

## Guidelines for Environmental Impact Assessment in Antarctica

### Table of Contents

1. Introduction.....	2
2. Objectives .....	3
3. The EIA Process .....	4
3.1. Considering the activity.....	7
3.2. Considering the environment.....	10
3.3. Analysis of Impacts .....	12
3.4. Comparison of impacts.....	18
3.5. Measures to minimise or mitigate impacts .....	18
3.6. Monitoring .....	20
4. Writing the EIA Document.....	22
5. EIA feedback processes .....	27
5.1 Monitoring.....	27
5.2 Changes to the activity .....	28
5.3 Review.....	29
6. Definition of terms in the EIA process .....	29
7. References .....	31
8. Acronyms.....	31
9. Resources .....	33
Appendices.....	35
Appendix 1. Example checklist for collecting and recording of baseline information about the state of the environment in the location of a proposed activity .....	35
Appendix 2. Aspects and potential impacts of Antarctic activities.....	40

## 1. Introduction

Article 3 of the Protocol on Environmental Protection to the Antarctic Treaty (the Protocol) establishes a number of environmental principles which can be considered a guide to environmental protection in Antarctica and its dependent and associated ecosystems. It states that “the protection of the Antarctic environment and dependent and associated ecosystems and the intrinsic value of Antarctica, including its wilderness and aesthetic values and its value as an area for the conduct of scientific research, in particular research essential to understanding the global environment, shall be fundamental considerations in the planning and conduct of all activities in the Antarctic Treaty area.”

To give effect to the above over-arching principle, Article 3.2(c) requires that ‘activities in the Antarctic Treaty area shall be planned and conducted on the basis of information sufficient 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 a minor or transitory impact*, *a minor or transitory impact* and *more than a minor or transitory impact*), according to their significance. The Article also requires that activities proposed to be undertaken in Antarctica shall be subject to the prior assessment procedures set out in Annex I to the Protocol.

Annex I provides a more comprehensive explanation of the different environmental 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, or subsequent evaluations if required, 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 an Initial Environmental Evaluation (IEE), if predicted impacts are likely to be no more than 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 “*minor or transitory impact*”, no agreement on this term has so far been reached. The difficulty with defining “*minor or transitory impact*” appears 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 impact*”, but rather is an attempt to provide basic elements for the development of the EIA process.

Article 8 and Annex I of the Protocol 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 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 both government and non-government operators;

- where appropriate, assist proponents to give consideration to the possible implications of climate change for proposed activities and their associated environmental impacts;
- where appropriate, assist proponents to give consideration to the possible risks of introduction or dissemination of non-native species associated with proposed activities;
- assist in the consideration of cumulative impacts relevant to the proposal; and
- 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. The process of preparing the EIA will result in an improved understanding of the likely environmental impacts. 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.

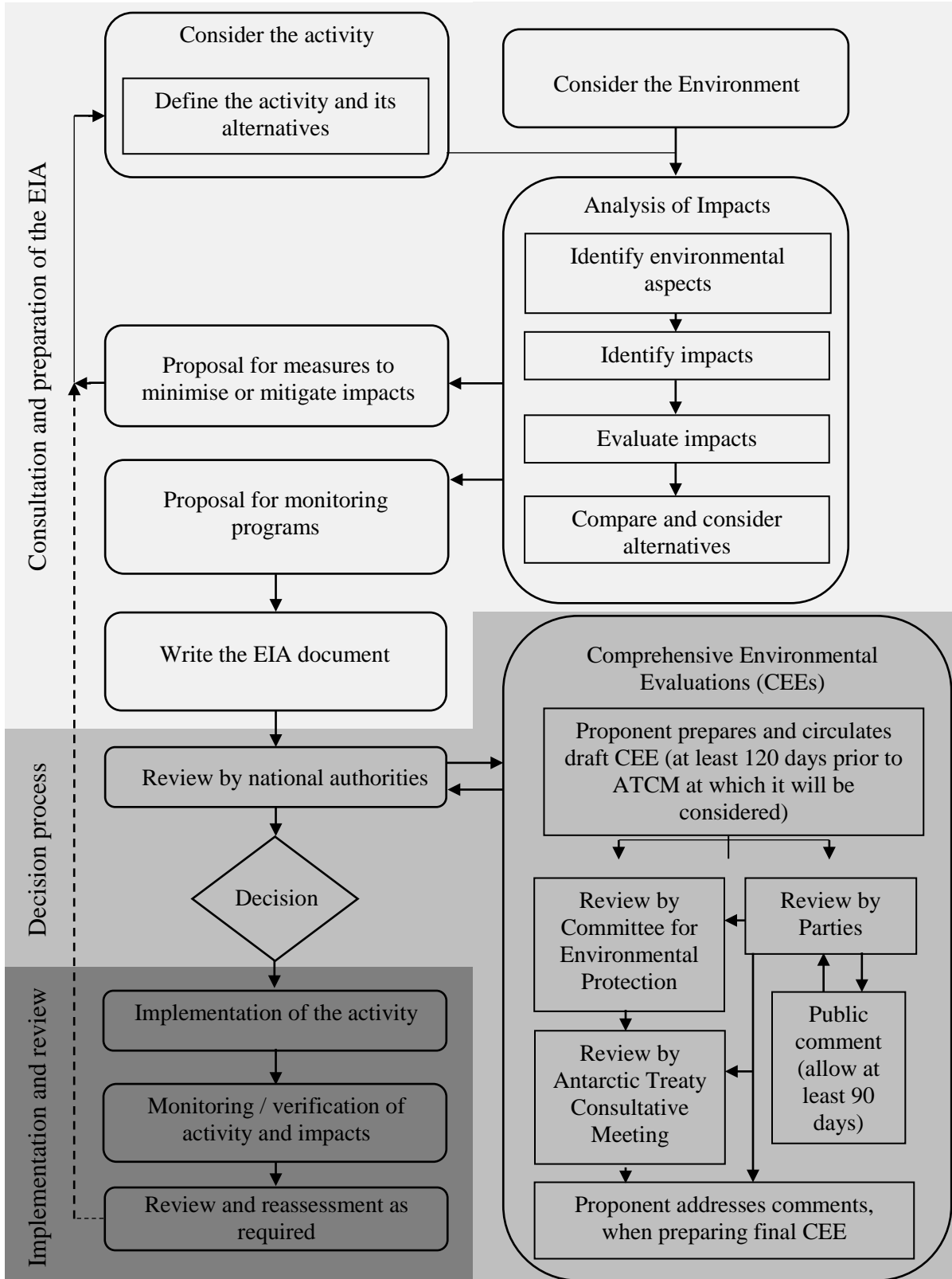


Figure 1: Steps of the EIA process for Antarctic activities

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, previous EIAs undertaken for proposed activities in Antarctica may represent a valuable source of information. [Resolution 1\(2005\)](#) recommends that Parties report annually to the Secretariat of the Antarctic Treaty on IEEs and CEEs prepared by or submitted to them (e.g. a short description of the development or activity; the type of environmental impact assessment undertaken (IEE or CEE); the location (name, latitude, and longitude) of the activity; the organisation responsible for the EIA; and any decision taken following consideration of the Environmental Impact Assessment). These details, including an electronic copy of the EIA document where possible, are available from the [EIA Database](#) on the ATS website. The [Antarctic Master Directory](#) can also represent a helpful source of metadata.

#### *Comprehensive Environmental Evaluations (CEEs)*

Under Annex I, a draft CEE must be prepared if the Party proposing an activity, or to which a proposal has been submitted, determines that an activity that is likely to have more than a minor or transitory impact. This determination will be made in accordance with appropriate national procedures, and with reference to the provisions and objectives of the Protocol.

The draft CEE shall be made publicly available and shall be circulated to all Parties, which shall also make it publicly available, for comment (Figure 1). 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.

In accordance with the [Procedures for intersessional CEP consideration of draft CEEs](#), the CEP Chair will establish an open-ended intersessional contact group (ICG) to consider the draft CEE, and will consult with CEP Members to identify a suitable convener and to agree the terms of reference. The ICG will report to the next CEP meeting, which will discuss the draft CEE and provide advice to the ATCM.

Article 3.5 of Annex I states that 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 60 days before the commencement of the proposed activity in the Antarctic Treaty area.

### **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 actions involved over every phase of the activity (e.g. construction, operational and decommissioning phases).

The activity and the individual actions should be defined through a planning process which considers the physical, technical and economic and other elements of the proposed project and its alternatives. Consultation with relevant experts to identify all these elements is an important part of this initial scoping process. It is important to accurately define all elements of the activity which could interact with the environment and result in impacts. The rest of the EIA process relies on this initial description, which should occur during the planning process.

The following elements of the proposed activity and its alternatives should be clearly identified:

- the purpose of and the need for the activity. The rationale for a proposed activity is an important component of any EIA and, where appropriate, should consider how the activity will contribute to advancing the objectives of the Antarctic Treaty and Protocol. In particular, where the activity is expected to result in benefits to the environment or science, this should be highlighted. Where appropriate, a description of proposed scientific activities could usefully include reference to broader national or international strategic science plans;
- 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 (types, numbers and frequency of use of vehicles, fuel types); type and quantity of wastes generated through different phases of the activity and their final disposition (with reference to Annex III of the Protocol); 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, current or reasonably foreseeable activities. In this respect, and where appropriate, the EIA should clearly explain the anticipated outcomes of the proposed activity, taking into account similar activities carried out in the area (e.g. how the proposed science or science support facilities will complement activities at existing nearby facilities, or how an activity proposed for educational purposes will promote the value and importance of Antarctica);
- a description of the activity's location and geographical area, including means of access and associated infrastructure. This should include a description of any characteristics that will have a bearing on the full geographic extent of the activity's impacts, including physical, visible and

audible elements. 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 important with respect to wildlife breeding cycles, for example); and
- location of the activity with regard to areas with special management requirements (ASPA, ASMA, HSM, CCAMLR CEMP sites, proposed ASPAs and/or ASMAs, etc.) Such information is readily available in the [Antarctic Protected Areas Database](#) maintained by the Antarctic Treaty Secretariat.

To ensure the EIA presents an accurate and comprehensive description of the activity, and potentially significant environmental aspects are addressed, particular attention should be given to:

- taking a holistic approach to defining the scope of the activity. 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. For example, a proposal to construct a new station should also discuss in detail the associated logistics, major scientific infrastructure, and ancillary facilities beyond the main station building (e.g. roads, helipads / airstrips, communication facilities etc.). This is particularly common where a number of activities take place at the same site either spatially and/or temporally. Where activities are to be undertaken at sites which are visited repeatedly by one or more operators the cumulative effects of past, current, and reasonably foreseeable activities should be taken into consideration;
- considering, and to the extent possible providing details of, the decommissioning phase, including the duration, costs and probable impacts. From an environmental perspective, and consistent with Annex III to the Protocol, the complete removal of infrastructure is preferable, although it is recognised there may be situations where this is not possible or may result in greater adverse environmental impacts. The EIA should describe whether any items will be left in place following decommissioning and, if so, clearly explain why they will not be removed. It should also be noted that, depending on the circumstances (e.g. elapsed time, changes in the activity/use of the installation, changes in the environment) a new EIA may need to be prepared at the time for decommissioning activities; and
- describing in detail activities relevant to the possible transfer of non-native species into and between locations in Antarctica (e.g. transport of vehicles / equipment / supplies / personnel). In this respect, the transport of equipment and heavy machinery from locations with a similar climate, such as the Arctic region or sub-Antarctic islands, may be of particular relevance.

In identifying spatial and temporal boundaries for the EIA proponents should identify other activities occurring in the region within the EIA framework.



When defining an Antarctic activity, experience gained in similar projects undertaken within and outside the Antarctic Treaty area (e.g. the Arctic region or sub-Antarctic islands) 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 (Figure 1).

### **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 on the Antarctic environment and dependent and associated ecosystems; in accordance with Article 3 of the Protocol, this should include consideration of impacts on the intrinsic value of Antarctica, including its wilderness and aesthetic values and its value as an area of the conduct of scientific research.

Examples of alternatives for consideration include:

- use of different locations or sites for the activity. Overall impacts can be minimised by selecting a location that will avoid adverse interactions between the activity and the environment (e.g. away from wildlife colonies, vegetated areas, locations of scientific projects, pristine sites important for microbiology, historic sites). For similar reasons, consideration should be given to the alternative of undertaking the activity in a location that has already been modified as a result of previous human activity;
- alternative arrangements for use of a proposed location, including the layout of facilities. For example, a multi-story building might minimise the area disturbed by footings. However, the visibility of structures should also be considered;
- opportunities for international cooperation on facilities, research and logistics. Where appropriate, there can be scientific and cost benefits, as well as environmental benefits, from cooperative arrangements with other nations, such as the shared use of existing research stations or other infrastructure, joining existing or planned scientific programs, or making arrangements to utilise established shipping, air and ground transport;
- use of different technologies, in order to reduce the outputs (or the intensity of the outputs) of the activity. For example, the use of renewable energy sources, energy efficient equipment, and building management systems that will help minimise atmospheric emissions, waste water treatment plants that may allow the re-use of treated water, the use of unmanned aerial vehicles (UAVs) that may minimise direct human impact in fragile environments, or alternative survey equipment that may minimise underwater noise;

- use of pre-existing facilities. For example, this may involve sharing or expanding operational facilities, including international collaboration, or the re-opening, rehabilitation and re-use of abandoned or temporarily closed facilities;
- alternatives that may avoid / minimise the cost and effort of decommissioning, as well as environmental impacts. If possible, the EIA should consider a combination of alternatives identified above, including location, layouts, international cooperation or technologies; and
- different timing for the activity (e.g. to avoid vehicle access during the breeding season of native birds or mammals, or during times of year when temporarily snow/ice-free ground may be susceptible to vehicle traffic).

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.

The EIA should describe the factors / criteria considered when assessing alternatives (e.g. environmental impact, logistical considerations, safety considerations, cost), and clearly explain the rationale and process for assessing and identifying the preferred option.

### **3.2. Considering the environment**

A thorough understanding of the pre-activity state of the environment is an essential basis for predicting and evaluating impacts, and for identifying relevant and effective mitigation measures. If it is proposed that the activity will take place in multiple locations, consideration should be given to all locations in question.

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

Such information should be quantitative (e.g. heavy metal concentration on organisms or on river flows, a bird population size) where available and appropriate. The recording of metadata (i.e. important information about a dataset, such as where, when and how such data were collected) can be valuable for future comparisons, including monitoring and verification of predicted impacts. In many cases qualitative descriptions may have to be used, such as when describing the aesthetic value of a landscape. 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, where appropriate:

- 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, such as topography, bathymetry, geology, geomorphology, soils, hydrology, meteorology, glaciology;
- the biota. For example inventories of terrestrial, freshwater and marine plant and animal species, populations and communities, other important features such as the presence of breeding grounds, and microbial communities and habitats); and
- any dependent populations. For example. bird nesting areas related to feeding areas;
- an assessment, to the extent possible, of the pre-activity wilderness state of the location of the proposed activity. While the Antarctic Treaty Parties have not agreed a definition for the term wilderness, it is generally understood to represent a measure of the relative absence of evidence of, or impacts from, human activity;
- an assessment of the value of the location as an area for the conduct of scientific research;
- 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. For example, differences in impacts when an area is snow covered, or covered by sea ice, compared to when it is not;
- identification and consideration of any particular vulnerabilities associated with the locations where the activity will take place, or any dependent or associated ecosystems, including any unique characteristics and vulnerabilities of the biogeographic region. It may be useful to have reference to the Antarctic Conservation Biogeographic Regions and the Environmental Domains Analysis of Antarctica);
- 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.);
- elements 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). This may include, but is not necessarily limited to, the presence of ASPAs, ASMAAs or HSMs – see the [Antarctic Protected Areas Database](#);
- 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, or planned to be carried out at the site, particularly scientific activities, given their intrinsic importance as a value to be protected in Antarctica; and

- specific parameters against which predicted changes are to be monitored.

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 baseline information is not available, field research may be necessary to obtain reliable data about the state of the environment before beginning the activity. Remotely sensed data, such as satellite or aerial imagery, can also be a useful source of information. An example checklist to help guide the process of obtaining and recording baseline information is presented at Appendix 1. The Resources section at the end of this document provides direction to a range of sources of information that may also be of use when considering the environment.

As far as possible, consideration should be given to anticipated / potential environmental consequences of climate changes in the location of the proposed activity, and over the timeframe of the proposed activity, including the decommissioning phase where relevant. For this purpose, relevant sources of general information would include, but would not be limited to, SCAR's 2009 Antarctic Climate Change and Environment report, and subsequent regular updates produced by SCAR. Proponents should also investigate sources of information that can give insight into observed or anticipated climate-related changes at the particular location in question.

It is also important to clearly identify gaps in knowledge and uncertainties encountered in compiling the information. The EIA should consider the extent to which any limitations in the understanding of the environment will affect the accuracy and relevance of the impact assessment and, where appropriate, indicate the means by which any gaps and uncertainties will be addressed (e.g. by further site surveys, field research, remote sensing etc.).

When an operator plans an activity which will be undertaken at several sites, each one of those sites should be described according to the methodology above.

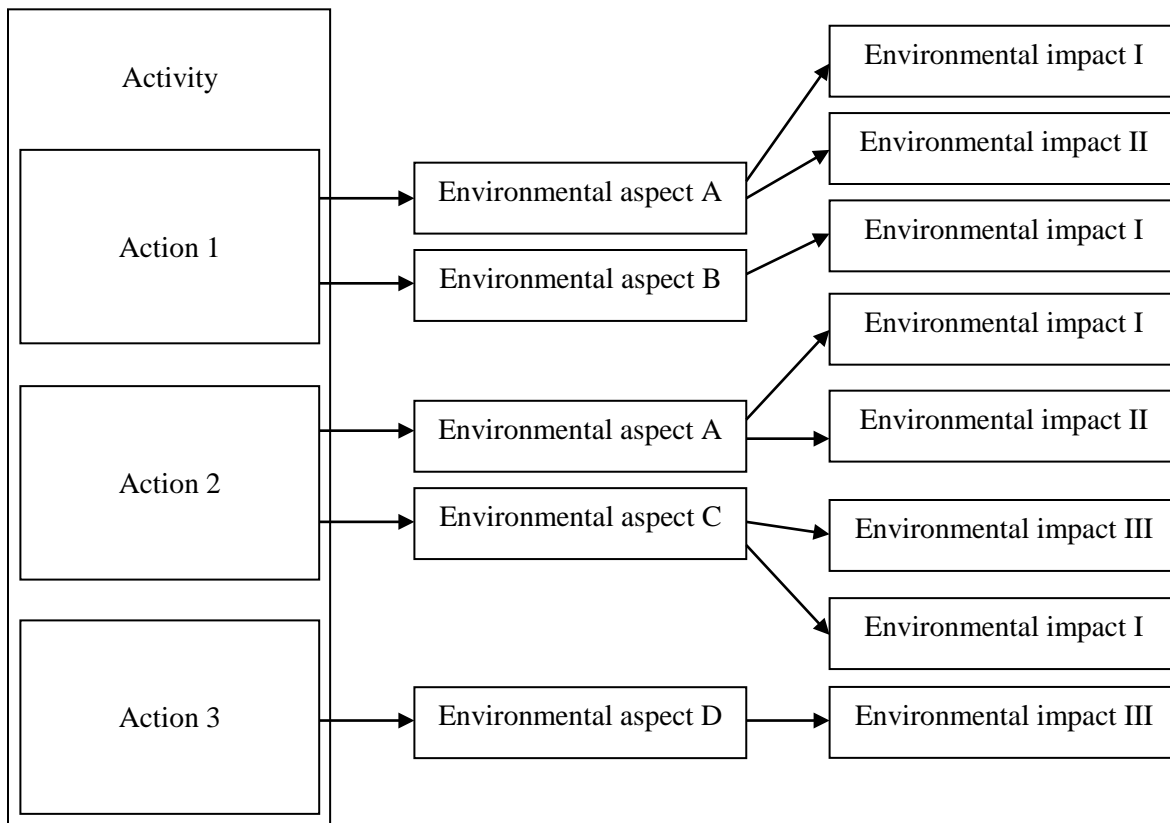
### **3.3. Analysis of Impacts**

#### **3.3.1 Identification of environmental aspects**

Understanding the ways in which a proposed activity can interact with the environment (i.e. its environmental *aspects*) is an important step in identifying and addressing the potential environmental impacts.

An environmental aspect may involve an output or addition to the environment (e.g. emission of pollutants / noise / light, human presence, transfer of native or non-native species, direct contact with wildlife / vegetation, leak or spill of hazardous substances etc.) or a removal from the environment (e.g. use of lake water, collection of moss samples, removal of rocks). Identifying environmental aspects involves determining the type of interaction (e.g. emission, discharge, extraction) and which component or components of the environment may be involved in interactions with the activity (e.g. discharge of waste water to the ocean / discharge of waste water into ice, or emission of noise to air / emission of noise to water).

A single activity may involve several component parts or *actions*, each of which may have several associated environmental aspects (see Figure 2). For example, the overall activity of constructing and operating a research station may involve the use of vehicles, which may interact with the environment by directly compacting soil, emitting atmospheric emissions, emitting noise, etc.). Constructing and operating a research station may also involve other actions, such as the management of waste and the management of fuel, each of which may interact with the environment. Similarly, different activities or actions may have similar environmental aspects. For example in an ice drilling activity the aspect ‘atmospheric emissions’ may be associated with the use of vehicles, use of the drilling rig itself or power generation. In turn, each environmental aspect may potentially result in one or more environmental impact (see Section 3.3.2).



Consider whether the activity may involve several component parts, or ‘actions, which may interact with the environment

Identify the ways in which the activity (including its component parts) can interact with the environment – these are the ‘environmental aspects’

Identify the consequences of each interaction between the activity and the environment – these are the ‘environmental impacts’

**Figure 2: Conceptual model for the process of identifying environmental aspects and impacts**

The identification of aspects should include not only normal operating conditions but should also consider, to the extent possible, abnormal conditions (e.g. such as start-up or shut-down) and emergency situations.

Systematising actions and aspects in a matrix format may be helpful in this process. As an example, the table below identifies some environmental aspects that may arise from some of the various actions associated with the construction of a new research station; this draws on an earlier example presented in “*Monitoring of Environmental Impacts from Science and Operations in Antarctica*” (SCAR/COMNAP, 1996), and is not intended to be representative of all actions and aspects of all potential activities in Antarctica.

ACTIONS	POTENTIAL ENVIRONMENTAL ASPECTS									
	Air emissions (incl. Dust)	Presence	Wastes	Noise	Fuel spills	Mechanical action on land	Mechanical action in water	Heat	Light	Transfer of species
Vehicles										
- Land	X	X	-	X	X	X	-	X	X	X
- Aircraft	X	X	-	X	X	X	-	-	-	X
- Watercraft	X	X	-	X	X	-	X	-	-	X
Power generation	X	-	-	X	X	-	-	X	-	-
Construction of buildings	X	X	X	X	X	X	-	-		
Fuel storage	-	X	-	-	X	-	-	-		-
Waste treatment	X	-	X	X	-	-	-	-	-	X

Aspects may vary across different alternatives, because some alternatives may involve a particular type of interaction with the environment while others do not. An appropriate way to avoid impacts arising is to modify the proposed activity so that the potential interaction with the environment (the environmental aspect) does not occur. For example, recycling waste water for use on station may avoid discharges to the marine environment and, in turn, avoid impacts to near shore marine species and habitats.

The geographical spread of an aspect has to be accurately estimated in order to determine to what extent the environment may be impacted.

### 3.3.2. Impact identification

In the context of environmental impact assessment, an environmental **impact** (synonym: **effect**) is a change in environmental values or resources that is attributable to a human activity. It is the consequence of an interaction between an activity and the environment, not the interaction itself. Impact may also be defined as the result of the interaction between an activity and an environmental value or resource. For example, the environmental aspect of ‘trampling’ may result in the impact of ‘reduced plant cover’.

Identifying potential impacts means determining which component(s) of the environment are susceptible to be affected by an activity or action. An activity will not result in an impact to an environmental value

or resource if there is no process of interaction, or ‘exposure’. Following the example in the previous section, wastewater management will not result in impacts to the near shore marine species or habitats environment if all wastewater is recycled for use on station, because there is no interaction between the activity and the near shore marine environment.

Overlaying spatial information (e.g. use of a geographic information system, or GIS) can be a valuable tool to assist in this determination. For example, an activity that has the environmental aspect ‘discharge of hazardous liquids’ might result in impacts on freshwater invertebrates if the activity is undertaken in location where lakes are present, but not if the activity is undertaken at a location remote from any lakes.

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

- Temporal variation. The interactions between an activity and an environmental value or resource may change with the timing of the activity, because of climate cycles, breeding patterns etc. For example, noise generated by an activity might cause wildlife disturbance if the activity is undertaken during the breeding season, but not if the activity is undertaken when no wildlife are present.
- Cause-effect relationships between the activity and environmental values or resources must be determined, especially in cases where the relationships are indirect, where the activity has numerous types of interactions with a value or resource, or where a single type of interaction occurs repeatedly.

It should also be noted that a single environmental aspect might have several related environmental impacts (Figure 2). For example, discharge of untreated wastewater to the marine environment might result in impacts on benthic communities, seals and water quality. Appendix 2 presents an illustrative list of aspects and potential impacts of Antarctic activities. It is not intended to be comprehensive, or prescriptive, but may be a useful reference when planning an activity.

The identification of environmental impacts consists of the characterisation of all changes in environmental values or resources resulting from the activity. Only when the impact is identified can an evaluation be made of its **significance**.

The identification of impacts should consider whether the impacts might change over the planned duration or the proposed activity. For example, the environmental impacts of a long-term activity may vary over time due to interaction with environmental responses to climate changes, or due to changes to the activity to respond or adapt to climate changes.

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

**Lag time:** time span between the moment an environmental interaction takes place and the moment impacts occur.

In addition, a proper impact identification should also identify direct, indirect and cumulative impacts, as well as unavoidable impacts.

A **direct impact** is a change in environmental values or resources that results from direct cause-effect consequences of interaction between the exposed environment and an activity or action (e.g. decrease of a limpet population due to an oil spill, or a decrease of a freshwater invertebrate population due to lake water removal). An **indirect impact** is a change in environmental values or resources 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). See also the section below on ‘Considering Cumulative Impacts’.

An **unavoidable impact** is an impact for which no further mitigation is possible. For example, it may be possible to reduce the area from which proposed new infrastructure will be visible, but it is unavoidable that the infrastructure will be visible over some area.

### 3.3.3 Consideration of cumulative impacts

The environmental aspects and impacts of a proposed activity should be considered together with those of past, present, and reasonably foreseeable future. Therefore, potential for additive, synergistic or antagonistic interactions (thus resulting in possible significant environmental impacts) has to be considered. As noted in Section 3.3.2, the identification of impacts may also need to consider the effects of climate changes, particularly for long-term activities.

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 occurred, are occurring, or could occur at the same site or within the same area. When considering spatial aspects, thought should be given to the distribution of that environment type across the wider Antarctic environment, particularly when that environment type might be unique to certain locations or limited in geographical extent (e.g. geothermal sites or unique geological formations). It is also important to identify and consider the activities or



actions of other proponents that can contribute to cumulative effects. In some instances, the potential cumulative impacts of activities by multiple operators might best be considered through the joint preparation of an EIA.

The accurate assessment of actual or predicted cumulative impacts is still an emerging field. However, 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. Recognition should be given to relevant scientific data, where this exists, and to the results of monitoring programs. Spatial data relating to other past, ongoing or future activities, where available, is particularly relevant. Such data might be available from databases, such as the [EIA Database](#), or accessible through direct consultation with relevant other operators.

In summary, important questions when considering the potential cumulative impacts of a proposed activity include:

- What activities have been undertaken, are currently being undertaken or are likely to be undertaken at the area of the proposed activity?
- Is there a temporal or spatial overlap (or a combination) with other activities in the area that might result in particular impacts?
- What are the likely pathways or processes of accumulation for the assessed impacts of the proposed activity?
- What effects may result from the proposed activity that may contribute to cumulative impacts?
- What are the likely cumulative impacts that could occur in the area?

#### **3.3.4. 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 judgment about the severity and importance of a change in a given environment or environmental value or resource.*

According to the Protocol and Annex I, impacts shall be evaluated by taking into account three levels of significance:

- less than a minor or transitory impact;
- no more than a minor or transitory impact; or
- more than a 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 (as noted above, details of previous IEEs and CEEs are readily accessible from the [EIA Database](#)).

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 an informed and broadly-agreed judgment. 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. This evaluation should determine the magnitude and significance of cumulative effects.

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 environmental aspects (i.e. interactions between an activity and the environment) of activities with impacts (i.e. the changes to the environment that result from those interactions); and
- limiting the analysis to direct impacts, without consideration of indirect and cumulative impacts.
- To enable independent verification / assessment of the evaluation, the EIA document should clearly describe the methods and criteria used to assess the significance of predicted 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. Measures to minimise or mitigate impacts**

The EIA process should consider measures to decrease, avoid, or eliminate any of the components of an impact on the environment, or on the conduct of scientific research and on other existing uses and values. This can be considered a process of feedback, and should occur throughout the EIA process, not simply as a final step. Such 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 component of the activity (and hence the consideration of the environmental aspects and impacts) 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, for example:

- selecting an appropriate location (e.g. avoiding environmentally sensitive sites, where possible) and identifying sub-areas within the location that may require additional protection or management;
- developing on site control procedures (e.g. arrangements for fuel storage and handling, use of renewable energy systems and other means of minimising atmospheric emissions, water supply, appropriate methods for waste disposal and management, approaches to minimising noise and light emissions);
- applying appropriate methods to prevent the transfer of species to, or between locations within, Antarctica (e.g. with reference to the guidelines and resources presented in the [CEP Non-Native Species Manual](#));
- establishing the best time for the activity (e.g. to avoid the breeding season of penguins);
- taking steps to limit the spatial and temporal extent of impacts (e.g. utilising temporary rather than permanent infrastructure, locating facilities in already modified locations, minimising the spread of individual items of infrastructure, or considering the setting of infrastructure in the landscape to minimise visibility);
- providing environmental education and training to personnel, or contractors, involved in the activity;
- measures to prevent, and where necessary respond to, emergencies that may cause environmental impacts (e.g. oil spills, fires); and
- 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 should describe both planned mitigation and remediation measures. 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;
- recognising that mitigation and remediation measures may also need to take into account the cumulative impacts of past, present and reasonably foreseeable activities;
- considering the extent to which decommissioning efforts could return the site to its pre-activity environmental state;
- noting that the environment may not always be capable of returning to its original condition, even when remediation actions are implemented; and
- considering that a given corrective measure may interact antagonistically or synergistically with other corrective measures.

Where the EIA refers to separate documents (e.g. waste management plans, oil spill contingency plans etc.) a link to such documents should be provided, where possible, or sufficient information should be included in the EIA to allow an assessment of the likely effectiveness of the planned arrangements.

The Resources section at the end of this document identifies several sources of guidance and information, including guidelines endorsed by the CEP, which may be of assistance in identifying mitigation and remediation measures.

### **3.6. Monitoring**

Monitoring consists of standardised measurements or observations of key parameters (outputs/removals 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 (e.g. impacts arising from planned waste discharges, noise generation or atmospheric emissions), including cumulative impacts, 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 re-analysis 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 about precise measurement of a few target species, processes, or other indicators, carefully selected on the basis of scientifically sound predetermined criteria. Where a number of proponents are conducting activities at the same sites they should give consideration to establishing joint regional monitoring programs.

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

Monitoring should be designed, wherever possible, to accommodate and account for climate-related changes during the period of the activity. This will be of particular relevance for activities with a lengthy duration, and activities occurring in locations known or expected to be subject to rapid change.

Where the EIA identifies the potential for the proposed activity to result in the introduction of non-native species, monitoring arrangements should seek to verify the effectiveness of planned preventive measures.

Planning or undertaking monitoring activities may be hindered by a number of situations including, for example:

- 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 adequately scope the monitoring program, so that it does not encompass all elements of the environment that may be impacted or does not cover a broad enough geographic area; and
- failure to distinguish between natural and human-induced variability in environmental parameters.

Guidance for designing monitoring programs relevant to the environmental characteristics of Antarctica can be found in:

- [COMNAP Practical Guidelines for Developing and Designing Environmental Monitoring Programmes in Antarctica](#)
- [COMNAP-SCAR Antarctic Environmental Monitoring Handbook](#)
- [CEP Clean-Up Manual](#)

- [CEP Non-Native Species Manual](#)

#### 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 I, 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 I, 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.

<b>EIA Contents and Annex I Requirements</b>	<b>IEE</b>	<b>CEE</b>
Cover sheet		X
Index	X	X
Preparers and advisors	X	√
Non-technical summary	X	√
Description of the proposed activity, including its purpose, location, duration and intensity	√	√
Description of the possible alternatives to the proposed activity	√	√
• Alternative of not proceeding with the activity	X	√
Description of the initial environmental reference state and prediction of the environmental state in absence of the proposed activity	X	√
Description of methods and data used to forecast the impacts of the proposed activity	X	√
Estimation of nature, extent, duration and intensity of direct impacts	√	√
Consideration of possible indirect or second order impacts	X	√
Consideration of cumulative impacts	√	√
Identification of unavoidable impacts	X	√
Effects of the activity on scientific research and other uses or values	X	√
Mitigation measures	X	√
• Monitoring programs	X	√
Identification of gaps in the knowledge	X	√
Conclusions	X	X
References	X	X
Glossary		X

√ 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 (see also Section 3.1)*

This section should include a brief description of the proposed activity and an explanation of the intent of the activity, including any benefits that will arise (e.g. environmental protection, scientific understanding, education). It should include sufficient detail to make it clear why the activity is being proposed including the need for the activity to proceed (e.g. reference to national or international strategic science plans). 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 (See also Sections 3.1.1 and 3.1.2)*

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 (see also Section 3.1.2)*

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 (see also Section 3.2)*

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. For example, modelling tools may assist with considering climate related changes to the environment with, and in the absence of, the proposed activity (e.g. future projections of wildlife, flora and ice retreat/increase). 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 (see also Section 3.3)*

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) (see also Sections 3.3.2 and 3.3.3)*

This section should include a clear description of identified environmental aspects and impacts. 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 (see also Section 3.6)*

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 (see also Section 3.5)*

An important purpose of the EIA process is to take steps to avoid or minimise likely impacts through the application of mitigation and remediation measures. For this reason, a description of planned mitigation measures (commensurate with the nature of the activity and the level of EIA) is a fundamental part of the EIA document. Since such 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.

*Identification of unavoidable impacts (see also Section 3.3.2)*

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 (see also Section 3.3)*

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 (e.g. as a scientific reference site), must be a fundamental consideration when the impact analysis is carried out. Where appropriate, it is also important to consider the effects of the proposed activity on other existing uses and values.

*Identification of gaps in the knowledge (see also Section 3.2)*

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. Where relevant, plans to address gaps and uncertainties should also be described.

### *Conclusions*

Although not an explicit requirement of Annex I, an EIA should briefly describe the conclusion of the EIA process, reflecting the language of Article 8 and Annex I of the Protocol (e.g. is the proposed activity assessed as likely to have: less than a minor or transitory impact; no more than a minor or transitory impact; or more than a minor or transitory impact). The conclusion should also include a clear statement of why the proposed activity, with the likely environmental impacts, should proceed.

### *Preparers and advisers*

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*

A 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*

A 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; and
- properly connecting results and conclusions.

## **5. EIA feedback processes**

It is important to recognise that the EIA process does not stop once the EIA document has been approved and the activity commences. There remains a need to verify the predicted impacts of the activity and assess the effectiveness of mitigation measures, including to consider whether it is necessary to make any changes to the activity or prepare a new EIA. There are three principal components of the feedback process that should be considered during the undertaking of the activity in question and upon its completion. These relate to: monitoring; changes to the activity, and review.

### ***5.1 Monitoring***

As recorded in Section 3.6 above and in Figure 1, monitoring of key parameters will often be required and is an important part of the EIA process so as to: verify the scale of predicted impacts; provide early warning of any un-predicted impacts; and assess the effectiveness of mitigation measures.

Such monitoring effort should form part of the EIA feedback process. Information that is gathered through monitoring can be assessed against the planned mitigation measures and the activity adjusted accordingly to maintain the actual impacts within the accepted or approved constraints.

This approach is consistent with the provisions of Article 3 of the Protocol, which provides for monitoring “*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*” (Article 3(c)(v)), and that “*regular and effective monitoring shall take place to allow assessment of the impacts of ongoing activities, including the verification of predicted impacts*” (Article 3(d)).

If information obtained from the monitoring programme identifies a significant departure from the predicted impacts, either in their nature/type or scale, or significant un-predicted impacts are observed, a review of the EIA may be required, and additional mitigation measures may need to be identified.

## 5.2 Changes to the activity

As noted in Section 3.1.1 above, changes to the activity may also require a reconsideration or review of the EIA. This is consistent with Article 8(3) of the Protocol which provides that “*the assessment procedures set out in Annex I shall apply to any change in an activity whether the change arises from an increase or decrease in the intensity of an existing activity, from the addition of an activity, the decommissioning of a facility, or otherwise*”.

Changes to an activity that may require an amendment to an EIA, or a new EIA, might include, for example:

- changes to the timing and duration of an activity;
- changes to the methods and materials to be used;
- changes in the size of a facility;
- changes in the primary use of a facility;
- the establishment of nearby facilities or protected areas;
- a noticeable increase or decrease in the population of a facility from one year to the next or over a few years;
- an expansion of surface area of a facility or activity;
- an increase or decrease in the number of buildings, or the replacement of buildings;
- increasing intensity or diversity of tourism or national Antarctic programme activities at particular sites; and
- projects that did not go to plan and encountered significant delays.

It is important therefore that the implications of any such changes are reassessed to identify changes to the predicted impacts and the mitigation measures that need to be applied. If significant changes to an activity are proposed, the EIA process may need to be repeated in full.

In situations where monitoring suggests that an EIA review is required, and when a significant change occurs to an activity, which may also prompt a review of the EIA or a new EIA, it will be important to consult with other stakeholders and interested parties. Such stakeholders might include, for example:

- the proponents of the project or activity who will need to consider: the environmental impacts associated with the operational and financial implications of adjusting the programme; and the need to accommodate additional mitigation measures that might arise from the EIA review;

- the relevant national authority who will need to be consulted on the extent to which an EIA needs to be amended or reviewed and the process to be followed; and
- third parties, including other national Antarctic programmes with interests in the activity, or who may be affected by changes to the activity, and independent reviewers seconded to provide an assessment of the activity against the EIA (see below).

In many cases the need to review or modify an EIA will need to be communicated to all those with an interest in the activity and its regulation.

### **5.3 Review**

There is significant benefit in considering a review of the EIA process at an appropriate point, for example on completion of the activity in question. A review process will provide an opportunity to assess the effectiveness of the EIA process, and identify where opportunities for improvement might be made for future EIAs.

Such reviews might be based on the EIA process described in these guidelines and consider each part in turn to determine what went well and what improvements might be made when undertaking future EIA processes.

For activities assessed at the level of a CEE the Antarctic Treaty Parties have encouraged such reviews to be undertaken. By means of Resolution 2 (1997), the ATCM has encouraged Parties to:

1. Include in their procedures for assessing the environmental impacts of their activities in Antarctica, provision for review of the activities undertaken following the completion of a CEE.
2. Adopt the following process for CEE follow-up:
  - (a) Review activities carried out following completion of CEE, including analysis of whether the activities were conducted as proposed, whether applicable mitigation measures were implemented, and whether the impacts of the activity were as predicted in the assessment;
  - (b) Record any changes to the activities described in the CEE, the reasons for the changes, and the environmental consequences of those changes; and
  - (c) Report to the Parties on the outcomes of (a) and (b) above.

## **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*).

**Aspect:** any element of an activity or action that can interact with the environment (i.e. through an output or addition to the environment, or through a removal from the environment).

**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 *Protocol, Annex I, 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*). These activities may involve visits by multiple operators or repeated visits to the same site by the same operator.

**Direct Impact:** a change in environmental components that results from direct cause-effect consequences of interaction between the exposed environment and an activity or action.

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

**Exposure:** the process of interaction between an output/input and an environmental value or resource. (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 EIA in the Arctic*.)

**Initial Environmental Evaluation (IEE):** an environmental impact document required for proposed activities that may have no more than a minor or transitory impact on the Antarctic environment (from *Protocol, Annex I, 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*).

**Operator:** individuals or organisations undertaking activities to or within Antarctica from which impacts arise.

**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 *Protocol, Annex I, Article I*).

**Proponent:** an individual or a national program advocating the activity and responsible for the preparation of the EIA document.

**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**

ATCM XXXV / IP23, CEP Tourism Study. Tourism and Non-Governmental Activities in the Antarctic: Environmental Aspects and Impacts, submitted by New Zealand.

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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.

SCAR/COMNAP. 1996. Monitoring of Environmental Impacts from Science and Operations in Antarctica. Workshop report. 43 pp and Annexes, .1996 Workshops

## **8. Acronyms**

ASMA: Antarctic Specially Managed Area

ASPA: Antarctic Specially Protected Area

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 for Environmental Protection

COMNAP: Council of Managers of National Antarctic Programmes

EIA: Environmental Impact Assessment

GIS: Geographical Information System

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



## 9. Resources

It is not practical to refer to all guidelines and resources that may be of relevance to the EIA process, and proponents should identify and draw on sources of information that are relevant to the proposed activity in question. The following list provides direction to guidance materials that may be of general relevance. While the list was accurate at the time of preparation of the EIA Guidelines, it also would be important to check for additional or updated materials. In addition, there is an extensive academic literature on EIA, including in the Antarctic context.

- [Website of the Antarctic Treaty Secretariat](#): the Antarctic Treaty Secretariat maintains a comprehensive website that contains a variety of information that may be useful for persons involved in an EIA process, including:
  - [Antarctic Protected Areas Database](#): contains the texts of the management plans for Antarctic Specially Protected Areas and Antarctic Specially Managed Areas, their legal status, location in the Antarctic continent and a brief summary of the purpose of designation. The database also contains information related to the list and location of Historic Sites and Monuments in Antarctica.
  - [Antarctic Treaty database](#): contains the text of all Recommendations, Measures, Decisions and Resolutions and other measures adopted by the ATCM together with their attachments and information on their legal status.
  - [EIA Database](#): contains details of IEEs and CEE undertaken in accordance with Annex I of the Protocol, where possible including an electronic version of the EIA document.
  - [Electronic Information Exchange System](#): allows parties to fulfil the Antarctic Treaty exchange of information requirements and acts as a central repository for this information.
  - [CEP Handbook](#): a compilation of key references, for use by CEP representatives when attending meetings or undertaking CEP-related work. It contains the Antarctic Treaty System instruments that guide the Committee's work, copies of procedures and approved guidelines that explain how the CEP conducts its business, other documents the CEP has produced or endorsed to help Treaty Parties protect the Antarctic environment, plus links to other useful references
  - [CEP Clean-Up Manual](#)<sup>1</sup>: provides guidance, including key guiding principles and links to practical guidelines and resources, that operators can apply and use, as appropriate to assist with addressing the requirements of the Protocol, in particular Annex III.
  - [CEP Non-Native Species Manual](#)<sup>2</sup>: provides guidance to Antarctic Treaty Parties in order to conserve Antarctic biodiversity and intrinsic values by preventing the unintended

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<sup>1</sup> Resolution 2 (2013)

<sup>2</sup> Resolution 6 (2011)

introduction to the Antarctic region of species not native to that region, and the movement of species within Antarctica from one biogeographic zone to any other. Includes key guiding principles and links to recommended practical guidelines and resources that operators can apply and use, as appropriate, to assist with meeting their responsibilities under Annex II to the Protocol.

- [General Guidelines for Visitors to the Antarctic](#)<sup>3</sup>: provide general advice for visiting any location, with the aim of ensuring visits do not have adverse impacts on the Antarctic environment, or on its scientific and aesthetic values.
- [Guidance for Visitors to the Antarctic](#)<sup>4</sup>: intended to ensure that all visitors are aware of, and are therefore able to comply with, the Treaty and the Protocol.
- [Site Guidelines for Visitors](#): the guidelines aim to provide specific instructions on the conduct of activities at the most frequently visited Antarctic sites. This includes practical guidance for tour operators and guides on how they should conduct visits in those sites, taking into account their environmental values and sensitivities.
- [Scientific Committee on Antarctic Research \(SCAR\) data and products](#): for the benefit of SCAR scientists and the wider community, SCAR provides several products that support the work of SCAR scientists but are also made widely available to others. SCAR promotes free and unrestricted access to Antarctic data and information by promoting open and accessible archiving practices. SCAR aims to be a portal to data repositories of Antarctic scientific data and information.
- [Council of Managers of National Antarctic Programs \(COMNAP\) publications](#): contains links to operational guidelines developed by COMNAP's Expert Groups and Networks with the aim of assisting National Programs implementing common procedures and practices to enhance operational effectiveness and safety, as well as manual and handbooks that provide National Programs and others with guidance in specialist fields of activity.
- [International Association of Antarctica Tour Operators \(IAATO\) guidelines and resources](#): contains links to information and guidance materials relevant to tourism and non-governmental activities.
- [Antarctic Environments Portal](#): provides an important link between Antarctic science and Antarctic policy. All scientific information available through the Portal is based on published, peer-reviewed science and has been through a rigorous editorial review process.

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<sup>3</sup> Resolution 3 (2011)

<sup>4</sup> Recommendation XVIII-1 (1994)

## Appendices

### Appendix 1. Example checklist for collecting and recording of baseline information about the state of the environment in the location of a proposed activity

(Modified from the CEP Clean-Up Manual, Annex 1: Checklist for Preliminary Site Assessment)

<b>ASSESSMENT AND REPORTING INFORMATION</b>			
Title of Report/Assessment			
Date of Report		Prepared by:	Contact details:
Date of site visit (if applicable)		Assessor(s):	Contact details:

<b>GENERAL CHARACTERISTICS OF SITE</b>				
Place name				
Intended site use (e.g. building, storage area, wastewater disposal, road, location of vehicle use etc.)				
Location (coordinates of point)				
Location (coordinates of bounding polygon)	North:	South:	East:	West:
Nearest Operational Antarctic Station		Distance from Station:	Accessibility:	
General Description of Site				
Human health and safety considerations				
Site Type (seasonally ice- free)				

land, lake, permanent snow/ice, marine)	
Sea ice (if applicable)	
Glaciology (if applicable)	
Geomorphology (slope, aspect, landscape features etc.)	
Geology (rock type, rock fracturing etc.)	
Regolith (depth and type of soil/sediment if present, depth to permafrost etc.)	
Protected area status (list ASMAs and ASPAs in the vicinity)	
Biogeographic region (after Terauds et al. 2012)	
Fauna/flora present	

<b><i>FLORA AND FAUNA INVENTORY</i></b>				
<b>Type</b>	<b>Species</b>	<b>Location</b>	<b>Timing of presence (i.e., constant, seasonal, etc.)</b>	<b>Other information</b>
Breeding birds				
Breeding mammals				

Transient birds				
Transient mammals				
Coastal species				
Marine species				
Flora				

***MICROBIAL COMMUNITIES INVENTORY***

<b>Location</b>	<b>Date</b>	<b>Species recorded</b>	<b>Other information</b>

***CLIMATE AND WEATHER***

<b>Indicator</b>	<b>Data</b>
Weather patterns	
Temperature data (seasonal average, min/max)	
Snowfall/precipitation data (frequency, total accumulation)	
Cloud cover (%)	
Wind (average speed, min/max, direction)	
Other relevant	

information	
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<b><i>HUMAN ACTIVITIES</i></b>				
<b>Type</b>	<b>Number of persons involved</b>	<b>Duration</b>	<b>Frequency</b>	<b>Other details</b>
Research				
Tourism				
Other				

<b><i>HISTORY OF SITE USE AND CONTAMINATION EVENTS</i></b>	
History of Site Use and Activities	
Information Sources (Station/Voyage Leader Reports, people interviewed, photographs etc.)	
Contamination History (operational activities and events, such as spills and spill responses if applicable – see CEP Clean-Up Manual for detailed guidance on site assessment for contaminated sites)	

<b><i>VALUES/RECEPTORS POTENTIALLY OR ACTUALLY IMPACTED BY ACTIVITY</i></b>			
<b>Values/Receptor</b>	<b>Site-Specific Information on Values/Receptors and Exposure Pathways (include estimates of distance from contaminants)</b>	<b>Actual or Potential Impacts?</b>	<b>Cumulative or one-time?</b>

Fauna and flora			
Scientific			
Historic			
Aesthetic			
Wilderness			
Geological and geomorphological			
Other environments (atmospheric, terrestrial (including glacial))			
Marine environment (if applicable)			
Protected areas			
Other values/receptors (such as station water supply)			

<b><i>PREDICTION OF FUTURE ENVIRONMENTAL STATUS IF ACTIVITY DOES NOT PROCEED</i></b>	
<b>Site Aspect</b>	<b>Prediction</b>
Flora	
Fauna	
Terrestrial environment	
Marine environment	

## Appendix 2. Aspects and potential impacts of Antarctic activities

(Modified from ATCM XXXV/IP23 CEP Tourism Study. Tourism and Non-Governmental Activities in the Antarctic: Environmental Aspects and Impacts, Table 2. Aspects and potential impacts of Antarctic tourism. Note: this table presents examples for illustrative purposes only, and is not intended to be an exhaustive list.)

Environmental aspect	Potential impact
<p><b>1. Presence</b></p> <ul style="list-style-type: none"> <li>The presence of people and human-made objects in the Antarctic.</li> </ul>	<ul style="list-style-type: none"> <li>Modification of, or risk to, the intrinsic value of Antarctica, including its wilderness and aesthetic values and its value as an area for the conduct of scientific research.</li> </ul>
<p><b>2. Atmospheric emissions</b></p> <ul style="list-style-type: none"> <li>Discharge of emissions to the atmosphere (including greenhouse gases and particulates) from engines, generators and incinerators, signalling or marking devices.</li> </ul>	<ul style="list-style-type: none"> <li>Pollution of marine, terrestrial, freshwater and atmospheric environments.</li> </ul>
<p><b>3. Anchoring</b></p> <ul style="list-style-type: none"> <li>Interaction with the seafloor or coastal mooring sites from deploying and retrieving anchors and anchor chains.</li> </ul>	<ul style="list-style-type: none"> <li>Disturbance and damage of benthic marine species, communities and habitats.</li> </ul>
<p><b>4. Light emission</b></p> <ul style="list-style-type: none"> <li>Discharge / escape of light from windows and other sources during dark hours.</li> </ul>	<ul style="list-style-type: none"> <li>Injury or death of seabirds striking vessels (see interaction with wildlife).</li> </ul>
<p><b>5. Generation of noise</b></p> <ul style="list-style-type: none"> <li>Sound arising from activities in water, on land or in the air from the operation of vessels, small boats, aircraft, equipment or from individuals or groups of people.</li> </ul>	<ul style="list-style-type: none"> <li>Disturbance to wildlife.</li> </ul>
<p><b>6. Release of waste</b></p> <ul style="list-style-type: none"> <li>Release or loss of any garbage, sewage, chemicals, noxious substances, pollutants, equipment or presence of toxic coatings (e.g. antifouling on hulls).</li> </ul>	<ul style="list-style-type: none"> <li>Pollution of marine, terrestrial and freshwater environments.</li> <li>Introduction of pathogens.</li> <li>Toxicity and other chronic impacts at the species, habitat and ecosystem level.</li> </ul>
<p><b>7. Release of fuel, oil or oily mixtures</b></p> <ul style="list-style-type: none"> <li>Leak or spill of oil or oily wastes to the environment, including the subsequent movement of such substances.</li> </ul>	<ul style="list-style-type: none"> <li>Pollution of marine, terrestrial and freshwater environments.</li> <li>Toxicity and other chronic impacts at the species, habitat and ecosystem level.</li> </ul>



Environmental aspect	Potential impact
<p><b>8. Interaction with water and ice</b></p> <ul style="list-style-type: none"> <li>Disturbance to the water column, by vessel movement or propulsion.</li> <li>Altered wave action.</li> <li>Direct breaking of sea ice with a vessel.</li> </ul>	<ul style="list-style-type: none"> <li>Mixing of the water column resulting in sediment disturbance or ecosystem disruptions.</li> <li>Coastal erosion from wave action.</li> <li>Enhanced breakout of sea ice.</li> </ul>
<p><b>9. Interaction with ice-free ground</b></p> <ul style="list-style-type: none"> <li>Direct or indirect contact with land by foot traffic, vehicles, camp equipment, etc.</li> </ul>	<ul style="list-style-type: none"> <li>Physical changes to the landscape (e.g. erosion, tracks)</li> <li>Physical changes to watercourses.</li> <li>Alien species introductions.</li> <li>Modification in the distribution, abundance or biodiversity of species or populations of species of fauna and flora.</li> <li>Altered ecosystem performance.</li> </ul>
<p><b>10. Interaction with wildlife</b></p> <ul style="list-style-type: none"> <li>Direct or indirect contact with, or approach to, wildlife.</li> </ul>	<ul style="list-style-type: none"> <li>Changes to wildlife behaviour, physiology and breeding success.</li> <li>Increased risk to endangered or threatened species or populations of such species.</li> </ul>
<p><b>11. Interaction with vegetation</b></p> <ul style="list-style-type: none"> <li>Direct or indirect contact with vegetation or controls on vegetation abundance (e.g. altered water availability).</li> </ul>	<ul style="list-style-type: none"> <li>Physical damage to flora.</li> <li>Modification in the distribution, abundance or productivity of species or populations of species of flora.</li> <li>Increased risk to endangered or threatened species or populations of such species.</li> </ul>
<p><b>12. Interaction with historic sites</b></p> <ul style="list-style-type: none"> <li>Direct or indirect contact with historic sites, monuments or artefacts and taking of artefacts.</li> </ul>	<ul style="list-style-type: none"> <li>Detrimental changes to the historic values of the areas or items of historic significance.</li> <li>Enhanced deterioration of or damage to historic sites and monuments through physical contact.</li> </ul>
<p><b>13. Interaction with scientific stations or scientific research</b></p> <ul style="list-style-type: none"> <li>Direct or indirect contact with science equipment, monitoring or research sites and with station activities.</li> </ul>	<ul style="list-style-type: none"> <li>Degradation of scientific values.</li> <li>Interruption of station activity.</li> <li>Interruption of, or interference with experimentation.</li> </ul>
<p><b>14. Transfer of non-native species or propagules (via ballast water, vessel hulls, anchors, clothing, footwear, non-sterile soil)</b></p> <ul style="list-style-type: none"> <li>Unintended introduction to the Antarctic region of species not native to that region, and the movement of species within Antarctica from one biogeographic zone to any other.</li> </ul>	<ul style="list-style-type: none"> <li>Alien species introduced.</li> <li>Modification in the distribution, abundance or biodiversity of species or populations of species of fauna and flora.</li> <li>Altered ecosystem performance.</li> <li>Increased risk to endangered or threatened species or populations of such species.</li> </ul>