

BACKGROUND

At the XIV ATCM (Rio de Janeiro, 1987) Parties agreed on Recommendation XIV-2, which provided ATCPs with a set of basic procedures with which to undertake Environmental Impact Assessments (EIAs) in Antarctica. This Recommendation formed the basis for the EIA obligations and procedures of Annex I to the Protocol on Environmental Protection to the Antarctic Treaty (Madrid Protocol).

The Protocol, through Articles 3, 8 and specifically Annex 1, requires prior Environmental Impact Assessment of all activities proposed in the Antarctic Treaty Area. In parallel, CoMNAP's 1991 Bologna workshop on "Environmental Impact Assessment in Antarctica" provided managers with a set of guidelines for the implementation of the EIA procedures.

After the adoption of the Madrid Protocol (October 1991), the CoMNAP guidelines were updated to meet the requirements of Annex 1. Since then, experience gained by ATCPs through carrying out numerous of EIAs, led to the necessity of providing more clear and accurate concepts to such guidelines, incorporating previous knowledge from Bologna's work and from other relevant meetings and technical workshops convened by SCAR, CoMNAP and IUCN.

At the First Meeting of the Committee of Environmental Protection (CEP), held in Tromsø (Norway), May 1998, after presentation of the Working Paper Nr. 14 by Argentina, the Committee supported the proposal to establish a set of guidelines and decided that:

... an open-ended intersessional contact group should be established which would prepare a draft guide on EM procedures to be presented at the next meeting of the CEP for further consideration. Such a guide should be very useful both to Parties with considerable experience in EIA procedures, and to those with little experience in such work.. The CoMNAP EM Guidelines will form the basis for this work. The issue of cumulative environmental impacts considered by the 1996 IUCN Workshop will also be considered."

During the intersessional period several contact points designated by Consultative Parties and observers have participated in preparing a set of guidelines, in order to comply with CEP's statement. Argentina was responsible for co-ordinating this openended group. Representatives from Australia, Finland, Germany, New Zealand, Norway, Peru, Romania, Sweden, United Kingdom, United States, Uruguay, SCAR (Scientific Committee of Antarctic Research), through its Group of Specialists on Environmental Affairs and Conservation (GoSEAC), ASoC (Antarctic and Southern ocean Coalition), and IUCN (World Conservation Union) contributed to prepare this draft.

The contact group has also drawn on the following reports:

CoMNAP Practical Guidelines on Antarctic Environmental Assessment Process;

IUCN Workshop Report on Cumulative Environmental Impacts in Antarctica;

SCAR/CoMNAP Workshop Report on Monitoring of Environmental Impacts from Science and operations in Antarctica;

Guidelines for Environmental Impacts Assessment (EIA) in the Arctic; various national guidelines on EIA in Antarctica .

This draft guide on EIA procedures in Antarctica is provided to the Committee for Environmental Protection for further consideration.

GUIDELINES FOR
ENVIRONMENTAL IMPACT ASSESSMENT
IN ANTARCTICA

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I. Introduction

The Madrid Protocol, in Article 3, establishes a number of environmental principles which can be considered a guide to environmental protection in Antarctica and its dependent and associated ecosystems. Among such principles, those stated under paragraph C express the necessity of collecting sufficient information "to allow prior assessments of, and informed judgements about, their possible impacts on the Antarctic environment and dependent and associated ecosystems and on the value of Antarctica for the conduct of scientific research". In addition, it states that "such judgements shall take account of:

- i) the scope of the activity, including its area, duration and intensity;
- ii) the cumulative impacts of the activity, both by itself and in combination with other activities in the Antarctic Treaty Area;
- iii) whether the activity will detrimentally affect any other activity in the Antarctic Treaty Area;
- iv) whether technology and procedures are available to provide for environmentally safe operations;
- v) whether there exists the capacity to monitor key environmental parameters and ecosystem components so as to identify and provide early warning of any adverse effects of the activity and to provide for such modification of operating procedures as may be necessary in the light of the results of monitoring or increased knowledge of the Antarctic environment and dependent and associated ecosystems; and
- vi) whether there exists the capacity to respond promptly and effectively to accidents, particularly those with potential environmental effects"

Article 8 of the Protocol introduces the term *Environmental Impact Assessment* and provides three categories of environmental impacts (*less than, equal to and more than minor or transitory*), according to their significance. The Article also requires that assessment of planned activities to be undertaken in Antarctica, subject to the procedures set out in Annex 1.

Annex I of the Protocol provides a more comprehensive explanation of the different impact categories and establishes a set of basic principles to conduct an EIA for planned activities in Antarctica.

In addition, it sets up a preliminary stage for assessing the environmental impact of Antarctic activities, which is intended to determine if an impact produced by a certain activity is less than minor or transitory or not. Such determination must be accomplished through the appropriate national procedures. According to the results of the preliminary stage, the activity can either:

proceed (if the predicted impacts of the activity are likely to be less than minor or transitory), or

be preceded by a an Initial Environmental Evaluation (IEE), if predicted impacts are likely to be minor or transitory; or

be preceded by a Comprehensive Environmental Evaluation (CEE), if the predicted impacts are to be more than minor or transitory.

Although the key to decide whether an activity shall be preceded by an IEE or a CEE is the concept of *aminor or transitory impact*", no agreement on this term has so far been reached (contributions to this subject can be found in XX ATCM/IP 2, New Zealand; XXI ATCM/ANP 35, New Zealand; XXI ATCM/IP 55, Argentina, XXII ATCM/IP 66, Russia and X~II ATCM/WP 19, Australia, among others). The difficulty with defining "*minor and transitory impactn*" thus far appear to be due to the dependence of a number of variables associated with each activity and each environmental context. Therefore the interpretation of this term will need to be made on a case by case site specific basis. As a consequence, this document does not focus on seeking a clear definition of "*minor or transitory impactn*", but rather is an attempt to provide basic elements for the development of the EIA *process*.

Article 8 and Annex I of the Protocol on Environmental Protection to the Antarctic Treaty set out the requirements for Environmental Impact Assessments (EIAs) for proposed activities in Antarctica. These Guidelines to EIA in Antarctica do not amend, modify or interpret the requirements set out in Article 8 and Annex I of the Environmental Protocol, or the requirements of national legislation which may include procedures and guidelines for the preparation of EIAs in Antarctica. These Guidelines have been produced to assist those preparing EIAs for proposed activities in Antarctica.

2.objectives

The general objective of these guidelines is to achieve transparency and effectiveness in assessing environmental impacts during the planning stages of possible activities in Antarctica, as well as consistency of approach in fulfilling the obligations of the Protocol. Specifically, the guidelines aim to

assist proponents of activities who may have little experience of EIA in Antarctica;

assist in determining the proper level of EIA document (according to the Protocol) to be prepared;
facilitate co-operation and co-ordination in EIA for joint activities;

facilitate comparison of EIAs for similar activities and/or environmental conditions; provide advice to operators other than ATCPs; assist in the retrospective analysis of cumulative impacts for specific sites; initiate a process of continuous improvement of EIA.

3.The EIA Process

The EIA is a process having the ultimate objective of providing decision makers with an indication of the likely environmental consequences of a proposed activity (figure 1).

The *process* of predicting the environmental impacts of an activity and assessing their significance is the same regardless of the apparent magnitude of the activity. Some activities require no more than a cursory examination to determine impacts, although it must be remembered that the level of assessment is relative to the significance of the environmental impacts, not to the scale or complexity of the activity. Thus, the picture that emerges with respect to the impacts of the activity will determine how much further the EIA process needs to be taken, and how complex it should be.

Those persons responsible for an Environmental Impact Assessment Process need to ensure that they consult as widely as is reasonably necessary and possible in order that the best available information and professional advice contribute to the outcome. A number of different participants may be involved throughout this process, ranging from those who are involved in the details of nearly all parts of the process (e.g. environmental officer, proponent of the activity) to those who are the technical experts who provide input in particular subjects of the process (e.g. researchers, logistic personnel, others with experience at the location or in a particular activity). In addition, EIAs undertaken in Antarctica for planned activities may represent a valuable source of information. At this respect, it should be pointed out that an updated list of EIAs is presented every ATCM, according to Resolution XIX-6. The Antarctic Data Directory System (ADDS) can also represent an helpful source of metadata.

3.1. Considering the activity

3.1.1. Defining the activity

An activity is an event or process resulting from (or associated with) the presence of humans in the Antarctic, and/or which may lead to the presence of humans in Antarctica. An activity may consist of several *actions*, e.g. an ice drilling *activity* may require *actions* such as the transport of equipment, establishment of a field camp, power generation for drilling, fuel management, drilling operation, waste management, etc. An activity should be analysed by considering all phases involved (e.g. construction, operation and potential dismantling or decommissioning phases).

The activity and the individual actions should be defined through a planning process which considers the physical, technical and economic aspects of the proposed project and its alternatives. Consultation with relevant experts to identify all these aspects is an important part of this initial scoping process. It is important to accurately define all aspects of the activity which could have environmental impacts. The rest of the EIA process relies on this initial description, which should occur during the planning process. The following aspects of the proposed activity and its alternatives should be clearly identified: the purpose of and the need for the activity;

the principal characteristics of the activity that might cause impact on the environment; for instance: design characteristics; construction requirements (types of material, technologies, energy, size of any installation, personnel, temporary constructions, etc.); transportation requirements (e.g. types, numbers and frequency of use of vehicles, fuel types); type (according to Annex III of the Protocol) and volume of wastes generated through different phases of the activity and their final disposition; dismantling of temporary constructions; decommissioning the activity if necessary; as well as those aspects that will result from the operational phase of the activity.

the relationship of the proposed activity to relevant previous or current activities;

a description of the activity's location and geographical area, indicating access roads, etc. Using maps will ease the evaluation process and, therefore, will be useful in the EIA documentation.

timing of the activity (including range of calendar dates for construction time, as well as overall duration, periods of operation of the activity and decommissioning. This may be significant with respect to wildlife breeding cycles, for example.);

location of the activity with regard to areas with special management requirements (SPA, SSSI, HSM, CCAMLR CEMP sites, already proposed ASPAs and/or ASMAs, etc.).

precautionary measures that are integral to the project including during the construction, operational and decommissioning phases.

Careful consideration is required to determine the full scope of the activity so that the impacts can be properly assessed. This is necessary to avoid preparing a number of separate EIAs on actions which indicate an apparent low impact, when in fact, taken in its entirety, the activity actually has potential for impacts of much greater significance. This particularly common where a number of activities take place at the same site either spatially and/or temporally.

When defining an Antarctic activity, experience gained in similar projects undertaken within and outside the Antarctic Treaty System Area (e.g. the Arctic) may be an additional and valuable source of information.

once the activity is defined, any subsequent changes to the activity must be clearly identified and addressed according to when they occur in the EIA process (e.g. if the change occurs once the EIA document is completed, then an amendment to the EIA or a rewrite of the document may be necessary depending on how significant the change is). In every case it is important that the change and its implications (in terms of impacts) is assessed in the same manner as other impacts previously identified in the EIA process.

3.1.2. Alternatives to the activity

Both the proposed activity and possible alternatives should be examined in concert so that a decision maker can more easily compare the potential impacts. Both the environmental and scientific consequences should be considered during the evaluation. Examples of alternatives for consideration include: use of different locations or sites for the activity,

use of different technologies, in order to reduce the outputs (or the intensity of the outputs) of the activity.
use of pre-existing facilities, and different timing for the activity.

The alternative of not proceeding with the proposed activity (i.e. the "no-action" alternative) should always be included in any analysis of environmental impacts of the proposed activity.

3.1.3.1 Identification of outputs of the activity

An *output* is a physical change (e.g. movement of sediments by vehicle passage, noise) or an entity (e.g. emissions, an introduced species) imposed on or released to the environment as the result of an *action* or an *activity*. outputs can also be defined as by-products of the activity (or action) and can include emissions, dust, mechanical action on substrate, fuel spills, noise, light, electromagnetic radiation, wastes, heat, introductions of alien species, etc.

Note that a single action may generate several different outputs (for example the use of vehicles may cause soil compaction, emissions, noise, visual interference etc.) and that the same type of output may be generated by different actions of a single activity, (for example in an ice drilling activity emissions may come from the use of vehicles, drilling operations, power generation, etc.).

output levels may play a relevant role especially if several activities take place at the same time. Therefore, potential for additive, synergistic or antagonistic interactions between outputs (thus resulting in possible significant environmental impacts) has to be considered.

Systematising outputs and actions in a matrix format may be helpful in this process. The example below, taken from "*Monitoring of Environmental Impacts from Science and operations in Antarctica*" (SCAR/CoMNAP, 1996), illustrates a potential situation (e.g. actions and outputs associated with a station complex).

OUTPUTS

ACTIONS	Air emissions (incl. Dust)	Wastes	Noise	Fuel	Mechanical spills	Heat action
Vehicles	X			X		
Power generation					X	–
Fuel storage	X				X	X

outputs may vary across different alternatives. That is there may not be a single set of outputs, but rather multiple sets if the alternatives are significantly different from one another.

The geographical spread of an output has to be accurately estimated in order to determine to what extent the environment is exposed.

3.2. Considering the environment

Consideration of the environment requires the characterisation of all relevant physical, biological, chemical and anthropic elements or values in a given area, where and when an activity is proposed. Relevant means all those aspects of the environment that the proposed activity might influence or which might influence the activity.

Such information should be quantitative (e.g., heavy metal concentration on organisms or on river flows, a bird population size) where available and appropriate. In many cases qualitative descriptions (e.g., aesthetic value of a landscape) may have to be used. Maps, publications, research results and researchers are different sources of information to be identified and taken into account. Consideration of the existing environment should include:

recognition of the special status accorded to Antarctica by the ATS, including its status as a natural reserve devoted to peace and science

the physical and biological features that could be affected directly or indirectly, including:

the physical characteristics (topography, bathymetry, geology, geomorphology, soils, hydrology, meteorology, glaciology etc.)

the biota (e.g. inventories of plant and animal species, populations and communities, and other important features such as the presence of breeding grounds.) and

any dependent and related populations (e.g. bird nesting areas related to feeding areas);

natural variations in environmental conditions that could occur on a diurnal, seasonal, annual and/or interannual timescale;

information about the spatial and temporal variability of the environmental sensitivity (e.g. differences in impacts when an area is snow covered compared to when it is not);

current trends in natural processes such as population growth or spread of particular species, geological or hydrological phenomena; the reliability of the data (e.g. anecdotal, historical, scientific, etc.);

aspects of the environment which have been changed, or may be changing as the result of other current or previous activities; special values of the area (if previously identified); the existence of areas potentially subject to indirect and cumulative impacts;

the influence that the activity may exert on dependent and associated ecosystems;

existing activities being carried out in the area or at the site, particularly scientific activities, given their intrinsic importance as a value to be protected in Antarctica

specific parameters against which predicted changes are to be monitored, including:

A thorough consideration of the environment before starting the activity (baseline information) is essential to ensure a valid prediction of impacts and to define

monitoring parameters, if required. If such a baseline information is not available, field research may be necessary to obtain reliable data about the state of the environment before beginning the activity.

It is also important to clearly identify gaps in knowledge and uncertainties encountered in compiling the information.

3.3. Analysis of Impacts

3.3.1.1 Identification of exposures

Exposure is the process of interaction between an identified potential output and an environmental element or value. Identifying exposure means determining which component of the environment is susceptible to be affected by the outputs of an activity or action. Overlaying spatial information (e.g. use of a GIS) is a valuable tool to assist in this determination.

Determination of exposures may be summarised using a matrix of outputs and environmental elements or values, taking into account that matrices can only give information about the existence of exposures but not on their intensity.

The table below provides an example of the interaction of various outputs with environmental elements to identify relevant exposures resulting from the activity.

ENVIRONMENTAL ELEMENTS OR VALUES OUTPUTS	ENVIRONMENTAL ELEMENTS OR VALUES		Freshwater / Seawater	Soil	Air
	Flora	Fauna			
Emissions	X	X	X	X	X
Fuel spills					
W~ Introduced species	X	X			

When the box is crossed (X) it means that the environmental element is exposed to the considered output. This is a random example for a given environment and may, therefore, vary in another context. For example, a noise may occur when a breeding site is unoccupied, or a breeding site may be protected from noise by a topographic feature. From the examples above it can be inferred that the occurrence of an output does not necessarily lead to exposure of environmental element or value and hence potential for environmental effects.

Correct identification of the intensity of exposure is a crucial step in making a reliable prediction of impacts. Some elements contributing to that identification are:

Temporal variation. The exposure of an environmental element or value may change with the season in which the activity takes place, as climate cycles, breeding patterns, etc. may change over time.

Cause-effect relationships between outputs and environmental elements or values must be determined, especially in cases where the relationships are indirect, or an element or value is exposed to outputs from numerous sources, or repeatedly from the same source.

3.3.2.1 Impact identification

An **impact** (Synonym: **effect**) is a change in the values or resources attributable to a human activity. It is the consequence (e.g. reduced plant cover) of an agent of change, not the agent itself (e.g. increase of trampling). Impact may also be defined as the result of the interaction between an output and an environmental value or resource.

The identification of environmental impacts consists of the characterisation of all changes in environmental elements or values exposed to the outputs of a given set of activities. The identification task requires that evaluators are able to determine the important cause-effect relationships between the activities and the environmental elements or values. only when the impact is identified can an evaluation be made of its **significance**.

An impact may be identified by its nature, spatial extent, intensity, duration, reversibility and lag time.

Nature: *type of change imposed on the environment due to the activity (e.g. contamination, erosion, mortality).*

Spatial extent: *area or volume where changes are likely to be detectable.*

Intensity: *a measure of the amount of change imposed on the environment due to the activity.(it can be measured, or estimated, through, e.g. number of species or individuals effected, concentration of a given pollutant in a waterbody, rates of erosion, rates of mortality, etc.)*

Duration: *period of time during which changes in the environment are likely to occur.*

Reversibility: *possibility of the system to return to its initial environmental conditions once an impact is produced.*

Lag time: *time span between the moment outputs are released to or imposed on the environment and the moment impacts occur.*

In addition, a proper impact identification should also enable a distinction between direct, indirect and cumulative impacts.

A **direct impact** is a change in environmental components that results from direct cause-effect consequences of interaction between the exposed environment and outputs (e.g. decrease of a limpet population due to an oil spill). An **indirect impact** is a change in environmental components that results from interactions between the environment and other impacts -direct or indirect- (e.g. alteration in seagull population due to a decrease in limpet population which, in turn, was caused by an oil spill).

A **cumulative impact** is the combined impact of past, present, and reasonably foreseeable activities. These activities may occur over time and space and can be additive or interactive/synergistic (e.g. decrease of limpet population due to the combined effect of oil discharges by base and ship operations). Cumulative impacts can often be one of the hardest impact categories to adequately identify in the EIA process. When attempting to identify cumulative impacts it is important to consider both spatial and temporal aspects and to identify other activities which have and could occur at the same site or within the same area.

Several methods exist to identify impacts such as: overlay maps, checklists, matrices, etc. The choice of the methodology will depend on the character of the activity and the environment that is likely to be affected.

3.3.3.1 Impact Evaluation

The purpose of impact evaluation is to assign relative significance to predicted impacts associated with an activity (and the various identified alternatives).

Significance: *It is a value judgement about the severity and importance of a change in a given environment or environmental value.*

According to the Madrid Protocol, impacts shall be evaluated by taking into account three levels of significance: less than minor or transitory impact; minor or transitory impact; or more than minor or transitory impact.

The interpretation of these terms should be made on a case by case site specific basis. However it may be useful to consider how similar impacts have been judged in earlier EIAs at similar sites and/or for similar types of activities.

An inherent consideration to judging significance is that it may have a rather subjective component and this fact should be acknowledged. Where an impact has the possibility of being significant, several experts should be consulted to achieve a view as objective as possible.. This is particularly important either if there is a reliance on incomplete data or if there are gaps in the knowledge.

Judging significance should not be based solely on direct impacts, but must also take account of possible indirect and cumulative impacts.

The significance of the unavoidable impacts (those impacts for which no further mitigation is possible) represents an important consideration for the decision maker in deciding whether, on balance, an activity is justified.

Some problems can arise when evaluating impacts, due to misunderstanding or overlooking some aspects of the process of evaluating impacts. These can include for example: confusing duration of the impact with duration of the activity; confusing outputs of activities with impacts;

limiting the analysis to direct impacts, without consideration of indirect and cumulative impacts.

3.4. Comparison of impacts

When the project has been assessed with respect to environmental impacts it is necessary to summarise and aggregate the significant impacts for the various alternatives in a form suitable for communication to the decision makers. From such an aggregation of information a comparison among alternatives can be easily made.

3.5. Proposal for corrective measures

Corrective measures are composed of all steps conducted to decrease, avoid, or eliminate any of the components of an impact. It can be considered a process of feedback, and should occur throughout the EIA process, not simply as a final step. Corrective measures include mitigation and remediation actions.

Mitigation is the use of practice, procedure or technology to minimise or to prevent impacts associated with proposed activities. The modification of any aspect of the activity (and hence the consideration of outputs and the environmental exposure) as well as the establishment of supervision procedures represent effective ways of mitigation.

Mitigation measures will vary according to the activity and the characteristics of the environment, and may include:

- developing on site control procedures (e.g. recommended methods for waste disposal)

- establishing the best time for the activity (e.g. to avoid the breeding season of penguins)

- providing environmental education and training to personnel, or contractors, involved in the activity.

- ensuring adequate on site supervision of the activity by senior project staff or environmental specialists.

Remediation consists of the steps taken after impacts have occurred to promote, as much as possible, the return of the environment to its original condition.

The final version of the activity to be assessed must incorporate all corrective measures, including those associated with mitigation and remediation actions. Impact avoidance, as a form of mitigation, may contribute to minimising monitoring, reducing remediation costs and generally contribute also to maintaining the existing state of the environment.

When considering mitigation and remediation measures, the following issues should be addressed: making a clear distinction between mitigation and remediation measures;

- clearly defining the state of the environment that is being aimed for through such measures;

- considering that new, unforeseen impacts may appear as a result of inadequate implementation of proposed mitigation measures;

- noting that the environment may not always be capable of returning to its original condition, even when remediation actions are implemented;

- considering that a given corrective measure may interact antagonistically or synergically with other corrective measures.

3.6. Proposal for Monitoring Programs

Monitoring consists of standardised measurements or observations of key parameters (outputs and environmental variables) over time, their statistical evaluation and reporting on the state of the environment in order to define quality and trends. For the EIA process, monitoring should be oriented towards confirming the accuracy of predictions about environmental impacts of the activity, and to detect unforeseen impacts or impacts more significant than expected. Given this, it may be useful to set environmental thresholds or standards for an activity that monitoring results are assessed against. If these thresholds are exceeded, then a review or reanalysis would be required of assumptions made regarding the environmental impacts or of management systems related to the activity.

Monitoring may also include any other procedures that can be used to assess and verify the predicted impacts of the activity. Where measurement of specific parameters is not necessary or appropriate, assessment and verification procedures could include maintaining a log of the activity that actually occurred, and of changes in the nature of the activity where they were significantly different from those described in the EIA. This information can be useful for further minimising or mitigating impacts, and, where appropriate, for modifying, suspending or even cancelling all or part of the activity.

Monitoring is not about the measurement of everything in a haphazard approach to detect change but about precise measurement of a few target species, processes, or other indicators, carefully selected on the basis of scientifically sound predetermined criteria.

The process of selecting key indicators should be accomplished during the activity's planning stage, once outputs have been identified, the environment has been considered and associated impacts have been assessed, while monitoring environmental parameters generally should start before the commencement of the activity if adequate baseline information is not available.

Planning or undertaking monitoring activities may be hindered by a number of situations: leaving the planning of monitoring programs until the activity is in progress;

monitoring activities can be costly, especially for multi-year projects and activities;

some assumptions about the environmental impacts of an activity cannot be tested; failure to follow through with monitoring;

failure to distinguish between natural and human-induced variability in environmental parameters;

4. Writing the EIA Document

The outcome of an EIA is a formal document, which presents all the relevant information about the EIA process. The EIA document represents a fundamental link between the EIA process and decision makers seeing that conclusions stemming

from the EIA process will assist decision makers to consider the environmental aspects of the proposed activity.

Four bodies of information arise from an EIA process: *methodology, data, results and conclusions* derived from them. Since *results* and *conclusions* are of particular interest for decision makers, these chapters should be written in an accessible language, avoiding very technical terms. The use of graphical information, such as maps, tables and graphs, is an effective way of improving communication.

The size and level of detail in the document will depend on the significance of the environmental impacts that have been identified throughout the EIA process. Thus, Annex I to the Protocol establishes two formats to document it: Initial Environmental Evaluation (IEE) and Comprehensive Environmental Evaluation (CEE), for which the Protocol requires the presentation of different volumes of information (Annex 1, Articles 2 and 3).

Unless it has been determined that an activity will have less than a minor or transitory impact or it has already been determined that a Comprehensive Environmental Evaluation is needed, an Initial Environmental Evaluation (IEE) shall be prepared. If the EIA process indicates that a proposed activity is likely to have more than a minor or transitory impact a Comprehensive Environmental Evaluation must be prepared. According to Annex I requirements a draft CEE shall be prepared first, which shall be circulated to all Parties as well as to CEP for comments. Once comments and suggestions have been incorporated, a final CEE is circulated to all Parties.

The following table summarises the steps to be considered throughout the EIA process (which are explained in Section 3 of the present guidelines). It also lists the requirements stemming from Annex I that should be included in an EIA document. In the case of IEE, some of the marked items are not specifically mentioned in Annex 1, Article 2. However, their inclusion in the IEE document is often useful to communicate the results of the process in a transparent manner. These items were distinguished in the table with an X.

L	EIA Contents and Annex I Requirements		
	IEE		
	CEE		
	Description of the purpose and need of the activity	~	
.~			
	Description of the proposed activity and possible alternatives and the consequences of those alternatives	~	.
	Alternative of not proceeding with the activity		
.~			
	Description of the initial environmental reference state and prediction of		
.~			
	the environmental state in absence of the activity		
	Description of methods and data used to forecast the impacts		
~	nullon ol na:re, extent, duration and intensity of direct impacts		
.f			
	Consideration of cumulative impacts		
.~		11	
	Consideration of possible indirect impacts	X	
~			
	Monitoring programs		.
	Mitigation and remediation measures		
	Identification of unavoidable impacts		.

Effects of the activity on scientific research and other uses or values

Identification of gaps in the knowledge

X

Preparers and advisors

X

References

X

X

Non-technical summary

X

In~e~

X

X

Glossary

~ required by Annex I

X often useful

The following text focuses briefly on how the items listed above should be referred to in the text of any EIA. Further technical information is already described in previous chapters.

Description of the Purpose and Need for the Proposed Activity

This section should include a brief description of the proposed activity and an explanation of the intent of the activity. It should include sufficient detail to make it clear why the activity is being proposed including the need for the activity to proceed. It should also provide details on the process by which the scope of the activity was defined. This will help ensure that the full scope of the activity has been included so that impacts can be properly assessed. If a formal process was used to accomplish this (a formal meeting or solicitation of input from the public or other groups), that process and its results should be discussed here.

Description of the proposed activity and possible alternatives and the consequences of those alternatives

This section should include a detailed description of the proposed activity as well as reasonable alternatives. The first alternative to be described would be the proposed activity. The description should be as comprehensive and detailed as possible (see section 3.1).

It may be useful to provide a comparison of alternatives in this section. For instance, for a new research station, alternatives might include differences in the size of the station and the number of persons that could be accommodated. These differences would mean different quantities of materials required, fuels consumed and emissions or wastes generated. Tables showing appropriate comparisons can be very helpful to the reader of the document.

Alternative of not proceeding with the activity

The alternative of not proceeding with the proposed activity (i.e. the "no-action" alternative) should be described to highlight the pros and cons of not conducting the activity. Although the Protocol only requires its inclusion in CEEs, it is useful to also include the "no-action" alternative in the text of IEEs in order to better justify the need for proceeding with the activity.

Description of the initial environmental reference state and prediction of the environmental state in absence of the activity

Such a description should not be limited to a characterisation of the relevant physical, biological, chemical and anthropic elements of the environment, but should also take into account the existence and behaviour of dynamic trends and processes in order to predict the state of the environment in absence of the activity. A proper description of

the initial environmental reference state provides elements against which changes are to be compared.

Description of methods and data used to forecast the impacts

The purpose of this section is to explain and, if necessary, defend the design of the assessment and then provide enough detail that a further evaluator can understand and reproduce the procedure. Careful writing of the methodology is critically important because it determines that results can be reproducible and/or comparable.

Estimation of nature, extent, duration and intensity of impacts (including consideration of possible indirect and cumulative impacts).

This section contains the results of analyses of impacts, which includes a clear description of identified exposures as well as the identification of impact aspects, in terms of their nature, spatial extent, intensity, duration, reversibility and lag time. It must clearly establish the significance assigned to each impact and the justification for such assignment. In addition, and to summarise this section, the inclusion of a table showing the environmental impacts on each environmental component can be very helpful.

Special attention must be paid to the consideration of possible indirect and cumulative impacts, since cause-effect relationship determining the existence of such impacts usually exhibit a higher degree of complexity.

Monitoring programs

When necessary, this section should clearly define monitoring objectives, set testable hypotheses, choose key parameters to be monitored, assess data collection methods, design statistical sampling program, and decide on frequency and timing of data collection/recording. Implementation of such monitoring programs is a further step that may begin after the planning of the activity has been completed, even though the activity has not actually been initiated.

Mitigation and remediation measures

Since mitigation and remediation measures usually aim to correct some aspects of the activity, communication of these measures must be concrete, pointing out the proposed actions and their timing, as well as the benefits associated to each individual measure. It is often useful to include this section in the text of IEEs.

Identification of unavoidable impacts

Recognition of the existence of unavoidable impacts should be included within any impact analysis. Consideration of such impacts is of great importance given that the occurrence of unavoidable impacts may affect the decision on whether to proceed with the proposed activity.

Effects of the activity on scientific research and other uses or values

Taking into account that the Protocol designates Antarctica as an area devoted to peace and science, the effects of the proposed activity on ongoing scientific research,

or on the potential of a site to future scientific research, must be a fundamental consideration when the impact analysis is carried out.

Identification of gaps in the knowledge

Existing bodies of knowledge (i.e., empirical, theoretical, or anecdotal data and information) are used to support the assessment process. Nonetheless, these bodies of knowledge may be incomplete or may be surrounded by varying degrees of uncertainty. It is critical to identify explicitly in the assessment where such incompleteness or uncertainty exists; and how this has been factored into the assessment process. This disclosure can be useful in assessment by clearly identifying where more knowledge is needed.

Preparers and Advisors

This section provides a list of those experts who were consulted in preparing the assessment, their areas of expertise, and appropriate contact information. It should also list the persons who were responsible for the actual preparation of the document. This information is useful to reviewers and decision makers to ensure that the appropriate expertise was brought to bear on the analyses needed to assess the type and degree of impact from the proposed activity. It is also useful information for future assessments on similar activities or issues.

References

This section should list any references used in preparing the evaluation. They may include research or other scientific papers used in the analysis of impacts or monitoring data used to establish baseline conditions in the area where the activity is proposed. They may also include other environmental assessments of similar activities at other or similar locations.

Index

As an EIA document may be fairly large, an index is a very helpful aid to the reader.

Glossary

This section provides a list of terms and definitions as well as abbreviations that are helpful to the reader, especially if the terms are not commonly understood .

Cover Sheet

The CEE should contain a title page or cover sheet that lists the name and address of the person or organization who prepared the CEE and the address to which comments should be sent (for the draft document only).

Non-Technical Summary

The CEE must contain a non-technical summary of the contents of the document. This summary should be written in an accessible language and include pertinent information on the purpose and need for the proposed activity, the issues and

alternatives considered, the existing environment, and the impacts associated with each alternative. A non-technical summary might also be useful for an IEE.

Finally, in either case (IEE or CEE) a number of considerations about writing the EIA document should be taken into account, such as: avoidance of including irrelevant descriptive information; documenting all relevant steps of the process; clearly describing the impact identification methodology;

clearly distinguishing between results (identification of impacts, mitigation measures, etc.) and final value judgement of significance; properly connecting results and conclusions.

5. Annex I Requirements for Circulation

5.1. Public circulation of an EIA

Under Annex 1, public circulation is only required for CEEs. The draft CEE shall be made publicly available and shall be circulated to all Parties, which shall also make it publicly available, for comment. A period of 90 days shall be allowed for the receipt of comments. It shall be forwarded to the CEP at the same time as it is circulated to the Parties, and at least 120 days before the next ATCM, for consideration as appropriate.

5.2. Receipt and incorporation of comments

No final decision shall be taken to proceed with the proposed activity in the Antarctic Treaty area unless there has been an opportunity for consideration of the draft CEE by the ATCM on the advice of the CEP, provided that no decision to proceed with a proposed activity shall be delayed for longer than fifteen months from the day of circulation of the draft CEE. A final CEE shall address and shall include or summarise comments received on the draft CEE. The final CEE, notice of any decision relating thereto, and any evaluation of the significance of the predicted impacts in relation to the advantages of the proposed activity, shall be circulated to all Parties, which shall also make them publicly available, at least sixty days before the commencement of the proposed activity in the Antarctic Treaty area.

6. Definition of terms in the EIA process

Action: any step taken as a part of an activity.

Activity: an event or process resulting from (or associated with) the presence of humans in the Antarctic, and/or which may lead to the presence of humans in Antarctica. (adapted from *SCAR/CoMNAP Monitoring Workshop*)

Comprehensive Environmental Evaluation (CEE): an environmental impact document required for proposed activities that may have more than a minor or transitory impact on the Antarctic environment (from *Madrid Protocol, Annex 1, Article 3*).

Cumulative Impact: the combined impact of past, present, and reasonably foreseeable activities. These activities may occur over time and space and can be additive or interactive/synergistic (adapted from *IUCN Cumulative Impacts Workshop*).

Direct Impact: a change in environmental components that results from direct cause-effect consequences of interaction between the exposed environment and outputs. (from *Guidelines for EIA in the Arctic*)

Environmental Impact Assessment (EIA): a process for identifying, predicting, evaluating and mitigating the biophysical, social and other relevant effects of proposed projects and physical activities prior to major decisions and commitments being made (from *Guidelines EM in the Arctic*)

Exposure: the process of interaction between an identified potential output and an environmental element or value. (adapted from *SCAR/CoMNAP Monitoring Workshop*)

Impact: a change in the values or resources attributable to a human activity. It is the consequence (e.g. reduced plant cover) of an agent of change, not the agent itself (e.g. increase of trampling). Synonym: effect. (from *SCAR/CoMNAP Monitoring Workshop*).

Indirect Impact: a change in environmental components that results from interactions between the environment and other impacts (direct or indirect). (from *Guidelines for EM in the Arctic*)

Initial Environmental Evaluation (IEE): an environmental impact document required for proposed activities that may have a minor or transitory impact on the Antarctic environment (from *Madrid Protocol, Annex 1, Article 2*).

Mitigation: the use of practice, procedure or technology to minimise or to prevent impacts associated with proposed activities. (*CoMNAP Practical Guidelines*)

Monitoring: consists of standardised measurements or observations of key parameters (outputs and environmental variables) over time, their statistical

evaluation and reporting on the state of the environment in order to define quality and trends. (adapted from *SCAR/CoMNAP Monitoring Workshop*)

output: a physical change (e.g. movement of sediments by vehicle passage, noise) or an entity (e.g. emissions, an introduced species) imposed on or released to the environment as the result of an *action* or an *activity*. (*SCAR/CoMNAP Monitoring Workshop*)

Preliminary Stage (PS): a process that considers the level of environmental impacts of proposed activities -before their commencement- referred to in Article 8 of the Protocol, in accordance with appropriate national procedures. (from *Madrid Protocol, Annex 1, Article 1*)

Remediation: consists of the steps taken after impacts have occurred to promote, as much as possible, the return of the environment to its original condition

Unavoidable Impact: an impact for which no further mitigation is possible.

7. References

- ARCTIC ENVIRONMENTAL PROTECTION STRATEGY. 1997. Guidelines for Environmental Impacts Assessment (EIA) in the Arctic. Sustainable Development and Utilisation. Finnish Ministry of the Environment, Finland, 50 pp.
- ATCPs. 1991. Protocol on Environmental Protection to the Antarctic Treaty (plus annexes). 11th, Antarctic Treaty Special Consultative Meeting. Madrid, 22-30 April, 17-23 June 1991.
- CoMNAAP. 1992. The Antarctic Environmental Assessment Process, Practical Guidelines. Bologna (Italy) June 20, 1991, revised Washington D.C. (USA), March 4, 1992.
- FOREIGN AND COMMONWEALTH OFFICE. 1995. Guide to Environmental Impact Assessment of Activities in Antarctica. Polar Regions Section, South Atlantic and Antarctic Department, London.
- IUCN - The World Conservation Union. 1996. Cumulative Environmental Impacts in Antarctica. Minimisation and Management. Edited by M. de Poorter and J.C. Dalziel. Washington, D.C., USA. 145 pp.
- MINISTRY OF FOREIGN AFFAIRS AND TRADE. 1997. Guidelines and Procedures for Visitors to the Ross Sea Region. Ministry of Foreign Affairs and Trade. New Zealand.
- SCAR/CoMNAAP . 1996. Monitoring of Environmental Impacts from Science and operations in Antarctica. Workshop report. 43 pp and Annexes, .1996 Workshops
- X-(ATCM/IP 2, Developing and Understanding of Minor or Transitory, submitted by New Zealand.
- X)(I ATCM/IP 55, Elementos para la Interpretacion de los Procedimientos de Evaluacion de Impacto Ambiental contenidos en el Anexo I del Protocolo de Madrid, submitted by Argentina.
- XXI ATCM/WP 35, Further understanding of the term Minor or Transitory, submitted by New Zealand.
- XXII ATCM/IP 66, Application of the " minor or transitory impacts" criterion of EIA in different regions of Antarctica, submitted by Russian Federation.
- XXII ATCM/IWP 19, Environmental Impact Assessment. The role of EIA Guidelines in understanding " Minor or Transitory", submitted by Australia.

8. Acronyms

- ASMA: Antarctic Specially Managed Area
ASPA: Antarctic Specially Protected Area
ASoC: Antarctic and Southern ocean Coalition

ATCM: Antarctic Treaty Consultative Meeting

ATCP: Antarctic Treaty Consultative Party

ATS: Antarctic Treaty System

CCAMLR: Commission for the Conservation of Antarctic Marine Living Resources

CEE: Comprehensive Environmental Evaluation

CEMP: CCAMLR Ecosystem Monitoring Program

CEP: Committee of Environmental Protection

CoMNAP: Council of Managers of National Antarctic Programmes

EIA: Environmental Impact Assessment

GIS: Geographical Information System

GoSEAC: SCAR Group of Specialists on Environmental Affairs and Conservation

HSM: Historic Sites and Monuments

IEE: Initial Environmental Evaluation

IUCN: International Union for the Conservation of Nature (World Conservation Union)

SCAR: Scientific Committee of Antarctic Research

SPA: Specially Protected Area

SSSI: Site of Special Scientific Interest