

NON-TECHNICAL SUMMARY

INTRODUCTION

This draft Comprehensive Environmental Evaluation (CEE) has been carried out by the National Centre for Antarctic and Ocean Research (NCAOR), an R&D wing of Ministry of Earth Sciences, Government of India, which is mandated to coordinate and manage all the activities of India in the Antarctic region. The CEE has been prepared for the establishment of the proposed new Indian research base in the Larsemann Hills of the East Antarctica (69°24' to 69° 25'S latitude and 76°10' to 76°13'E longitude) at an unnamed promontory also referred in some journals as Grovnes. The document has been prepared in accordance with Annex I of the Protocol on Environmental Protection to the Antarctic Treaty (The Madrid Protocol 1991) and the Guidelines for Environmental Impact Assessment in Antarctica (Resolution 4, XXVIII ATCM, 2005). This document deals with the following:

- History of Indian Antarctic programme and scientific activities planned at new base
- Description and need of the proposed activity
- Design and construction criteria
- Alternatives to proposed activity
- Initial environmental reference
- Identification and prediction of impacts
- Mitigation measures to control proposed activity
- Gaps in knowledge and uncertainty to define activity or impacts.

This CEE is based on a conceptual design of the station which will be built using the latest technology to minimize the environmental impact of the structures and planned scientific and logistic activities.

DESCRIPTION OF THE PROPOSED ACTIVITY

The proposed station, which is to be built on an unnamed promontory between Stornes and Broknes peninsula in the Larsemann Hills area (69°24'-69° 25'S latitude and 76°10'-76°13'E longitude) is an ice-free coastal oasis fringing the Prydz Bay. It is located approximately midway between the eastern extremity of the Amery Ice Shelf and the southern boundary of the Vestfold Hills.

The proposed location is of interest on account of scientific and logistic reasons, the ice-free terrain and the easy access from the sea. This area including the islands and promontories offers an excellent scope for extensive studies on geological structures and tectonics with special reference to Gondwanaland, palaeoclimatology, solid earth geophysics, spaceweather and meteorology, oceanography, marine biology, microbiology, environmental science etc.

The proposed research base is planned to have a life span of 25 years. It shall accommodate 25 people during summer and 15 people during winter. Design of the station will withstand extreme environmental conditions prevailing at Larsemann Hills, meeting the environmental standards as provided under the Madrid Protocol. Emphasis will be on use of alternative energy i.e. wind and solar power to reduce the fossil fuel consumptions.

STATION DESIGN AND CONSTRUCTION CRITERIA

The Station is being designed as an ergonomic entity in harmony with the prevailing environment at the Larsemann Hills. It is proposed to build a self-contained double-storey structure on stilts capable of accommodating a maximum of 25 persons. To facilitate the

planned scientific studies including environmental monitoring, the base will have state-of-the-art laboratory facilities.

The conceptual design of the station has been obtained through global tenders for innovative ideas. Overall 32 design proposals were received from around the world out of which four entries were short listed for providing a detailed concept on design and construction of the station. The architect/consultants were selected based on their experience to build environmental friendly stations in Antarctica by a committee of experts, drawn from the national organizations and academic institutions involved in building design, construction and environmental engineering.

The selected conceptual design meets the Madrid Protocol requirement. Once the approvals of the CEP and ATCM are obtained, the construction of the station will be initiated during the subsequent austral summer. The station is expected to be commissioned in two years time from the initiation of construction activity. The scientific activities and work for collection of base data, which was started in the austral summer of 2003-04, when the first Task Force landed at Larsemann Hills, will however continue to gather more information on the gap areas and to improve upon the design parameters and further reduce the environmental impact.

SITE SELECTION AND ALTERNATIVES

Initially three regions in Antarctica were recommended to the Government of India by an expert committee in 1996, for more comprehensive research by the Indian scientists by establishing an additional research base in Antarctica. The probable areas were:

- a) Antarctic Peninsula,
- b) Filchner Ice Shelf and
- c) Amery Ice shelf – Prydz Bay area

The site for the new Indian base at the Larsemann hills was selected after a thorough consideration of various options available along the East Antarctic coast.

The Antarctic Peninsula being overcrowded by the existing stations did not find much favor. The Filchner Ice Shelf poses logistics constraints in maintaining a research facility. The third option emerged as the most favorable choice, after a thorough consideration of various options available along the East Antarctic coast, since it offered enormous scope for initiating long term scientific experiments in Antarctica and the Indian Ocean region between India and Antarctica.

In the Amery Ice shelf-Prydz Bay area, many sites were visited to find a suitable location. Considering various environmental factors and avoiding areas of wildlife concentration and critical natural values, the Larsemann Hill region was found most suitable. In Larsemann Hills, three locations were visited but finally the present site was selected based on:

- the availability of a flat terrain for station construction
- the relative ease of cargo discharge operations,
- the availability of freshwater lakes, and
- the open sea approach to the site.

As bathymetry of Prydz Bay along the approach route was not available, a detailed multibeam bathymetry survey was carried out during the austral summer of 2006 to identify a suitable channel for ship/barge movement. The route is found deep enough for vessel movement and will provide a safe sea access to the station site.

The information on the selection of the new site was provided to the ATCM through IP 80 at XXVIII ATCM in Stockholm and in the WP 20 at XXIX ATCM in Edinburgh.

DESCRIPTION OF THE AREA AND ENVIRONMENT

The Larsemann Hills area is marked by persistent, strong katabatic winds that blow from east to southeast during austral summer. Daytime air temperatures from December to February at times exceed 4°C, with the mean monthly temperature a little above 0°C. Extreme minimum temperature recorded in the region so far is -40⁰ C (Turner and Pendlebury, 2004). Annual mean wind speed of 7 m/s and maximum wind speed 50 m/s is recorded at the nearby Zhongshan station. Annual mean gale days are about 171 (47%). Precipitation occurs as snow and is unlikely to exceed 250 mm water equivalent annually (Hogdson et al., 2001). Pack ice is extensive in north-eastern side throughout the summer and the fjords and embayment are rarely ice-free. Snow cover is generally thicker and more persistent on Stornes Peninsula than on Broknes Peninsula. The sea ice grows steadily during March – September, with maximum growth in April – June.

Lakes present in the Larsemann Hills area are mostly saline in nature (Gillieson et al, 1990) and are characterized by low microbial diversity (Burgess and Kaup, 1997). However the promontory supporting the proposed site has small fresh water lakes and a saline lake at upper reaches. The area adjoining the proposed site does not support any population of breeding penguins or seals.

IMPACT ASSESSMENT AND MITIGATION MEASURES

Assessment of the impact of the proposed station has been carried out keeping in view various activities pertaining to the logistics of transportation, construction and subsequent operation of the proposed station. Experience of about 25 years in maintaining Dakshin Gangotri and Maitri stations in Antarctica has been the main strength of the Indian scientists and engineers in assessing the environmental impacts and taking mitigation measures in the proposed CEE.

A matrix was prepared to identify the impacts and define appropriate practical mitigation measures. The main environmental disturbances during construction and operational phases pertain to:

- air pollution due to emissions from the vehicles, vessels, aircrafts, generators and incinerators
- ground impact due to vehicular and human movement
- noise pollution
- disposal of treated wastewater and solid waste
- accidental oil spill

The environmental impact assessment matrix indicates by and large of low to medium category impacts. Proper preventive and mitigation measures have been proposed for strict implementation during the construction and operation phases. Solid waste treatment shall be carried out and wastewater will be discharged in sea after proper treatment. Electromagnetic disturbance due to operation of the electrical equipment and vehicles is not ruled out, but all the equipment placed in the area will meet Electro Magnetic Compatibility standards. To reduce the fossil fuel consumption, renewable energy (solar and wind) shall supplement fuel based power generation. The thermal energy from the water cooled generators will be used for station heating purposes.

Since the mitigation measures are defined and all construction and operational activities at the proposed station shall comply with the provisions contained in Madrid Protocol using

appropriate technology, the environmental impact will be kept at minimum and close to the existing parameters.

GAPS IN KNOWLEDGE AND UNCERTAINTIES

Gaps and uncertainties in this draft CEE report include:

- Uncertainty of sea ice extent during the period January-March each year.
- The exact berthing spot of the ship close to the landing site is not known.
- The CEE is based on the conceptual design of the station. There may be some modifications based on the site requirements, practical difficulties etc.
- Impact matrix and evaluation have been done according to expert judgment which is based on the predicted values and are subject to change depending on the environmental conditions.
- During the long life span of the station, the need-based scientific activities and the energy scenario may change with the developments in the technologies.

CONCLUSIONS

India plans to have a new research base in the Larsemann Hills of East Antarctica for carrying out long-term research in various domains of polar, ocean and atmospheric sciences for complementing the existing studies at Maitri and adjoining areas from an additional location. India considers that construction and operation activity of the proposed Indian research base shall have more than minor or transitory impact on the Antarctic Environment. Suitable mitigation measures have been proposed based on impact assessment matrix to minimize the impact.

The Report is submitted for consideration by the Committee for Environmental Protection (CEP X) at the forthcoming Antarctic Treaty Consultative Meeting (ATCM) to be held from 30th April – 11th May 2007 in New Delhi, India. We welcome further comments and suggestions on the draft CEE.

FURTHER INFORMATION

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