New methodology for the quantitative assessment of the environmental impacts of the Argentine Antarctic Programme

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**Information Paper submitted by Argentina**

***Summary***

Environmental impact assessments are the mechanism required by the Protocol on Environmental Protection to the Antarctic Treaty to determine the degree of impact that the development of an activity will have on the Antarctic continent. Article 8 of the Protocol establishes three categories of impacts: less than a minor or transitory impact, a minor or transitory impact, or more than a minor or transitory impact. An important aspect is that an objective methodology must be available to identify the environmental impacts of the activities through the quantitative assessment of the attributes that characterise them. Based on the guidelines of Annex I to the Protocol on Environmental Protection and Resolution 1 (2016) "Guidelines for Environmental Impact Assessment in Antarctica", a new methodology has been designed for the activities of the Argentine Antarctic Programme to carry out the quantitative assessment of the impacts of the activities that are carried out on the Antarctic Continent and that are part of Argentina's Annual Antarctic Plan with the aim of having a more precise analysis of the effects of the mitigation measures implemented.

***Objective***

The objective was to design a new procedure that allows a quantitative evaluation of the environmental impacts of the activities evaluated by the Environmental Management and Tourism Programme (PGAyT) of the National Antarctic Directorate (DNA) and that also considers the effects of the mitigation measures. This methodology has been developed in the course of 2021 and has begun to be implemented in the initial environmental impact assessments that are currently under development for the next Summer Antarctic Campaigns.

***General technical specifications***

In Resolution 1 (2016) “Guidelines for Environmental Impact Assessment in Antarctica” it is established that an activity is an event or process that results from (or is associated with) the human presence in Antarctica or that can lead to that presence. In addition, each activity should be analysed considering all the actions that each phase involves (for example, construction phase, operation phase and decommissioning phase). One of the important issues highlighted in this document is that understanding the ways in which a proposed activity may interact with the environment (i.e., its environmental aspects) is an important step in identifying and addressing potential environmental impacts.

According to the general guidelines for carrying out an environmental impact assessment, a procedure must be followed that can be summarised in five stages: 1) Considering the activity, 2) Considering the environment, 3) Analysis of Impacts, 4) Comparison of Impacts 5) Measures to minimise or mitigate impacts. The new procedure contemplates these 5 mentioned points. An activity will not result in an impact to an environmental value or resource if there is no process of interaction, or 'exposure'.

***Characterisation of the Impacts***

The identification of environmental impacts consists of characterising all the changes in the environmental values or resources resulting from an activity. Only when the impact is identified can an assessment of its significance be made. In the case of this new methodology proposed for the Argentine Antarctic Programme, each impact will be identified by the following characteristics in a summarised manner:

* ***Activity (1)***: Set of actions within a process that are carried out to fulfil a specific stage of the process. The name of the activity that contains the aspects and impacts to be valued must be stated, together with the process in which it is included.
* ***Exposed Environmental Component (2)***: including the physical and biological features that could be directly or indirectly affected.
* ***Environmental Aspect (3)***: environmental aspects (synonym = cause) are those elements or derivatives of activities with a possible impact on the environment.
* ***Environmental Impacts (4):*** an environmental impact (synonym: effect) is a change in the values or resources of the environment that can be attributed to human activity. It is the consequence of an interaction between an activity and the environment, and not the interaction itself.
* ***Type of impact (5):*** establishes whether an impact is direct or indirect according to the following characterisations. A ***direct impact*** is the change in environmental values or resources as a result of the consequences of the interaction between the exposed environment and an activity or action. An ***indirect impact*** is a change in environmental values or resources due to the interaction between the environment and other impacts, both direct and indirect.

***Analysis and Evaluation of Impacts***

Once the actions that constitute the activity have been determined, the significance value of the environmental impacts surveyed is established. With the information collected or supplied, the extent, intensity, duration, probability and legal aspects are valued according to the following Table 1:

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Descripción generada automáticamenteTable: rating scale from 1 to 4 for each of the elements analysed to identify an impact.

Once the matrix of actions has been assessed, the **Level of Significance without mitigation** that each particular action will have is established. To do this, the following mathematical formula is used:

***Significance = extent x intensity x duration x probability x legal aspects (a)***

Thus, the significance of the impact is obtained by multiplying the impact score of each characteristic (for example, 2 x 2 x 2 x 2 x 2 = 32).

The overall impact score range is between 1 and 1024, considering that a score of all the minimums in each evaluation criterion is equal to one (that is, 1 x 1 x 1 x 1 x 1 = 1) and a maximum score is equal to 1024 (that is, 4 x 4 x 4 x 4 x 4 = 1024). This provides a simple means of comparing impacts, the higher the value, the greater the environmental impact.

Once the impact analysis has been carried out, the prioritisation of the risk area or original Risk is determined, which allows us to determine which actions require immediate treatment. There are three levels of impact significance (Low, Medium and High) that correspond to those described in Article 8 (1) of the Protocol (Table 2):

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Table2: impact significance levels.

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Table3: matrix with impact analysis. The coloured columns correspond to the previous impact analysis methodology (table for the purpose of showing an example).

If a given action presents a Medium or High level of significance, it will require the implementation of **Mitigation Measures**. That is, the use of practices, procedures or technologies in order to minimise or prevent the impacts associated with the proposed activities. The modification of some component of the activity (and, therefore, the consideration of environmental aspects and impacts), as well as the establishment of supervision procedures, are effective forms of mitigation.

After this first analysis, the mitigation measures are considered in the matrix, and from these measures the **Level of Significance with mitigation** is calculated, which is the result of the mathematical formula of the rating (a) with the new values of extent x intensity x duration x probability x legal aspects, but after taking into account the mitigation measures applied. With this new calculation, the **Mitigated Risk** is obtained, the significance level of the impact after the application of the mitigation measures and the one that is compared again with...

Table4: matrix with impact analysis. The initial and subsequent analysis are observed, where the effects of the mitigation measures are taken into account.

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Figure1: Graphic summary of the analysis and quantitative evaluation of environmental impacts.

***Conclusions***

The new methodology implemented to assess the environmental impact of the activities within the Argentine Antarctic Programme allows for a more precise analysis of the environmental impacts and, in particular, allows for the incorporation of the expected effect of the established mitigation measures. To validate it, a comparison was made with respect to other methodologies of this type used by some member countries of the Antarctic Treaty. Preliminary results indicate that the characteristics analysed and their categorisation are consistent with those used in Antarctica and that therefore the procedure adequately applies the required guidelines.

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