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MEASURES TO STRENGTHEN INTERNATIONAL CO-OPERATION IN NUCLEAR, RADIATION AND WASTE SAFETY

STUDY OF THE RADIOLOGICAL SITUATION AT THE ATOLLS OF MURUROA AND FANGATAUFA

INTRODUCTION

1. Last year, in document GC(40)/INF/4, the Secretariat reported to the General Conference on the start of a Study of the Radiological Situation at the Atolls of Mururoa and Fangataufa. The purpose of the present document is to recapitulate some of the background, give a brief account of how the Study is progressing, present a forecast of future developments and indicate the support provided so far for the Study.

BACKGROUND

2. On 22 September 1995, in resolution GC(39)/RES/23 entitled "Nuclear testing", the General Conference, inter alia, called on all States concerned "*to fulfil their responsibilities to ensure that sites where nuclear tests have been conducted are monitored scrupulously and to take appropriate steps to avoid adverse impacts on health, safety and the environment of such nuclear testing*".

3. On 18 March 1996, the Director General informed the Board that:

"..... the Secretariat had been requested by the Government of France to conduct a study designed to assess the radiological situation at the atolls of Mururoa and Fangataufa in French Polynesia. Since the informal briefing of Board members in February, at which he had mentioned the progress made in preparing for the study, all arrangements and the terms of reference had been formalized. An International Advisory Committee to supervise the study was being established under the chairmanship of Dr. Gail de Planque of the United States. A technical team from the Secretariat had visited the Pacific test sites in order

to make logistic preparations for the necessary measurements and sampling..... The findings, conclusions and recommendations of the study, which was expected to take about 18 months, would be contained in a report of the Committee to be published by the Agency. The co-operation with the French authorities had been good. France was covering the costs of the study, but other voluntary contributions - in the form of expert services and laboratory work - would be welcome."^{1/}

4. On 10 June 1996, the Director General informed the Board that:

"The International Advisory Committee on the Study of the Radiological Situation at the Atolls of Mururoa and Fangataufa was now fully operative. It was composed of ten prominent scientists from ten Member States plus [ex officio] representatives of WHO [the World Health Organization], UNSCEAR [the United Nations Scientific Committee on the Effects of Atomic Radiation], the South Pacific Forum and the European Commission. The Committee had set up task ... and working groups supported by a grid of national laboratories co-ordinated by the Agency's laboratories in Seibersdorf and Monaco. "^{2/}

THE STUDY

5. The Study of the Radiological Situation at the Atolls of Mururoa and Fangataufa aims to

- *assess the radiological situation (both present and future) at the two atolls and involved areas from the point of view of radiological safety,*
- *ascertain whether there are any radiological hazards to people^{3/},*
- *make recommendations on the form, scale and duration of any monitoring, remedial action or other follow-up action that might be required.*

^{1/} See GOV/OR.887, paragraph 19.

^{2/} See GOV/OR.891, paragraph 26.

^{3/} In radiological protection it is customary to presume that the adequate protection of individual human beings should also ensure that no other species will be threatened as a population, even if individuals of the species may be harmed; this presumption is being examined by taking into account any known particular characteristics of the local biota at the Mururoa and Fangataufa Atolls.

The Study covers both the current radiological situation and the potential long-term^{4/} radiological situation.

Technical framework

6. The technical framework for the Study is provided by the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources, which are jointly sponsored by the Food and Agriculture Organization of the United Nations, the International Labour Organization, the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development, the Pan American Health Organization, the World Health Organization and the International Atomic Energy Agency.^{5/}

Organizational structure

7. The organizational structure for the Study includes (see the chart in Attachment 1): an International Advisory Committee responsible for providing the Agency with scientific guidance and direction on all matters related to the conduct of the Study (see paras 3 and 4 above); a Project Management Office set up by the Agency; two Task Groups (A and B) and five Working Groups; and a Liaison Office set up by the French Government. The membership of the various bodies is shown in Attachment 2.

Preliminary meetings

8. An informal technical consultation meeting between selected scientists from several Member States and representatives of intergovernmental organizations was convened by the Agency in Vienna from 29 to 31 January 1996 to consider the substance of the French request for a radiological assessment of the atolls. The meeting discussed the objectives of the Study and matters that should be included in its terms of reference and considered the Task and Working Group structure needed to carry out the assessments. The scientists attending this meeting comprised the nucleus of the formally established International Advisory Committee.

9. A preliminary meeting of the proposed Chairmen of the two Task Groups and five Working Groups with representatives of the French Liaison Office took place at the Centre d'Etudes de Montlhéry on 28 and 29 March 1996. The main purpose was to translate the objectives of the Study into proposed action plans for the Task and Working Groups and to discuss the information and data which the French authorities were beginning to provide.

^{4/} "Long-term" is used to mean a period of time over which remedial actions can have a significant effect on the doses to people. It is provisionally presumed that the customary time of around 10 000 years - with emphasis on the short-term - will provide an appropriate margin for this purpose.

^{5/} They were approved by the Board of Governors in September 1994 (see paras 161 and 162 of GOV/OR.847) and issued by the Agency as Safety Series publication No. 115.

Regular meetings

10. The International Advisory Committee held its first regular meeting in Vienna on 13 and 14 April 1996. The membership of the Task and Working Groups was confirmed and the action plans proposed by the Groups were endorsed. A major decision of the Committee was that Task Group A should plan an independent environmental sampling and surveillance campaign at and near the atolls. The Committee agreed that this campaign should serve - inter alia - as a means of evaluating a very comprehensive French database on the levels of radioactive material at the atolls with a view to the use of this database as input into the assessment of the current radiological situation.

11. The first regular meetings of the Task and Working Groups were held during the period May-July 1996. At those meetings, detailed work programmes were formulated and assignments given to members of the Groups.

12. The second regular meeting of the International Advisory Committee was held during December 1996, partly at the headquarters of the South Pacific Forum, in Suva, Fiji, and partly in Papeete, Tahiti, French Polynesia.

13. At this meeting, the Committee reviewed the work of the Task and Working Groups and concluded that the Study was progressing well, the handover of the information promised by the French authorities having been almost completed and the information being deemed by the relevant Task and Working Groups to be of high quality.

14. The Committee noted that it was not within the Study's terms of reference to assess retrospectively the exposure experienced by the inhabitants of the region as a result of (and at the time of) the atmospheric tests carried out between 1966 and 1974. Nevertheless, there was considerable concern, especially among the general public, about the effects of the atmospheric tests and, arising from this, an expectation that the final Study report would contain some references to any exposure which might have been suffered by the inhabitants of the region. Accordingly, the Committee decided that the Study report would contain discussion of the doses received at the time of the atmospheric tests. The Committee understands that these doses were due largely to short-lived fallout radionuclides, especially radioactive iodines. The information in question will be provided to and pre-assessed by the UNSCEAR Secretariat. The Committee agreed that the report might also contain some material on other issues which could be of particular public concern, such as the occurrence of ciguatera toxins in the lagoons of the atolls.

15. Finally, the Committee agreed on the general format and content of the final Study report and expressed itself in favour of suggesting that the Agency arrange for an international conference on the Study to be held shortly after the release of the final Study report (see para. 35 below).

16. In conjunction with the meeting, a number of Committee members, Task and Working Group Chairmen and members of the Agency's Project Management Office attending the meeting inspected the Mururoa and Fangataufa atolls, where the French authorities are

engaged in dismantling operations. Also, delegations from Australia, the Cook Islands, Fiji, Kiribati, the Marshall Islands, Micronesia, Nauru, New Zealand, Niue, Palau, Papua New Guinea, the Solomon Islands, Tonga, Tuvalu, Vanuatu and Western Samoa (the States belonging to the South Pacific Forum) were briefed in Suva and press conferences dealing with the progress of the Study were held in Suva and Papeete by the Chairman of the International Advisory Committee with the support of the Task Group Chairmen and of Project Management Office members.

Sampling and surveillance campaign: residual radioactive material in the environment

17. The sampling and surveillance campaign planned by Task Group A was carried out in July-August 1996. Its purpose was both to evaluate the environmental data supplied by the French authorities (see para. 10 above) and to ascertain - as far as practicable - whether the French monitoring programme had been sufficiently comprehensive to allow reasonably good estimates to be made of the amount of residual radioactive material in the environment of the region.

18. The campaign was split into a terrestrial part, covering the surface soils and corals and flora of the atolls, and a marine part, covering the lagoons, the surrounding ocean and marine biota. The terrestrial part was co-ordinated by the IAEA Laboratory at Seibersdorf, Austria, and the marine part by the IAEA Marine Environment Laboratory in Monaco. The terrestrial sampling team comprised six scientists from four countries supported by six members of the IAEA Laboratory at Seibersdorf and the marine sampling team comprised four scientists from three countries supported by four members of the IAEA Marine Environment Laboratory in Monaco. The participating experts are listed in Attachment 2.

19. The terrestrial part involved the collection of about 300 samples (vegetation, coconuts, sand, top soil, soil profiles, corals, cores of coral bedrock, aerosols) and a large analytical effort (over 1000 radioanalytical determinations), which was spread among the following institutes: the Institut für Anorganische Chemie and the Federal Institute for Food Control and Research, Vienna, Austria; the Institute of Radiobiology, Minsk, Belarus; the Centro de Isótopos, Havana, Cuba; the Physikalisch-Technische Bundesanstalt, Braunschweig, Germany; the Norwegian Radiation Protection Authority, Østerås, Norway; the Jožef Stefan Institute, Ljubljana, Slovenia; the Instituto de Medio Ambiente, C.I.E.M.A.T., Madrid, Spain; the Radiochemistry Group, Central Veterinary Laboratory, Addlestone, Surrey, United Kingdom; the US Department of Energy's Environmental Measurements Laboratory, New York, United States; and the IAEA Laboratory at Seibersdorf, Austria.

20. In addition, a number of gamma surveys and gamma spectrometric measurements were carried out, particularly in the Colette area of Mururoa atoll, where five safety trials^{6/} had

^{6/} In the safety trials, a more or less fully developed nuclear weapon was subjected to simulated accident conditions. The nuclear core was destroyed by means of conventional explosives, usually with no release of fission energy.

been conducted in the atmosphere between 1966 and 1974.^{7/} Surface scrapings and sand from this area have been examined by the IAEA Laboratory at Seibersdorf, Austria, for the presence of residual particles of plutonium and plutonium oxide (see para. 25 below). The biokinetic properties of representative particles are being examined at the laboratory of the National Radiological Protection Board, Chilton, United Kingdom, which has had experience of examining such particles from a similar source that were formed in the 1950s during the United Kingdom's weapons testing programme at Maralinga, Australia.

21. The marine part, carried out with the logistic support of five vessels provided by the French Government, involved gamma-spectrometric surveys of the sea bed, in order to optimize sampling, and the collecting of over 300 samples of lagoon water, ocean water, sediment pore water, sediment, corals and biota. About 13 000 litres of water and a tonne of solid samples were processed, packaged and transported to Monaco. The analytical effort was spread among the following institutions: the Australian Nuclear Science and Technology Organisation (ANSTO), Sydney, and the Australian Radiation Laboratory, Melbourne, Australia; Risø National Laboratory, Roskilde, Denmark; the Federal Fisheries Research Centre, Hamburg, Germany; the National Radiation Laboratory, Christchurch, and the Institute of Geological and Nuclear Sciences, Lower Hutt, New Zealand; the Centre for Environment, Fisheries and Aquaculture Science, United Kingdom; Lawrence Livermore National Laboratory, Livermore, California, United States; and the IAEA Marine Environment Laboratory in Monaco.

22. The French authorities, who placed no restrictions on the sampling operations, provided invaluable logistic assistance throughout the campaign.

23. Task Group A is assessing the agreement between the French data on residual radioactive material in the environment of the atolls and the results of the Agency's sampling and surveillance campaign.

Assessment of the current and committed radiological situation due to the residual radioactive material in the environment

24. Using the evaluated data on residual radioactive material in the environment, Task Group A is estimating potential individual radiation doses to people living in the vicinity of the Mururoa and Fangataufa atolls and doses which could be incurred by a hypothetical population living on the atolls themselves. There are some 5000 people living within 1000 km of the Mururoa atoll, the closest inhabited atoll being Tureia - 110 km away and with a population of about 100 people.^{8/} It is assumed that the hypothetical population living on the atolls would eat local seafood and locally cultivated foodstuffs, although at present there is only very limited foodstuff cultivation on the Mururoa atoll and virtually nothing edible is growing on the Fangataufa atoll.

^{7/} Ten further safety trials were conducted underground between 1976 and 1989.

^{8/} The largest nearby town, Papeete, with a population of about 24 000, is 1200 km away.

25. In the case of the Mururoa atoll, there is an additional radiological exposure pathway due to the presence of plutonium-contaminated particulates resulting from the safety trials conducted above ground in the Colette area. This area has been extensively cleaned and scoured, but some contamination persists. This matter is being studied by Task Group A (see para. 20 above).

Assessment of the potential long-term radiological situation due to the residual radioactive material underground

26. Task Group B is estimating the long-term migration of residual radioactive material from its underground locations through the geological media constituting the atolls into the respective lagoons and the nearby ocean, and its potential dispersion in the ocean throughout the South Pacific region. The possible exposure to such material of hypothetical local and regional population groups and of population groups living further afield in the South Pacific is being evaluated.

27. Working Group 3 has estimated the yields of the underground test explosions using seismic monitoring information from a number of countries and the residual activity in the cavities (and its distribution between lava and rubble) by making assumptions about the design of the nuclear devices and about the materials constituting them. The yield estimate is being compared with data provided by the French authorities.

28. Working Group 4 is estimating the rate of radionuclide leaching from the lava and rubble in the cavities, the extent of radionuclide migration through the surrounding geological media (volcanic rock and hundreds of metres of carbonate rock capping) and the rate of radionuclide release into the lagoons and the ocean.

29. Migration from a number of notional cavities representative of what is known about the location of the tests and about the depth and integrity of the geological covering material is being modelled. The total release from all cavities at both atolls will be estimated in order to provide the source terms for the modelling of dispersion in the lagoons and the ocean.

30. A separate underground water sampling campaign was carried out at the Mururoa and Fangataufa atolls at the end of May and the beginning of June 1997. Samples were taken from two Mururoa test cavities and from nine monitoring wells in the carbonate formation, the wells sampled having been selected by Study participants. The sampling was carried out by three Study participants with French logistic and technical support. The analyses of the samples will be carried out by the IAEA Marine Environment Laboratory in Monaco and the Australian Nuclear Science and Technology Organisation (ANSTO) at Lucas Heights, Australia. The analyses will allow French data on radionuclide concentrations in cavity water to be evaluated and provide input for model calculations by Working Group 4 of the future release of radionuclides.

31. Working Group 5, with the assistance of the IAEA Marine Environment Laboratory in Monaco, is estimating the potential dispersion of radioactive materials into the lagoons and the ocean. It has developed numerical models of the dispersion of dissolved and sediment-

31. Working Group 5, with the assistance of the IAEA Marine Environment Laboratory in Monaco, is estimating the potential dispersion of radioactive materials into the lagoons and the ocean. It has developed numerical models of the dispersion of dissolved and sediment-bound contaminants within and from the atolls and also compartment models for estimating dispersion towards and beyond relatively nearby islands such as the Tureia atoll and Tahiti. A large-scale general circulation model is being used to estimate how potentially released radionuclides might be transported over long distances.

FORECAST

32. The Task and Working Groups have nearly completed their work. Advanced drafts of the Working Groups' technical reports are to be considered at a co-ordination and review meeting of Task and Working Group Chairmen and Agency Project Management Office representatives on 17-19 September 1997. The Chairman of the International Advisory Committee will preside over the meeting, at which draft material for the Study report will also be reviewed.

33. Final drafts of the technical reports of the Task and Working Groups are due to be completed before the end of November 1997, and the penultimate draft of the Study report is to be circulated to International Advisory Committee members in December.

34. The final meeting of the International Advisory Committee is scheduled for February 1998. At this meeting, the Study report is to be reviewed for approval. It is expected to be issued by the Agency in April 1998 or soon afterwards.

35. The Secretariat is planning for an International Conference on the Study of the Radiological Situation at the Atolls of Mururoa and Fangataufa to be held in the middle of 1998 (see para. I/4 of GC(41)/10 - "The Agency's budget for 1998"). The main purpose of the Conference will be to facilitate discussion of the results of the Study by the scientific community and other interested parties.

36. In association with the release of the Study report, the Agency's Secretariat intends to send a small team of Study participants to the South Pacific in order that they may present the results and conclusions of the Study to the people of the region.

SUPPORT FOR THE STUDY

37. France has been covering the direct costs of the Study, which amounted to approximately US \$ 1 100 000 at the end of May 1997. Significant in-kind support has been provided by Argentina, Australia, Austria, Belarus, Belgium, Cuba, Denmark, Germany, Indonesia, Japan, the Republic of Korea, New Zealand, Norway, the Russian Federation, Slovenia, Spain, Sweden, Switzerland, the United Kingdom, the United States of America, the European Commission, the South Pacific Forum, the University of the South Pacific, UNSCEAR and WHO. As at the end of May 1997, the direct in-kind contributions associated

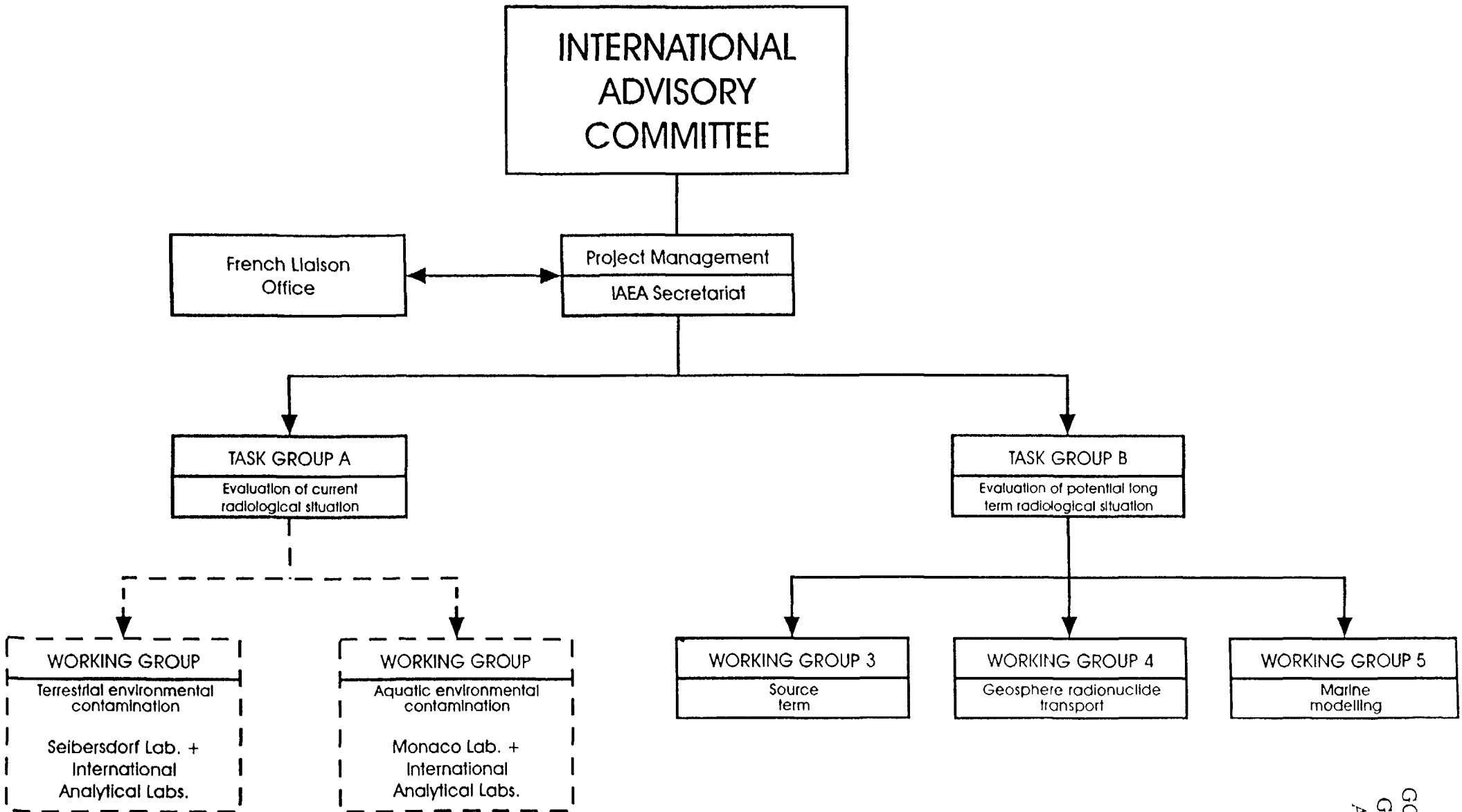
the Study were estimated by the Secretariat to be worth around US \$340 000.^{2/} This figure does not reflect the substantial contributions made by scientists working on the Study outside meeting times or the extensive support received from the various laboratories involved in the Study.

^{2/}

For the analysis of samples, the estimates were made by the IAEA Laboratory at Seibersdorf and the IAEA Marine Environment Laboratory in Monaco taking into account the special rates granted for the Study. For the services of cost-free experts, the estimates reflect only costs per meeting-day plus (where applicable) the travel and subsistence costs covered by the Member State or the organization.

STUDY OF THE RADIOLOGICAL SITUATION AT THE MURUROA AND FAUGATUFA ATOLLS

Organization



Study of the Radiological Situation at the Atolls of Mururoa and Fangataufa
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RADIOACTIVE MATERIAL IN THE AQUATIC ENVIRONMENT

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Task Group A

Evaluation of current radiological situation

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Mr. R. P. DANESI, DIR-RIAL, Seibersdorf

Working Group 2 - aquatic environmental contamination

Mr. P. POVINEC, RIML, Monaco

Task Group B
Evaluation of potential long-term radiological situation

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Working Group 3 - Source Term

Mr. T. McKENNA, Radiation Safety Section (NSRW)

Working Group 4 - Geosphere Radionuclide Transport

Mr. E. WARNECKE, Waste Safety Section (NSRW)

Working Group 5 - Marine Modelling

Mr. M. BAXTER, DIR-RIML, Monaco

