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GEMS: Global Environment Monitoring System

BASIC PRINCIPLES OF THE WHO/UNEP GLOBAL ENVIRONMENTAL RADIATION NETWORK



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WHO/UNEP expert meeting on the basic principles
of a global network on environmental radiation
monitoring and emergency response (GERMON)

Le Vésinet, France, 15-18 December 1987

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1. INTRODUCTION

Information on radiation doses received by populations after radioactive contamination of the environment is required by the authorities responsible for protecting public health and the environment. This information is particularly badly needed if there has been a further release of radioactivity. International cooperation is needed to facilitate the timely exchange of information, promote harmonization of data gathering, and support the development of national programmes where that is desired. There is also a need for regional and global overviews of the levels of environmental radiation and for assessments of their impact on health.

After the accident at Chernobyl, USSR, in 1986, attempts were made to improve radiation monitoring capabilities and the exchange of information, at both national and international levels. The efforts of international organizations are being coordinated by an Interagency Committee⁽¹⁾. As part of this effort, WHO and UNEP are promoting the further development of existing international cooperation in monitoring radioactivity in the environment⁽²⁾ and considering the establishment of a global network of national institutions for environmental radiation monitoring. Such a network would have two main objectives: the collection of global radiation data on a routine basis, and rapid transmission and evaluation of environmental radiation data during emergencies. To this end, a meeting of experts was convened to advise the two Organizations on:

- what kind of a worldwide system might be developed to meet the desired objectives, and
- how existing international cooperation in environmental radiation monitoring could be developed to serve this purpose.

A working document, prepared by WHO/UNEP, was used as the basis for the review and discussions by experts from 17 countries, invited in their personal capacities, and by representatives of IAEA, UNEP, WHO and WMO. FAO could not attend but provided its comments in writing.

The meeting was held at the French Central Service for Protection against Ionizing Radiation from 15-18 December, 1987. Mrs D. P. MEYERHOF (Canada) chaired the meeting and Mr J. R. MORONEY (Australia) served as its rapporteur. Dr H. GHARBI (Tunisia) and Dr J. BROADWAY (USA) assisted as rapporteurs of working groups. A list of participants is attached as Annex 1.

The results of this meeting of experts are presented in this Report, which is intended to guide the secretariats of WHO and UNEP in developing a global network of national institutions for monitoring environmental radiation. The report contains an overview of the existing national and international programmes, and makes suggestions about the structure and operational arrangements which should be considered in the development of a global system. It is intended that this report will serve as the basis for discussions with Member States of the two organizations in developing an international monitoring system designed to provide information on a timely basis for the protection of public health and the environment.

(1) Interagency Committee for the Coordinated Planning and Implementation of Response to Accidental Releases of Radiation Substances (IAC PIRAR), "Internationally Coordinated Radiation Monitoring Programme", 8668s (8022s)/1s, 14 July 1987, IAEA, Vienna.

(2) For example WHO Environmental Radioactivity Monitoring Network coordinated by the International Reference Centre for Radioactivity, Le Vésinet, France

2. NATIONAL ACTIVITIES ON ENVIRONMENTAL RADIATION MONITORING AND PREPAREDNESS FOR MAJOR RADIOACTIVITY RELEASES

Many countries have made provisions for routine monitoring of environmental radiation and for emergency response to a major release of radioactivity to the environment. Not surprisingly, specific provisions vary from country to country according to the country's needs and capacity to fulfil them. A common feature, however, is that most countries with developed monitoring activities have two programmes.

(i) A country-wide programme designed to monitor the environment for radioactive contamination, irrespective of its origin, national or otherwise. This programme is usually the responsibility of a government authority on public health (radiation protection) or environmental protection, and frequently involves major inputs from specialized agencies in meteorology and agriculture.

(ii) A programme which is site-specific to each major establishment in the country dealing with substantial quantities of radioactive material, such as a nuclear power plant, nuclear research reactor, fuel reprocessing plant or radioactive waste facility. This type of programme is designed to monitor the environs of each site for radioactive contamination generated by the establishment operating there. It is usually the responsibility of the establishment at the site and comprises an essential part of its safety system.

In many countries, both programmes measure the environmental radiation field and radioactivity in air, water and the various elements of the food chain; the objective is to enable continuous assessments to be made of the impact of radioactivity on health, and on the environment. In some countries, the two programmes are complementary so that country-wide monitoring provides an independent check on site-specific monitoring.

National public health and environmental protection authorities are making a significant contribution to controlling environmental radiation. These bodies are expected to play an even greater role in the future.

Radiation monitoring varies widely between countries in the adequacy of population coverage, and environmental depth. There are large geographical areas, of great importance when worldwide coverage is sought, that are sparsely monitored, or not monitored at all.

3. CURRENT ACTIVITIES OF INTERNATIONAL ORGANIZATIONS IN ENVIRONMENTAL RADIATION MONITORING AND PREPAREDNESS FOR MAJOR RADIOACTIVITY RELEASES

3.1 WHO

WHO activities related to radiation monitoring have been carried out largely through its Collaborating Centres designated for the purpose. Since 1969, the WHO Collaborating Centre at the Central Service for Protection against Ionizing Radiation, Le Vésinet, France, has coordinated a global network for monitoring radioactivity in the environment (see Annex 2). In addition, this Centre, and the WHO Collaborating Centres at the Bureau of Radiation and Medical Devices in Canada and at the Australian Radiation Laboratory in Australia, have provided assistance in dosimetry, radioactivity monitoring, assessment of health effects from exposure to radioactivity releases and training of personnel.

The WHO Regional Office for Europe is strengthening its ability to improve the exchange of information in Europe during radiation emergencies.

3.2 UNEP

UNEP is responsible for the coordination of United Nations activities concerned with the environment. Radiation monitoring and assessment fall within UNEP's Earthwatch Programme. There are at present no activities in this area, though a mandate to carry out such work was given by the Governing Council of UNEP at its second session in 1974 Decision 9(II). The UNEP unit that has responsibility for such activities is the GEMS Programme Activity Centre which coordinates the UN system-wide Global Environment Monitoring System. A brief outline of GEMS and its scope is given in Annex 3.

3.3 IAEA

IAEA's activities of particular importance to the WHO/UNEP Network are related to the implementation of the Convention on Early Notification of a Nuclear Accident (Annex 5). The IAEA and WMO have agreed to use the WMO Global Telecommunication System (GTS) for rapid near real-time transmission of data provided under the Convention by the State incurring the accident. The use of the GTS for this purpose was expected to be demonstrated at the February 1988 meeting of the IAEA Board of Governors and the GTS is expected to become available for general application in June 1988.

The IAEA is preparing a guide-book on reliable methods of measuring environmental radioactivity⁽³⁾. It is also preparing a Safety Series publication on "Principles for the Monitoring for the Radiation Protection of the Public following a Nuclear Accident", and updating its existing publications on intervention and derived intervention levels (Safety Series 72 and 81 respectively). The Analytical Quality Control Services (AQCS) of IAEA organizes inter-comparison studies and provides radioactivity reference materials.

3.4 WMO

Apart from the use of the GTS mentioned above, WMO's activities relating to environmental radioactivity are in atmospheric modelling. Computer-based models for the prediction of dispersion and transport of radioactive material, at various scales of space and time, are available and are run by some countries. IAEA and WMO are considering possible distribution, through the GTS, of modelling results to interested countries in the event of a major release of radioactivity.

3.5 FAO

FAO participates with WHO and UNEP in food contamination monitoring (at present, chemicals and aflatoxins) and provides advice to FAO member countries on control of all contaminants in food, including radionuclides, at all levels of food production, including harvesting, storage, processing and marketing.

3.6 UNSCEAR

UNSCEAR compiles information on radioactivity in the environment and the consequent radiation exposure of populations. Assessments are made of the likely impact on health and the environment.

4. OBJECTIVES OF THE GLOBAL ENVIRONMENTAL RADIATION MONITORING NETWORK (GERMON)

4.1 GERMON should regularly provide selected information on levels of radioactivity in the environment, from as many countries as possible, which is needed by governments and the scientific community for the assessment of the impact of radioactive contamination on public health and on the environment.

4.2 GERMON should provide, with minimum delay, information on environmental radiation resulting from a major release of radioactive material. The information would improve national authorities' knowledge of the radiological situation in other countries and hence enable them to take effective remedial action.

4.3 GERMON should help countries that do not currently monitor environmental radiation to do so. This would enable governments to assess the situation in the event of a major radioactivity release affecting their territory.

4.4 GERMON should improve the quality and compatibility of data generated by countries by their monitoring programmes on environmental radioactivity.

(3) The Determination of Radionuclides in Food and the Environment - A Guide-Book - IAEA Technical Report Series to be published in 1988

5. CONCEPT AND DESIGN OF GERMON

GERMON would be based largely on existing national programmes for monitoring environmental radiation and for dealing with major releases of radioactivity. National authorities with radiation monitoring programmes should be invited to join GERMON. In order to meet the objectives 4.1 to 4.4 above, GERMON would have four main features:

- i) the ability to collect, compile and disseminate information on environmental radiation;
- ii) the ability to provide an international alert in cases of unusual increases in environmental radiation;
- iii) the ability to collect, compile, and exchange relevant information rapidly during radiation emergencies on a harmonized basis; and
- iv) the ability to improve the quality of measurements, and the harmonization of sampling and reporting, in all participant countries.

GERMON should be "low-cost"; it should rely mainly on existing mechanisms such as the WHO Environmental Radioactivity Monitoring Network, the system of WHO Regional Offices, the WHO Collaborating Centres and the available communication links. At a later stage, technical cooperation might be possible to strengthen the capacities of developing countries to participate in GERMON.

6. STRUCTURE OF GERMON

GERMON would be part of GEMS and comprise the following elements:

- i) WHO Headquarters and Regional Offices, and UNEP Headquarters;
- ii) a Scientific Advisory Committee (SAC);
- iii) a Coordinating Collaborating Centre (CCC);
- iv) Regional Collaborating Centres (RCC);
- v) national Liason Institutions;
- vi) national radiation monitoring stations and laboratories.

The responsibilities of each of these are summarized below.

6.1 WHO Headquarters and Regional Offices, and UNEP Headquarters

Collectively, these bodies would:

- coordinate the overall development and operation of GERMON;
- provide for liaison with IAEA, UNSCEAR, WMO and other relevant international organizations;
- collect and store summarized information, including the CCC bulletins, on the results of routine monitoring and disseminate it on request;
- incorporate the Network into GEMS;
- provide advice to Member States under both normal and emergency conditions;
- support programmes of technical cooperation to strengthen the ability of developing countries to monitor environmental radiation.

In the event of a major radioactivity release to the environment, WHO/UNEP would:

- receive and transfer urgent information, as far as practicable in conformity with the format requested under the Convention on Early Notification;
- activate the emergency response of GERMON;
- promote the exchange of information between the elements of GERMON;
- provide advice to any Member State requesting it.

6.2 Scientific Advisory Committee (SAC)

The main task of the SAC would be to advise WHO/UNEP on GERMON and its developments. The Committee would review the programme annually. It would comprise one expert from each of the six WHO regions (Africa, America, Eastern Mediterranean, Europe, South East Asia, and Western Pacific) including the Chairman and Secretary. In addition there would be representatives from WHO, UNEP and the CCC. National experts would be appointed by WHO/UNEP in consultation with national authorities.

6.3 Coordinating WHO Collaborating Centre (CCC)

For routine monitoring, the CCC would collate the processed information from the network and issue a regular bulletin on the environmental radiation situation. Processed information would be provided by the Liaison Institutions to the CCC either directly or through the Regional Collaborating Centres. The bulletin and other summarized information and interpretation would be provided by the CCC directly to the participating Regional Collaborating Centres and Liaison Institutions, and to WHO/UNEP for distribution to other international agencies.

In the event of an emergency, the Liaison Institutions would communicate directly with WHO/UNEP or with the CCC. In collaboration with other scientific groups as arranged, the CCC would compile and analyse the data coming from GERMON and, in consultation with WHO and UNEP, be responsible for the production of assessments of the global radiation situation (using government designated expert groups).

6.4 The Regional Collaborating Centres (RCCs)

The RCCs would collect processed information on routine monitoring from Liaison Institutions in those countries that have chosen an RCC as a point of direct contact. This information would be forwarded to the CCC for inclusion in the bulletin and subsequent assessments. In the event of an emergency, the RCCs - like the other Liaison Institutions - would serve only as national points of contact for GERMON.

6.5 Liaison Institutions

The Liaison Institutions would coordinate work on environmental radiation monitoring and preparedness for major radioactivity releases in their countries, and provide monitoring data directly to CCC or appropriate RCCs. Only one Liaison Institution for each country would be included in GERMON. The Liaison Institution for a country would be recommended by the appropriate Ministry of Health or the Environment. The Liaison Institution might be a medical research institute, a radiation protection service or a nuclear medicine laboratory. The Liaison Institution would probably belong to the Ministry of Health or the environment ministries, although for some countries it might be associated with another sector such as nuclear energy. In those countries where relevant Collaborating Centres have been designated, these Collaborating Centres would probably serve as Liaison Institutions.

The Liaison Institutions would gather raw data from national environmental monitoring stations or laboratories in their countries, process these data and provide processed information to either the CCC, or an RCC, depending on which Centre had been chosen as the most appropriate for the country.

In the event of an emergency, the Liaison Institutions would be receivers and suppliers of information within their Member States. They would communicate directly with WHO/UNEP or the CCC.

6.6 Monitoring stations and laboratories

The monitoring stations and laboratories conduct their environmental radiation measurements and supply the raw data to the Liaison Institution in their own country. The monitoring stations and laboratories would not be called upon to communicate with other elements of GERMON.

7. OPERATIONAL FEATURES OF GERMON

7.1 Normal Conditions

7.1.1 The minimum requirements for participation in GERMON should be the ability to:

- i) measure external radiation dose rate at ground level all the time;
- ii) measure airborne radioactivity at least weekly;
- iii) measure radioactivity of precipitation (rain, snow, dry deposition) and milk at least quarterly;
- iv) process the raw information at the Liaison Institution and report the processed information in standard form, once a quarter, to the appropriate Collaborating Centre, not later than one month after the end of each calendar quarter;
- v) send the processed information from the RCC, if one is involved, to the CCC within two months after the end of the calendar quarter;
- vi) use SI units⁽⁴⁾ for reporting information to the Collaborating Centres; secondary units are to be standardized and the conditions of sampling and measurement are to be clearly indicated so that data from different Liaison Institutions can be compared.

7.1.2 Countries with developed environmental monitoring programmes undertake more comprehensive investigations routinely. They should be encouraged to supplement the basic measurements of 7.1.1 with their more detailed analyses. The choice of radionuclide and material for analysis depends upon the resources available and the contaminants present in the environment.

7.1.3 The reports from Liaison Institutions would be further processed at the appropriate Collaborating Centres to make the information ready for inclusion in the bulletin.

7.1.4 The CCC would receive the final processed data from the RCCs and issue the regular bulletin. Presentation in the bulletin should accord with the basic information as specified by the minimum requirements for participation in GERMON. Some Liaison Institutions might wish to provide some supplementary information for inclusion in the bulletin.

7.1.5 The bulletin would be produced annually and be distributed to all Liaison Institutions, WHO, UNEP and other relevant international organizations. If requested, the bulletin would also be sent to health and environment management authorities in Member States.

7.2. Abnormal conditions

7.2.1 The purpose of this section of the Report is to distinguish between the operation of GERMON during normal conditions and during those that are deemed to be abnormal. The main differences concern the functioning of GERMON and the flow of data to and from it as compared with the flow of data under the provisions of the Convention on Early Notification. Annex 4 contains diagrams showing the flow of information for three situations: normal, abnormal (conforming to the Convention) and abnormal (outside the Convention).

7.2.2 An abnormal condition is defined as any level of radiation or radioactivity that is regarded as abnormal for a given country by the respective Liaison Institution.

7.2.3 In an emergency, the Convention on Early Notification (Annex 5) takes priority over any procedure described in this Report and GERMON would support the Convention by providing data on environmental radioactivity as they become available.

(4) The SI for the Health Professions. 1977, WHO, Geneva.

7.2.4 In the event of a major radioactivity release the main functions of GERMON should be to generate, and to accelerate circulation of, reliable and relevant information on the radiation situation needed for decision-making by health and environment management authorities in the Member States concerned.

7.2.5 Information about a major radioactivity release might come to WHO/UNEP in different ways:

- i) from IAEA in accordance with the Convention on Early Notification in the Case of a Nuclear Accident;
- ii) from a Liaison Institution;
- iii) from a Ministry of Health or Environmental Agency;
- iv) from other sources (in which case the information should be verified before acceptance).

Under the Convention, in addition to informing those States that may be physically affected, IAEA has to inform relevant international organizations, including WHO and UNEP, of any accident notified to it and, on request, provide any supporting information made available by the State incurring the accident.

In addition, any Liaison Institution, including a Collaborating Centre, may wish to report to WHO/UNEP about elevated levels that have been registered in that particular country and have been regarded by the respective Member State as being of international significance. In such a case, WHO/UNEP will inform IAEA.

If an internationally significant release of radioactivity, which has not been reported according to the Early Notification Convention, is confirmed by IAEA, then the actions of WHO and UNEP that would follow should be similar to those in the case of notification under the Convention and WHO would activate GERMON.

7.2.6 To activate GERMON, WHO would notify all the Liaison Institutions, including the Collaborating Centres, about the emergency. WHO through its Regional Offices may notify Member States in their Regions.

7.2.7 Liaison Institutions would probably intensify radiation monitoring in their countries so that their national authorities would be better briefed to implement emergency plans. Intensification of monitoring operations would be guided largely by the nature and extent of the radioactive contamination in the country at the time.

7.2.8 Transfer of data during abnormal occurrences

7.2.8.1 Accidents covered by the Convention on Early Notification.

Under the Convention on Early Notification, the country incurring an accident is responsible for notifying, either directly or through the IAEA, those States that may be physically affected, as well as notifying the IAEA. In these cases, the IAEA has primary responsibility for notifying the relevant international organizations, including WHO/UNEP, and providing them, on request, with information made available by the State incurring the accident, in support of its initial notification. Several features can be distinguished in the arrangements:

- i) Geographical area of coverage: the IAEA is more likely to receive information for a relatively small geographical area around the accident site, whereas GERMON, which would be global in scope, could provide any Member State with information of value in making decisions regarding the existing public health hazard.
- ii) Response to requests for data: based on previous experience in such accidents, many requests for data on environmental radioactivity can be expected from countries near, and far from, the site of the accident. Such requests for information would be met by GERMON.

- iii) Time frame of data availability: the IAEA would be expected to provide information it received from the State incurring the accident, on the conditions at, and near, the accident site for a period of time according to the provisions of the Convention (see Annex 5). In contrast, GERMON would continue to provide information to any WHO/UNEP Member State regarding changes in ambient radioactivity for a longer time, to answer questions relating to hazards to health.
- iv) WMO has agreed that its GTS may be used for the transmission of data in GERMON, provided the appropriate data protocols are followed.

7.2.8.2 Abnormal occurrences not covered by the IAEA Convention on Early Notification (see Annex 5).

If a Liaison Institution detects a significant change in radiation level but no accident has been notified under the Early Notification Convention, the Liaison Institution may wish to keep WHO/UNEP, CCC, RCC and other Liaison Institutions informed of its findings. Advice and relevant information may be provided by WHO and CCC to Liaison Institutions.

7.2.9 Under abnormal conditions:

- i) all urgent information received by WHO/UNEP, unless marked "confidential", would be passed to their Regional Offices, IAEA, FAO, the Collaborating Centres and Liaison Institutions; and
- ii) any Liaison Institution would be free from any formal obligation to deliver emergency information to WHO/UNEP or any other Liaison Institution.

8. CONCLUSIONS AND RECOMMENDATIONS

8.1 The Expert Meeting agreed on the need for coordinated monitoring of environmental radioactivity and data exchange, with worldwide coverage, for normal conditions and with provision for enhanced programmes in the event of a major release of radioactivity to the environment.

8.2 It is recommended that the Global Environmental Radiation Monitoring Network, or GERMON, as outlined in sections 4 to 7 of this Report, should be implemented to provide the desired measures on environmental monitoring and data exchange in normal and abnormal situations. Countries would thereby be equipped with the information needed to assess impact on public health and the environment.

8.3 The Expert Meeting recognized that GERMON could be achieved most efficiently by an extension of participation in the existing WHO Environmental Radioactivity Monitoring Network. It is recommended that the Central Service for Protection against Ionizing Radiation at Le Vésinet should become the Co-ordinating Collaborating Centre for the Network.

8.4 In the event of a State which is party to the Early Notification Convention incurring a major release of radioactivity to the environment, the provisions of the Convention impose specific requirements on that State party, to which they must give priority attention, especially in the period immediately following the release.

The Expert Meeting fully explored the effect of this commitment on the provisions in GERMON for rapid gathering and dissemination of data for purposes of protecting public health and the environment. The Meeting concluded that servicing the two channels of data exchange, even in the exigent circumstances of the early stage of an accident, would not involve conflict of purpose nor be a burden for the national institutions participating.

8.5 For developed countries, the resources needed for GERMON, additional to those already committed to monitoring environmental radioactivity, would be minor and relate mainly to data processing and communication.

For developing countries, participation in GERMON could pose serious technical burdens. As these countries cover areas of great importance for worldwide coverage, it is recommended that consideration be given to seeking additional sources of finance for the purpose, and for modifying existing monitoring networks designed for other purposes, including those of GEMS.

8.6 While GERMON would directly involve those countries with national institutions that can meet the minimum requirements for participation, any WHO/UNEP Member State would be able to receive information resulting from the operations. Some Liaison Institutions, especially those serving as Collaborating Centres, should continue to provide, with support where appropriate, training courses and fellowships for young scientists from developing countries.

8.7 WHO and UNEP, in conjunction with IAEA, should develop, and make available, improved techniques to be used by the Liaison Institutions for monitoring under routine and abnormal situations. It was further recommended that these agencies should organize inter-comparison studies, and provide information and guidance on quality assurance programmes. The Coordinating Collaborating Centre, the Central Service for Protection against Ionizing Radiation at Le Vésinet, should continue to provide this service for WHO as it has done in the past.

8.8 Collated data from abnormal occurrences should be summarized annually, and published as a supplement to the bulletin.

8.9 Once the major part of GERMON is in operation, preparedness for information transfer under abnormal conditions should be tested, as feasible, and within available resources.

8.10 At suitable intervals, as decided by the Scientific Advisory Committee, the data from GERMON should be reviewed on a global basis to characterize the radiation environment at that scale and to reveal changes and developments. This task would be undertaken by the CCC in collaboration with other bodies, as appropriate.

9. ACKNOWLEDGEMENT

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WHO/UNEP MEETING ON THE BASIC PRINCIPLES OF A GLOBAL NETWORK
ON ENVIRONMENTAL RADIATION MONITORING AND EMERGENCY RESPONSE

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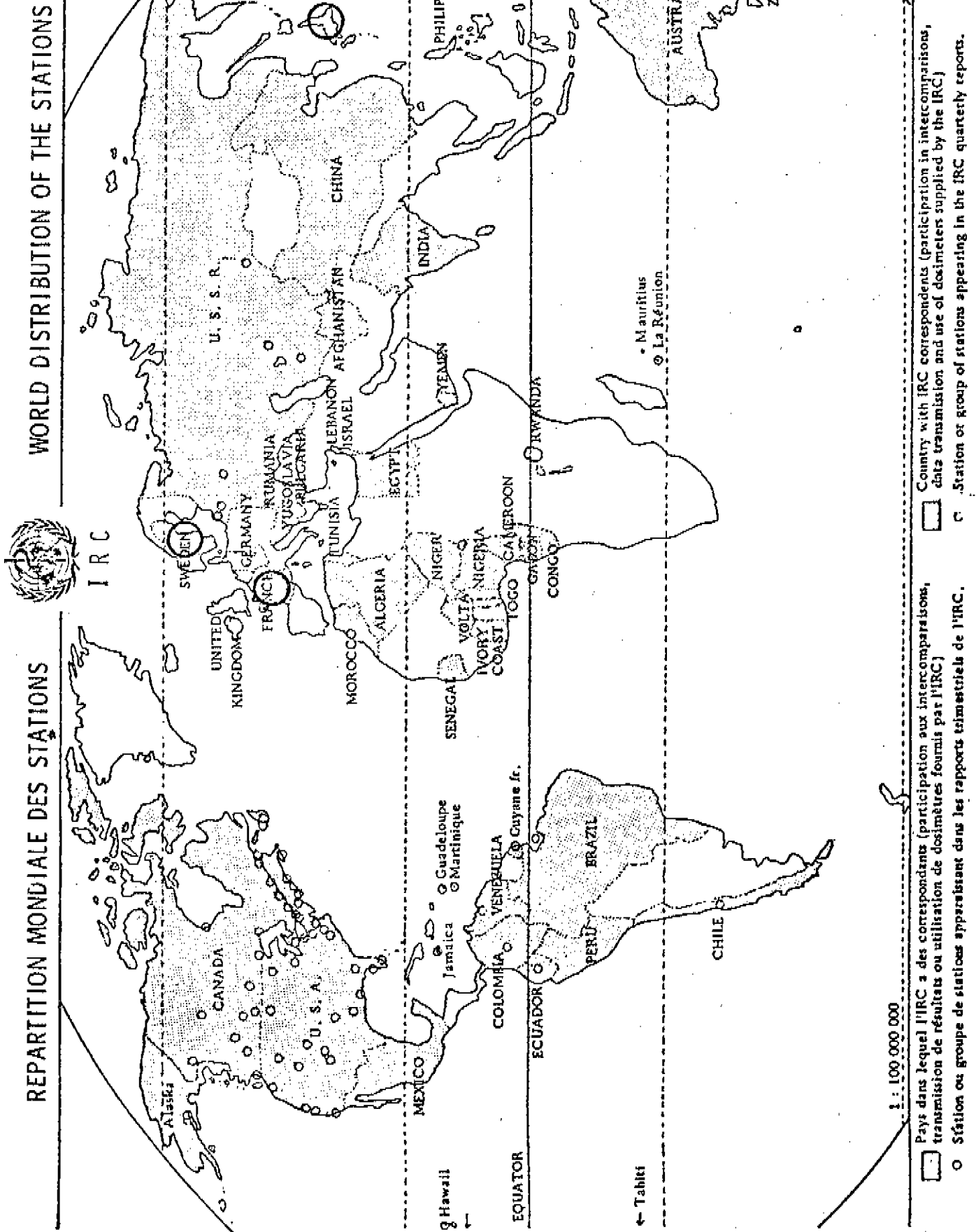
Existing WHO Environmental Radioactivity Monitoring Network

The WHO network of national institutions for monitoring environmental radioactivity was initiated in 1969 with the aim of studying trends in levels of ^{90}Sr and ^{137}Cs originating from atmospheric nuclear tests. The network is coordinated by a WHO Collaborating Centre, the International Reference Centre for Radioactivity (Le Vésinet, France). It collects data on environmental radioactivity for WHO and UNSCEAR with a view to assessing the radiation exposure of the world population. The most comprehensive data on radioactivity in air, precipitation, milk and other environmental media have been provided by Australia, Canada, France, Japan, New Zealand, Sweden, USA and USSR. In total, countries occupying about 20% of the Earth's surface have been involved (Fig.1). Results of the monitoring are published quarterly. Fig.2 exemplifies the evolution of ^{90}Sr concentrations in milk during the period of 1974-1985 for 4 countries.

Once or twice a year, the Centre organizes intercomparison studies for the participants in the network. About twenty countries, including developing ones, take part in each intercomparison to ensure the quality of their measurements. The participants were asked to determine ^{90}Sr , ^{134}Cs , ^{137}Cs , ^3H and some other nuclides in various standard samples such as milk, solid foodstuff, water, vegetation, sediment, etc. Each participant could then see under his code number the deviation from the standard value.

Although the network had not been assigned to provide a rapid response in the event of a nuclear accident, the Collaborating Centre in Le Vésinet was systematically supplying WHO Headquarters with immediate data on environmental levels of radioactivity in France during initial and subsequent stages of the Chernobyl accident as well as with other relevant information.

Fig. 1



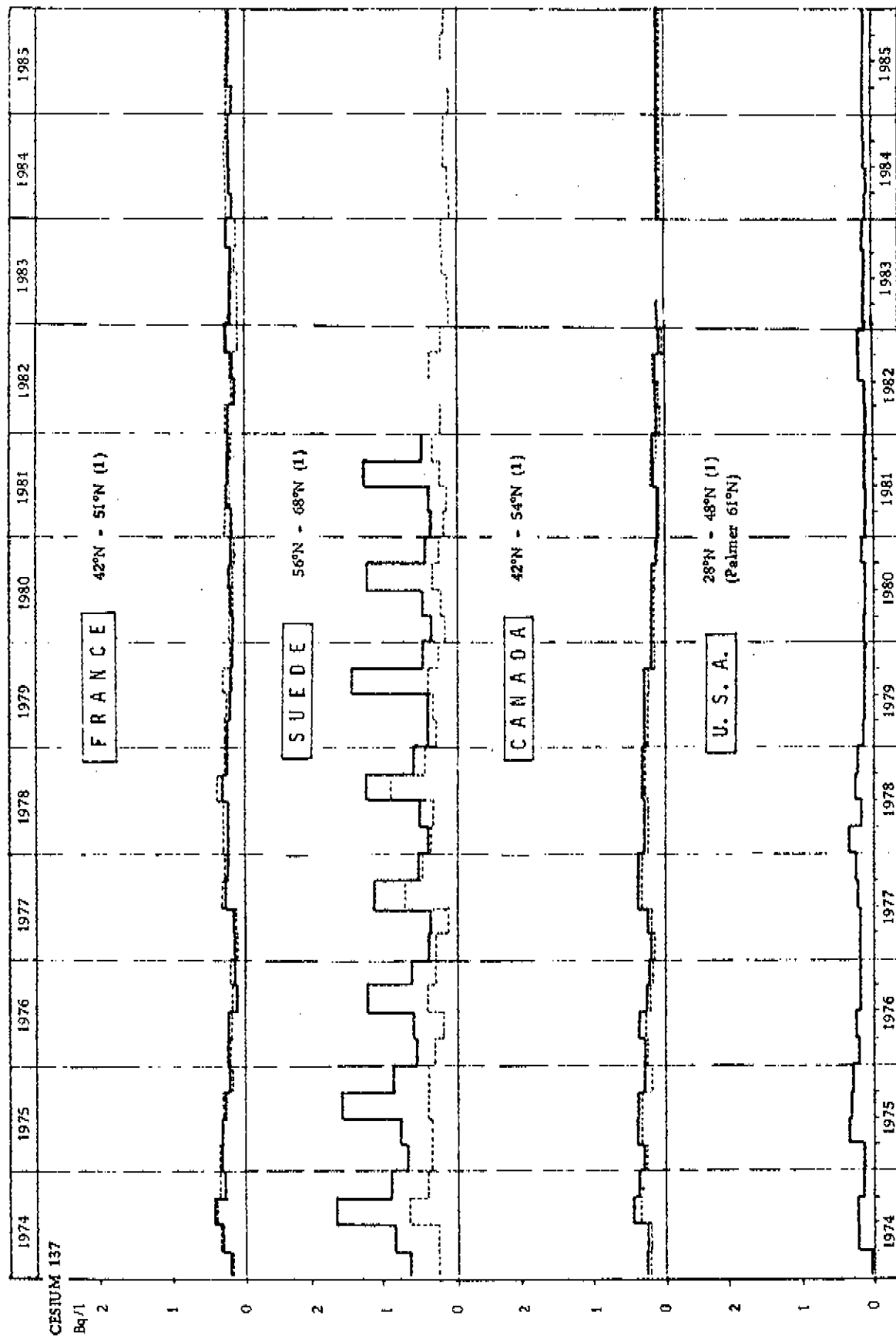


FIGURE 2 : CAESIUM-137 ACTIVITIES IN MILK SINCE 1974 (Bq/l)

— quarterly unweighted averages
 ---- quarterly weighted averages
 (1) Utmost latitudes of the sampling stations.

FIGURE 2 : ACTIVITES DU CESIUM 137 DANS LE LAIT DEPUIS 1974 (Bq/l)

— moyennes non pondérées trimestrielles
 ---- moyennes pondérées trimestrielles
 (1) Latitudes extrêmes des stations de prélèvement.

GEMS: THE GLOBAL ENVIRONMENT MONITORING SYSTEM

The Global Environment Monitoring System (GEMS) is coordinated within the United Nations System by UNEP. GEMS is a major cooperative global effort to acquire and assess environmental data. GEMS develops and uses methods which are compatible and comparable in order that both experience and data may be shared to make more efficient the enormous task of monitoring the environment, both to describe its trend and to understand how it functions. Such understanding is a vital ingredient to sound environmental management.

Within UNEP, a GEMS Programme Activity Centre (PAC) was established in 1974 as a direct response to the mandate given at the United Nations Conference on the Human Environment in Stockholm, 1972 to coordinate environmental monitoring and assessment activities within the United Nations system. The GEMS/PAC has a modest staff and budget, and works largely through the Specialized Agencies of the UN, such as FAO, WHO, WMO and UNESCO to establish monitoring networks and coordinate projects in the fields of pollution, climate and renewable natural resources.

GEMS Health-related monitoring networks are designed to assess the exposure of man and other targets to harmful environmental agents. Current activities include monitoring and assessment of; urban air pollution (with WHO and WMO), food contamination (FAO/WHO), water quality (WHO), accumulation of harmful substances in human tissues (WHO), and long-range transport of air-borne pollutants (WMO, ECE, SCOPE and others).

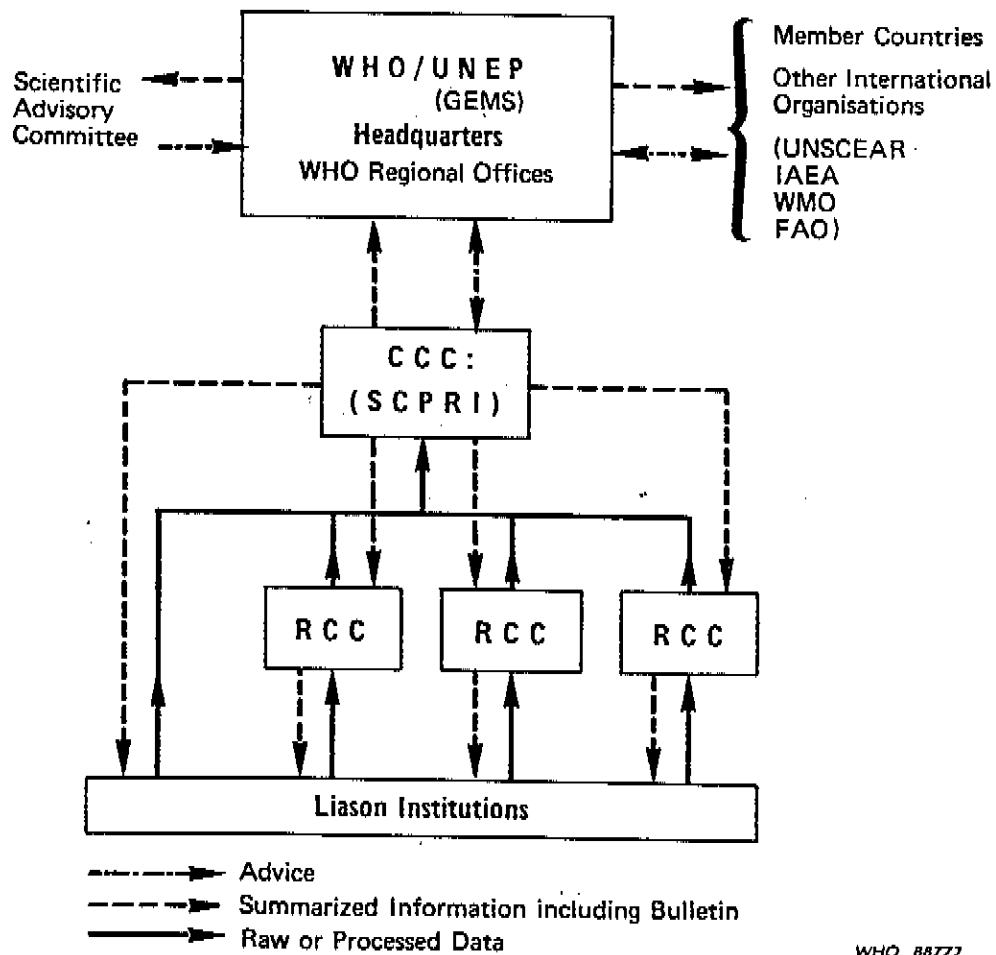
Climate-related activities are concerned with natural and human induced climate variability and its impacts. Monitoring and assessment aspects include the Background Air Pollution Monitoring Network (BAPMoN), the World Glacier Inventory, and Climate System Monitoring. Major concerns at present include prevention of excessive modification to the ozone layer, and the possible climate change effects resulting from increased greenhouse gas emissions, and their socio-economic impacts. This work is done in conjunction with WMO, UNESCO, various international organizations (e.g. IFIAS, ICSU) and national agencies.

The GEMS renewable natural resource monitoring networks develop and demonstrate standard monitoring methodologies designed to understand trends in environmental production systems. Programmes include: assessment of soil degradation (FAO, ISSS), monitoring and assessment of tropical forest resources (FAO and others), and inventory and monitoring of dryland ecosystems (FAO, UNESCO, etc.). GEMS is also concerned with plant and animal species conservation, monitoring and utilization (with IUCN and WWF). Geographically referenced data are related to each other through computer based Geographical Information System technology to enable better understanding of data interrelationships thus enabling better management and remedial actions to be taken. The Global Resource Information Database (GRID) elements of GEMS uses such GIS technology at global, regional and national levels.

Emphasis is placed on interpreting the information from the GEMS networks and using it to ensure proper environmental management. The databases are used as a basis for assessments of the state and trends of a particular environmental variable or resource at appropriate time intervals. In this way the attention of the world community is regularly focused upon areas of concern so that sound, effective action can be taken.

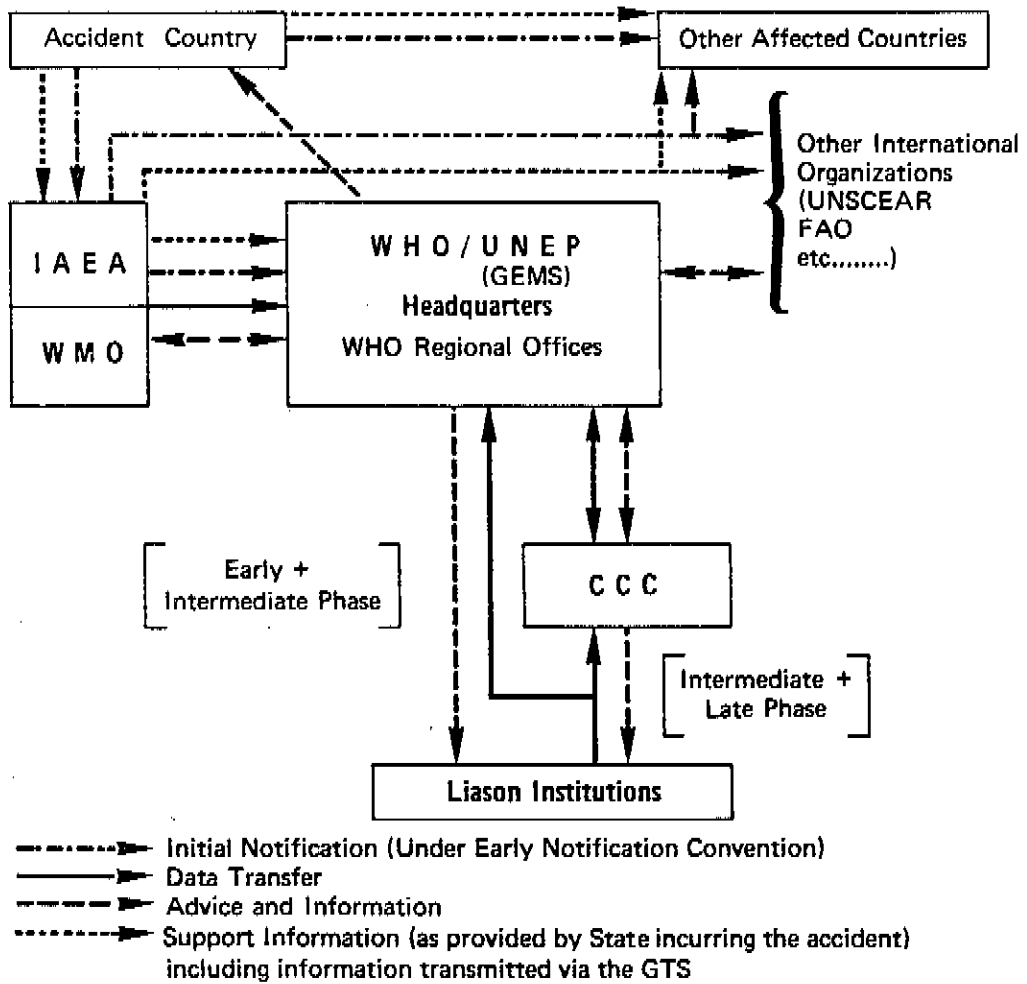
ANNEX 4 — INFORMATION FLOW

4.1 Normal Conditions



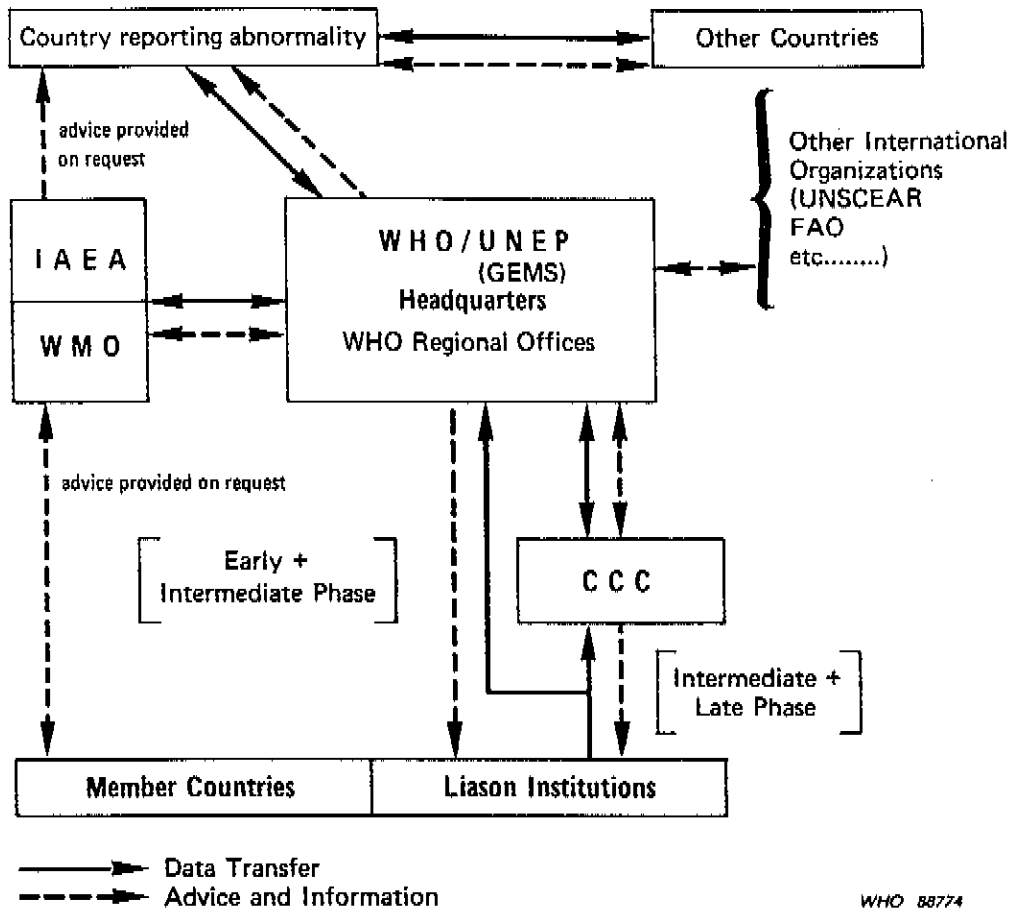
ANNEX 4

4.2 Abnormal Conditions which Conform to the Convention on Early Notification



ANNEX 4

4.3 Abnormal Conditions which do not Conform to the Convention



III

CONVENTION ON EARLY NOTIFICATION OF A NUCLEAR ACCIDENT

(Adopted on 26 September 1986, during the 8th plenary meeting)

THE STATES PARTIES TO THIS CONVENTION,

AWARE that nuclear activities are being carried out in a number of States,

NOTING that comprehensive measures have been and are being taken to ensure a high level of safety in nuclear activities, aimed at preventing nuclear accidents and minimizing the consequences of any such accident, should it occur,

DESIRING to strengthen further international co-operation in the safe development and use of nuclear energy,

CONVINCED of the need for States to provide relevant information about nuclear accidents as early as possible in order that transboundary radiological consequences can be minimized,

NOTING the usefulness of bilateral and multilateral arrangements on information exchange in this area,

HAVE AGREED as follows:

Article 1

Scope of application

1. This Convention shall apply in the event of any accident involving facilities or activities of a State Party or of persons or legal entities under its jurisdiction or control, referred to in paragraph 2 below, from which a release of radioactive material occurs or is likely to occur and which has resulted or may result in an international transboundary release that could be of radiological safety significance for another State.
2. The facilities and activities referred to in paragraph 1 are the following:
 - (a) any nuclear reactor wherever located;
 - (b) any nuclear fuel cycle facility;
 - (c) any radioactive waste management facility;
 - (d) the transport and storage of nuclear fuels or radioactive wastes;
 - (e) the manufacture, use, storage, disposal and transport of radioisotopes for agricultural, industrial, medical and related scientific and research purposes; and
 - (f) the use of radioisotopes for power generation in space objects.

NOTE: Pursuant to Article 12.3, the Convention entered into force on 27 October 1986.

Article 2

Notification and information

In the event of an accident specified in article 1 (hereinafter referred to as a "nuclear accident"), the State Party referred to in that article shall:

- (a) forthwith notify, directly or through the International Atomic Energy Agency (hereinafter referred to as the "Agency"), those States which are or may be physically affected as specified in article 1 and the Agency of the nuclear accident, its nature, the time of its occurrence and its exact location where appropriate; and
- (b) promptly provide the States referred to in sub-paragraph (a), directly or through the Agency, and the Agency with such available information relevant to minimizing the radiological consequences in those States, as specified in article 5.

Article 3

Other Nuclear Accidents

With a view to minimizing the radiological consequences, States Parties may notify in the event of nuclear accidents other than those specified in article 1.

Article 4

Functions of the Agency

The Agency shall:

- (a) forthwith inform States Parties, Member States, other States which are or may be physically affected as specified in article 1 and relevant international intergovernmental organizations (hereinafter referred to as "international organizations") of a notification received pursuant to sub-paragraph (a) of article 2; and
- (b) promptly provide any State Party, Member State or relevant international organization, upon request, with the information received pursuant to sub-paragraph (b) of article 2.

Article 5

Information to be provided

1. The information to be provided pursuant to sub-paragraph (b) of article 2 shall comprise the following data as then available to the notifying State Party:

- (a) the time, exact location where appropriate, and the nature of the nuclear accident;
- (b) the facility or activity involved;

- (c) the assumed or established cause and the foreseeable development of the nuclear accident relevant to the transboundary release of the radioactive materials;
 - (d) the general characteristics of the radioactive release, including, as far as is practicable and appropriate, the nature, probable physical and chemical form and the quantity, composition and effective height of the radioactive release;
 - (e) information on current and forecast meteorological and hydrological conditions, necessary for forecasting the transboundary release of the radioactive materials;
 - (f) the results of environmental monitoring relevant to the transboundary release of the radioactive materials;
 - (g) the off-site protective measures taken or planned;
 - (h) the predicted behaviour over time of the radioactive release.
2. Such information shall be supplemented at appropriate intervals by further relevant information on the development of the emergency situation, including its foreseeable or actual termination.
3. Information received pursuant to sub-paragraph (b) of article 2 may be used without restriction, except when such information is provided in confidence by the notifying State Party.

Article 6

Consultations

A State Party providing information pursuant to sub-paragraph (b) of article 2 shall, as far as is reasonably practicable, respond promptly to a request for further information or consultations sought by an affected State Party with a view to minimizing the radiological consequences in that State.

Article 7

Competent authorities and points of contact

1. Each State Party shall make known to the Agency and to other States Parties, directly or through the Agency, its competent authorities and point of contact responsible for issuing and receiving the notification and information referred to in article 2. Such points of contact and a focal point within the Agency shall be available continuously.
2. Each State Party shall promptly inform the Agency of any changes that may occur in the information referred to in paragraph 1.
3. The Agency shall maintain an up-to-date list of such national authorities and points of contact as well as points of contact of relevant international organizations and shall provide it to States Parties and Member States and to relevant international organizations.

Article 8

Assistance to States Parties

The Agency shall, in accordance with its Statute and upon a request of a State Party which does not have nuclear activities itself and borders on a State having an active nuclear programme but not Party, conduct investigations into the feasibility and establishment of an appropriate radiation monitoring system in order to facilitate the achievement of the objectives of this Convention.

Article 9

Bilateral and multilateral arrangements

In furtherance of their mutual interests, States Parties may consider, where deemed appropriate, the conclusion of bilateral or multilateral arrangements relating to the subject matter of this Convention.

Article 10

Relationship to other international agreements

This Convention shall not affect the reciprocal rights and obligations of States Parties under existing international agreements which relate to the matters covered by this Convention, or under future international agreements concluded in accordance with the object and purpose of this Convention.

Article 11

Settlement of disputes

1. In the event of a dispute between States Parties, or between a State Party and the Agency, concerning the interpretation or application of this Convention, the parties to the dispute shall consult with a view to the settlement of the dispute by negotiation or by any other peaceful means of settling disputes acceptable to them.
2. If a dispute of this character between States Parties cannot be settled within one year from the request for consultation pursuant to paragraph 1, it shall, at the request of any party to such dispute, be submitted to arbitration or referred to the International Court of Justice for decision. Where a dispute is submitted to arbitration, if, within six months from the date of the request, the parties to the dispute are unable to agree on the organization of the arbitration, a party may request the President of the International Court of Justice or the Secretary-General of the United Nations to appoint one or more arbitrators. In cases of conflicting requests by the parties to the dispute, the request to the Secretary-General of the United Nations shall have priority.
3. When signing, ratifying, accepting, approving or acceding to this Convention, a State may declare that it does not consider itself bound by either or both of the dispute settlement procedures provided for in paragraph 2. The other States Parties shall not be bound by a dispute settlement procedure provided for in paragraph 2 with respect to a State Party for which such a declaration is in force.

4. A State Party which has made a declaration in accordance with paragraph 3 may at any time withdraw it by notification to the depositary.

Article 12

Entry into force

1. This Convention shall be open for signature by all States and Namibia, represented by the United Nations Council for Namibia, at the Headquarters of the International Atomic Energy Agency in Vienna and at the Headquarters of the United Nations in New York, from 26 September 1986 and 6 October 1986 respectively, until its entry into force or for twelve months, whichever period is longer.
2. A State and Namibia, represented by the United Nations Council for Namibia, may express its consent to be bound by this Convention either by signature, or by deposit of an instrument of ratification, acceptance or approval following signature made subject to ratification, acceptance or approval, or by deposit of an instrument of accession. The instruments of ratification, acceptance, approval or accession shall be deposited with the depositary.
3. This Convention shall enter into force thirty days after consent to be bound has been expressed by three States.
4. For each State expressing consent to be bound by this Convention after its entry into force, this Convention shall enter into force for that State thirty days after the date of expression of consent.
5.
 - (a) This Convention shall be open for accession, as provided for in this article, by international organizations and regional integration organizations constituted by sovereign States, which have competence in respect of the negotiation, conclusion and application of international agreements in matters covered by this Convention.
 - (b) In matters within their competence such organizations shall, on their own behalf, exercise the rights and fulfil the obligations which this Convention attributes to States Parties.
 - (c) When depositing its instrument of accession, such an organization shall communicate to the depositary a declaration indicating the extent of its competence in respect of matters covered by this Convention.
 - (d) Such an organization shall not hold any vote additional to those of its Member States.

Article 13

Provisional application

A State may, upon signature or at any later date before this Convention enters into force for it, declare that it will apply this Convention provisionally.

Article 14

Amendments

1. A State Party may propose amendments to this Convention. The proposed amendment shall be submitted to the depositary who shall circulate it immediately to all other States Parties.
2. If a majority of the States Parties request the depositary to convene a conference to consider the proposed amendments, the depositary shall invite all States Parties to attend such a conference to begin not sooner than thirty days after the invitations are issued. Any amendment adopted at the conference by a two-thirds majority of all States Parties shall be laid down in a protocol which is open to signature in Vienna and New York by all States Parties.
3. The protocol shall enter into force thirty days after consent to be bound has been expressed by three States. For each State expressing consent to be bound by the protocol after its entry into force, the protocol shall enter into force for that State thirty days after the date of expression of consent.

Article 15

Denunciation

1. A State Party may denounce this Convention by written notification to the depositary.
2. Denunciation shall take effect one year following the date on which the notification is received by the depositary.

Article 16

Depositary

1. The Director General of the Agency shall be the depositary of this Convention.
2. The Director General of the Agency shall promptly notify States Parties and all other States of:
 - (a) each signature of this Convention or any protocol of amendment;
 - (b) each deposit of an instrument of ratification, acceptance, approval or accession concerning this Convention or any protocol of amendment;
 - (c) any declaration or withdrawal thereof in accordance with article 11;
 - (d) any declaration of provisional application of this Convention in accordance with article 13;
 - (e) the entry into force of this Convention and of any amendment thereto; and
 - (f) any denunciation made under article 15.

Article 17

Authentic texts and certified copies

The original of this Convention, of which the Arabic, Chinese, English, French, Russian and Spanish texts are equally authentic, shall be deposited with the Director General of the International Atomic Energy Agency who shall send certified copies to States Parties and all other States.

IN WITNESS WHEREOF the undersigned, being duly authorized, have signed this Convention, open for signature as provided for in paragraph 1 of article 12.

ADOPTED by the General Conference of the International Atomic Energy Agency meeting in special session at Vienna on the twenty-sixth day of September one thousand nine hundred and eighty-six.

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