Statements

Although it may be counter-productive to attempt to specify in detail the information requirements in an EIS (given that this is an objective of the scoping process) it would be beneficial to establish some basic ground rules. The study reports noted that there is currently a significant amount of duplication of information requirements in the context of the EIA Directive, the information required to be sent to the Commission under Article 37 of the Euratom Treaty, and the requirements of national safety and environmental legislation. It was suggested that a hierarchical approach to presenting an EIS might be helpful in this respect. Advice on the possibilities for rationalisation of these information requirements would be helpful.

Public involvement

As with the level of information in an EIS it is not likely to be helpful to offer prescriptive advice on approaches to involving the public in the EIA process. Nonetheless, guidance on basic aspects such as how documentation can be made available to the public would be helpful, especially for those countries where the public has not previously been involved in development consent procedures to any significant extent.

Costs of undertaking EIAs

Guidance on the basic categories of costs for undertaking an EIA would be generally helpful.

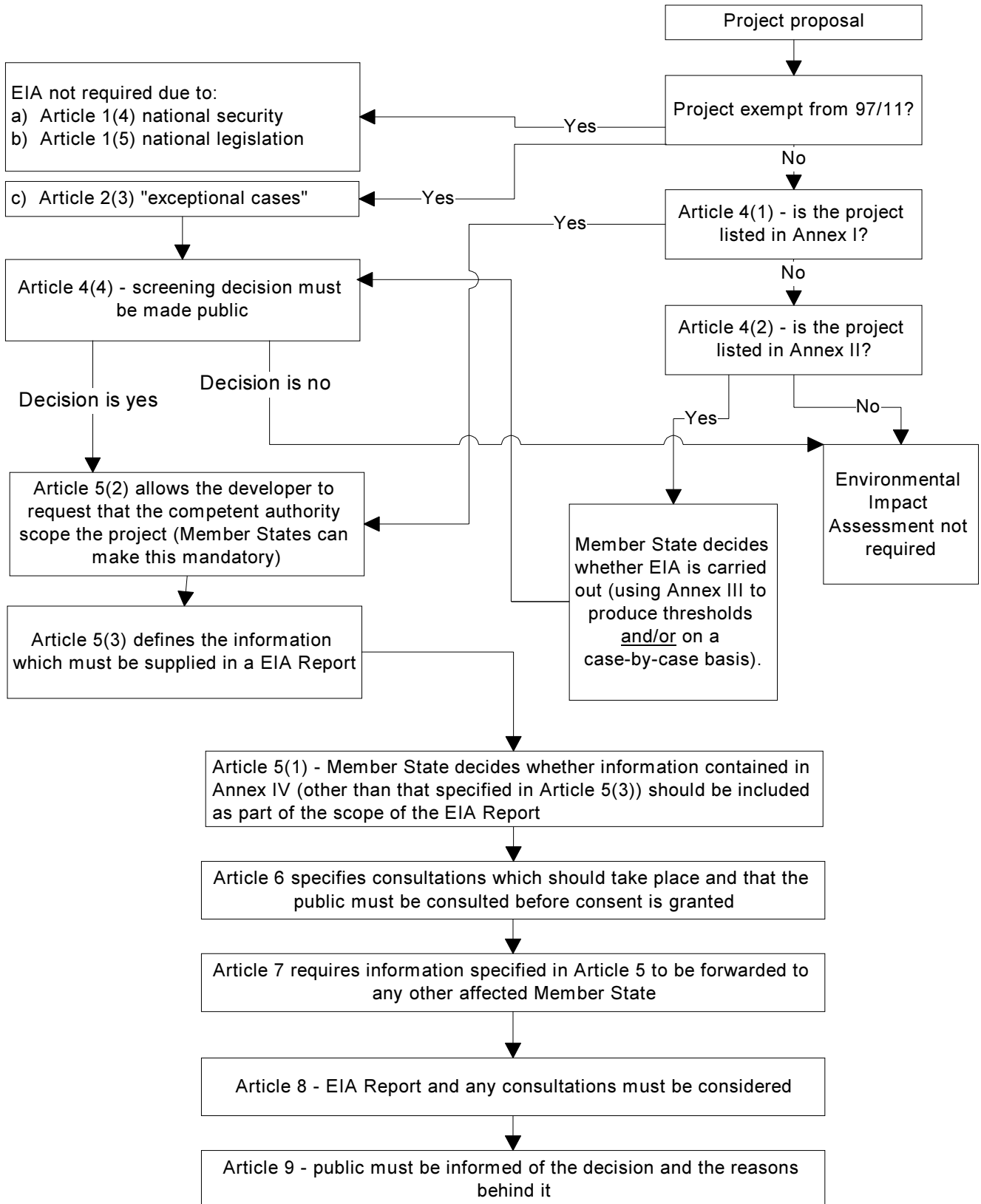


Figure 1. The EIA process specified in the EIA Directive

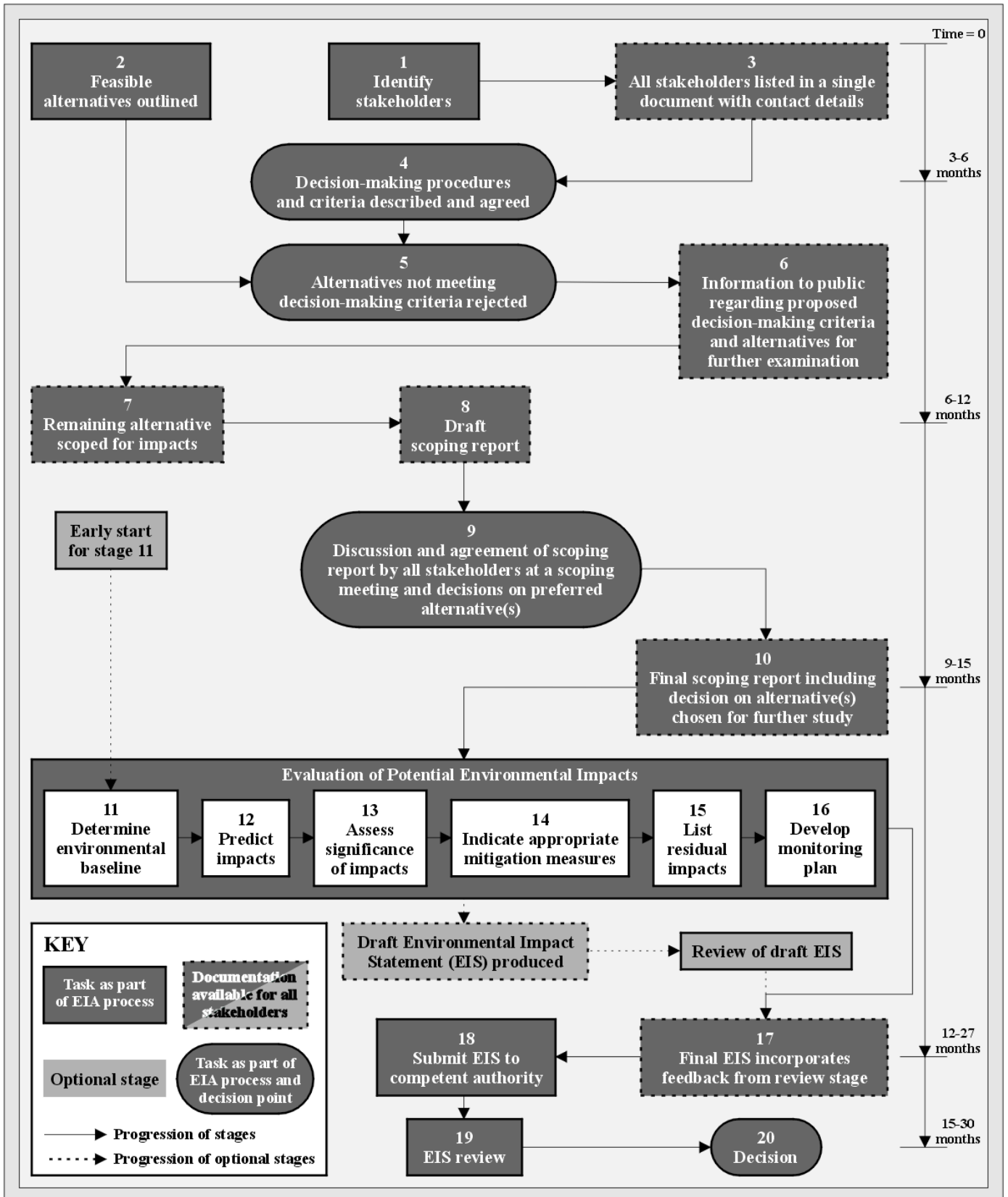


Figure 2. The steps of the EIA process

APPENDIX

Council Directive 97/11/EC of 3 March 1997 amending Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment

consolidated version available at:

http://www.europa.eu.int/comm/environment/eia/full-legal-text/9711_consolidated.pdf