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Italy answer to the US / Russian Inspection at Mario Zucchelli Station in 2012

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Summary

In the last CEP XV in Hobart, the US and the Russian Federation reported the results of their joint inspection at Mario Zucchelli Station and Concordia Station occurred in January 2012.

Among the comments, although a high level of compliance with the Antarctic Treaty rules was assessed, concerns were raised about the Italian ability to fully implement legal standards related to the Environmental Protocol, in the absence of a specific implementing law.

This paper presents the more detailed information about this situation, the actual monitoring program in place and measures adopted by Italy in answer to the inspection team. In particular, Italy is grateful for this comments that had positive effects: a working group of experts in environment and legislation is elaborating a proposal for a full implementation law.

The US / Russia Inspection Report 2012, main problems outlined

In January 2012, an inspection was conducted by the US and the Russian Federation at Concordia Station pursuant to Article VII of the Antarctic Treaty of 1959 and Article 14 of the Protocol for Environmental Protection to the Antarctic. In their report (ATCM XXXV IP 47), the inspectors noted that they “*Italy lacks legislation needed to implement the Environmental Protocol and thus Italian agencies would have no ability under law to enforce Antarctic treaty rules with respect to Italian citizens or those participating in activities at the station*”. In addition, they reported that although administrative actions could be undertaken, “*the inability of the Government of Italy to prosecute persons for failure to adhere to environmental rules could be an impediment to effective enforcement*”.

Actual situation

Italy ratified the Antarctic Treaty with the law n. 963 of 29/11/1980 and the Madrid Protocol with the law n.54 of 15/2/1995. In both laws it is stated that the ratified act will be immediately fully executed.

The Italian Ministry of Instruction, University and Research (MIUR) among its duties has the task to supervise on the implementation of the Italian National Antarctic Research Program (PNRA) in the respect of the provisions of the Antarctic Treaty and of the Madrid Protocol.

Intergovernmental laws setting the regulations for all the personnel involved in the Italian PNRA state that all personnel employed in the Antarctic treaty area is to respect the provisions of the Antarctic Treaty and of the Madrid Protocol and is functionally and hierarchically dependent from the Expedition Leader that operatively ensures the respect of the rules together with the one of the Italian laws. The Expedition Leader has the possibility to adopt enforcing regulations to ensure the correct execution of the PNRA.

The Italian environmental regulations are more restrictive than the prescriptions of the Protocol and are applied since this specific activity does not have yet a specific environmental law. Actually the Environmental Protocol is applied directly as it is together with the environmental Italian laws.

A link between detection of illicit actions conducted in the Antarctic Treaty Area and the possible consequences other than administrative in terms of prosecution actions and sanctions is needed.

Prevention methods already in force

Personnel training Course

A first, but important, preventive measure is the development of an environmental awareness in all personnel going to Antarctica. All the personnel follow a two weeks training course whose program encompasses

different areas. This training course is an active part of the selection process and ends with a verification of learning. In particular lectures are given on the Antarctic Treaty system and specifically on the Madrid Protocol. Notions of history, geography, first aid, fire fighting, rubber dinghy conduction and operation procedures (radio, GPS...) in the stations and in remote camps are given. Theoretical and practical exercises are done in the first week, while the second one is more dedicated to survival issues with a practical camp conducted in the Mt Blanc at 3200 m. Prevention and adequate personnel selection helped Italy to be compliant with the requirements set in the Protocol.

Management procedures

MZS was built and was operated from the very beginning in such a way as to keep the environmental impact to a minimum. The major issues in environmental management are relative to: energy management, waste management, oil spills prevention, hazardous material handling and storage, environmental monitoring. All personnel arriving in the station is trained and informed on environmental issues related to their activity (waste management, energy conservation).

A Waste Management Handbook exists describing the procedures and instructions given to expedition members. Waste is separately collected in all the station facilities, stored and depending on the type of waste, can be shipped back to Italy or if paper/food waste it can be incinerated in the incineration plant.

Only trained and expert personnel manages the incineration plant that has a primary combustion chamber operated at 650°C, and a post combustor operating at 950°C. All the off gases are quenched through a scrubber and an air cooled, neutralized with sorbalite and filtrated in filter bags.

Concerning oil spill, only specifically trained personnel can do large amount of fuel transfer. Absorbent pads are provided to collect any accidentally lost fluid. For vehicles refueling, a user friendly petrol station is present.

Air environment monitoring program

The presence of MZS produced inevitable impacts in the last 28 years around the area, from the construction and growth of the base, to scientific and logistic activities such as air and vessel operations and field camps.

The application of the Madrid Protocol requires an effective and regular monitoring to detect local and regional environmental effects caused by human activities. Since the beginning of the Italian operations in 1986, a monitoring program was carried out to identify and mitigate possible impacts. The first intention was to evaluate the baseline of pollutants (eg. in airborne particulate and fresh water), then to analyze the level of contamination due to the activity after the station installation.

A choice of compounds as human activity markers was done and directed to compounds that could be simply correlated to a certain type of source. Polycyclic Aromatic Hydrocarbons (PAH) and heavy metal (mainly As, Cd, Pb, V, Ni, Cu) in atmospheric particulate under 10 µm were identified as a good indicators, for their identified anthropogenic sources, either for their menace for environmental and life cycle.

PAHs are generated from incomplete combustion processes, could they be natural or related to human presence. MZS is an old station that relies only on hydrocarbons for power although renewable energy sources will be installed in the future (tests of solar panels are in progress). PAHs presence in the collected airborne particulate can be exclusively related to human combustion sources located in the station area. Possible sources may be the electric power generators, the incineration plant, the automatic remote controlled platform (PAT), the additional heating system, vehicles and aircraft operations.

PAHs partition between gas/solid phase, as a function of atmospheric conditions (eg. temperature, pressure, precipitation). The conducted analyses for monitoring focused only on the solid fraction adsorbed on PM10. In MZS four PM10 sampling stations at the four cardinal points were installed. A remote sampler was installed at Icaro Camp (CI) about 2.5 km from MZS to evaluate a baseline of pollutants. This area was chosen for its relatively remoteness regarding the anthropogenic activity. CI is separated from MZS by two heights and it is placed at 42 m above the sea level, about 100 m far from the coast. This territorial

conformation and his position help keeping the place safe from direct pollution transport from the sources in MZS as it is downwind with respect of the prevailing winds.

Results indicate that the amount of PAHs was correlated with anthropogenic activity as in the last years, expeditions implementing a larger number of programmed activities and personnel resulting in a higher quantity of PAHs. In particular for CI a correlation between helicopter flight over and higher level of PM10 measured was found. Higher values measured in MZS roughly corresponded to higher values registered in CI depending on the weather conditions.

Possible sources of heavy metal in PM10 could be alternators, batteries, welding and steel processing, painting, electric power generation, vehicles and aircrafts, incineration plant. Results indicate that in MZS slightly higher levels of heavy metals were observed than in CI. Copper main apportionment could be from the old power generator plants as it may be present in lubricants used for diesel engine. Cd and Ni could derive from natural apportionment. Trend measured in MZS seemed constant in time and there was a certain comparability of data between CI and MZS.

Considering the amount of available data, it is possible to affirm that the observed levels of contaminants at the site of Campo Icaro were very close to those of a pristine environment. Contamination in the station area resulted being low and contained in space, decreasing in time for the majority of considered pollutants.

The Italian air quality environmental regulations are fully respected as, for example, concerning BaP (a PAH) the determined amount during the activity time in MZS was 40 times lower than the Italian threshold.

Water environment monitoring program

Concerning water quality, MZS discharges a treated water effluent in the sea. Since the beginning of the activities in Antarctica it was decided to install a sewage treatment plant. The plant treats sewage and grey waters. It is a physico-chemical plant operating with a coagulation step and a flotation unit followed by a filtration step with sand and activated coal and a disinfection step.

The output water of the plant is monitored daily according to the Italian law. Three sampling points are present and allow for measurements before the plant, after the coagulation step and at the discharge point.

The following analyses are performed: pH, Conductibility, BOD₅, COD, Al, NH₄⁺, Coli forms, PO₄²⁻. Other analyses are performed in Italy on frozen samples.

Results indicate that for the NH₄⁺ parameter the MZS plant slightly exceeds the limits of the Italian law. This type of treatment is not able to effectively treat ammonia, therefore a study to add a zeolite adsorption stage followed by desorption and electrochemical oxidation able to remove this pollutant, is under progress.

In addition sampling of sea water is performed monthly and followed by extraction of total hydrocarbons for successive measurements in Italy. The results indicate a quantity below the detection limit.

Future developments

A working group of experts in environment and legislation was formed by the Ministry of Foreign Affairs. Its main task is the formulation of a proposal of law that will implement in the national legislation and with an operative point of view, all the requirements set in the Environmental Protocol.

Actually a draft proposal was elaborated and under revision of the Antarctic Unit of the Ministry of Foreign Affairs.

The proposal of law will then have to follow the Italian procedures until its final approval by the parliament.