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REPORT OF THE UNITED NATIONS SCIENTIFIC COMMITTEE ON THE EFFECTS OF ATOMIC RADIATION

Report of the World Meteorological Organization on the implementation of General Assembly resolution 1629 (XVI)

The Secretary-General has received, for consideration by the General Assembly at its seventeenth session, the attached report of the World Meteorological Organization on the implementation of General Assembly resolution 1629 (XVI) of 27 October 1961.

62-22147

WORLD METEOROLOGICAL ORGANIZATION

REPORT BY THE WORLD METEOROLOGICAL ORGANIZATION ON THE IMPLEMENTATION OF UN GENERAL ASSEMBLY RESOLUTION 1629 (XVI)

(Submitted for consideration by the XVII regular session of the General Assembly under item 30 of its agenda)

Introduction

1. On 27 October 1961 the General Assembly of the United Nations adopted Resolution 1629(XVI), of which the operative paragraphs of Part II read as follows :

> "The General Assembly
>
> 1. Invites the World Meteorological Organization, in consultation with the International Atomic Energy Agency and the United Nations Scientific Committee on the Effects of Atomic Radiation, as necessary, to examine urgently the feasibility of extending the present meteorological reporting system to include measurements of atmospheric radioactivity with the following aims in mind :
>
> (a) To ensure that reliable and standardized measurements of atmospheric radioactivity are made at a world-wide network of stations;
>
> (b) To ensure the day-to-day exchange of this information by telegraphic and other means with a view to its prompt reception at appointed national centres;
>
> (c) To ensure that national and/or international arrangements be made for these observations to be stored as permanent records of atmospheric radioactivity and to be published in appropriate forms at suitable intervals;
>
> 2. Invites the World Meteorological Organization to implement the above-mentioned scheme, if found feasible, at the earliest possible date."

2. This document reports the action which WMO has taken in implementation of this request of the General Assembly.

3. In accordance with this resolution, the Secretary-General of WMO has had frequent consultations with the International Atomic Energy Agency and with the Secretariat of the United Nations Scientific Committee on the Effects of Atomic Radiation and has also received valuable advice from the Presidents of the WMO technical commissions which would be concerned in the implementation of the resolution.

4. As a result of these consultations it was concluded that the purpose of the measures called for in Part II of Resolution 1629 (XVI) was the establishment of a system whereby every country would be able to receive speedily reliable and standardized measurements of atmospheric radioactivity from a world-wide network of stations. The objective of speedy dissemination of such reports could be achieved by utilizing the existing telecommunications system for the world-wide exchange of meteorological reports.

5. In drawing up a plan to implement the resolution, it was necessary to take account of the fact that many countries were already making measurements of atmospheric radioactivity and that the results of these measurements were discussed from time to time by UNSCEAR. The first draft of a plan to comply with the resolution was accordingly forwarded to UNSCEAR for comment as well as to IAEA, the WMO Executive Committee and members of the Panel.

6. This draft was considered by UNSCEAR at a meeting held in New York in March 1962. The Committee embodied its advice in the following formal statement :

"Acknowledging that the World Meteorological Organization has sought the advice of the Committee on the draft plan prepared by that organization for the implementation of Part II of General Assembly Resolution 1629 (XVI),

Believing that questions regarding standardization of measurements, and concentration and geographical distribution of atmospheric radioactivity fall within the terms of reference of the Committee in so far as these subjects are relevant to the estimation of doses of radiation received by human populations,

1. Expresses the view that the measurement of radioactivity in samples of air and precipitation be made only by procedures which will provide information on the different components of the fission product mixture.

2. Recommends that WMO reconsider its draft plan in the light of the following comments :

(a) existing national networks and programmes for collecting samples by air filtration and precipitation techniques should be fully recognized by the World Meteorological Organization and additional stations should be considered only for those other areas of the world where the network is found to be too sparse.

(b) in planning any global network, emphasis should be placed on the quality rather than the quantity of observing points, and a density of stations less than that of the World Meteorological Organization draft plan seems appropriate.

(c) of the times of analysis of the filter papers outlined in the World Meteorological Organization plan, the five day period be adopted, because measurements are more informative after the natural radioactivity has largely decayed. Furthermore, such analyses should be confined to measurements of gamma radiation in the region above 1 Mev (such as that emitted by Barium-Lanthanum 140). The complexity of such measurements will require initially that the analyses be carried out at central national laboratories.

(d) monthly composite samples of the daily filter papers should be analysed by gamma spectroscopy or radiochemical analysis to indicate the mean monthly air concentration of important radionuclides such as strontium-90, cesium-137, zirconium-95 and barium-140.

(e) a similar analysis should be performed on monthly precipitation samples for the same radionuclides as in (d) above.

3. Further recommends that any plan for the implementation of Part II of Resolution 1629 (XVI) of the General Assembly, if adopted, be reviewed within an appropriate period of time after its inception.

4. Invites the World Meteorological Organization to consult further with UNSCEAR on any new plans formulated by that Organization."

7. The Secretary-General of WMO then called a meeting of the Executive Committee Panel of Experts on the Meteorological Aspects of the Peaceful Uses of Atomic Energy for the purpose of examining all the comments and advice received upon the first draft plan; representatives of IAEA and UN attended the meeting. This meeting was held in Geneva on 16-18 April 1962 and drew up the plan which is described in the Appendix.

8. The Panel considered that the role of WMO in fulfilling the purposes of the UN resolution was mainly to facilitate the collection of samples and the rapid dissemination throughout the world of reports on atmospheric radioactivity and to assist, where necessary, in the establishment of additional stations for the sampling of atmospheric radioactivity. As a result of the general statement by UNSCEAR, it was felt that monthly composite air filters and precipitation should be included in the plan. The Panel was also of the opinion that it would be for each country to decide what advantage should be taken of the rapid exchange of reports of atmospheric radioactivity.

9. The plan referred to in paragraph 6 above was submitted to the WMO Executive Committee for consideration at its fourteenth session. The majority of the Committee approved the plan and the Secretary-General was directed to forward it to IAEA and UNSCEAR for consideration prior to its implementation.

10. In July 1962 the Secretariat of WMO received a letter from the Secretary of UNSCEAR suggesting certain minor editorial amendments to the plan. These amendments are incorporated in the Appendix.

11. In August 1962 comments on the plan were received from IAEA. These are also incorporated in the Appendix.

12. WMO has been informed that the final comments of UNSCEAR must await its discussion at the UNSCEAR meeting which is scheduled for January 1963. In the meantime it has been distributed to Committee members with a request for comments.

13. It should be mentioned that the WMO Executive Committee noted that an average period of about seven days would be required for processing the daily observations of radioactivity before the information became available for broadcast over the meteorological telecommunications network. The attention of the Secretary-General of UN has already been invited to this.

Appendix : 1

DRAFT WMO PLAN FOR THE IMPLEMENTATION OF UN RESOLUTION 1629 (XVI)

Rev. (2)

Observational Programme

(a) Air

1. Samples of surface air should be taken through consecutive periods of 24 hours each. The sampling instrument should consist of a pump drawing air through a fixed filter. It is suggested that initially a Whatman 41 filter of 2 inches diameter, or an equivalent filter of any other make, should be used (*). (This type of filter is used in several European countries. The suggested diameter, corresponding to an area of 21 cm^2, should allow the collection of samples of at least 100 m^3 in 24 hours). The filter should be situated not less than 1 m above ground level. It should not be exposed to heavy dust blown from the ground or to rain.

2. With the filter specified, the pump must be capable of ensuring that at least 100 m^3 of air pass the filter in 24 hours. This volume of air should be known to within ± 10%.

3. The daily dust samples collected by the sampling stations should be sent to properly equipped nuclear laboratories for analysis. Analysis should consist of :

(i) A measurement of the gross gamma activity above 1 Mev threshold energy (**). This measurement should be carried out on individual daily samples, preferably 5 days (***) after the end of the collection period. Counters should be standardized with K^{40} and the results expressed in pc K^{40}-equivalent;

(ii) A determination of individual nuclides of health physics importance such as the following : Sr^{89}, Sr^{90}-Y^{90}, Zr^{95}-Nb^{95}, I^{131}, Cs^{137} and Ba^{140}-La^{140}. This determination should routinely be carried out on monthly composited samples, using gamma spectrometry and/or radiochemical techniques, as applicable. In the event of unusually high daily gross gamma counts, determinations of the individual nuclides listed in Table I, page 6 may have to be made daily. In the case of unusually high single observations, gross gamma counts may also be supplemented by autoradiography to detect the possible presence of highly radioactive individual particles.

(*) This specification might be altered in the final plan in view of the possible results of experiments at present undertaken by certain Member States.

(**) As recommended by UNSCEAR, see paragraph 5, subparagraph 2 (c).

(***) Subject to review.

(b) Precipitation

4. Samples of precipitation should preferably be collected with a funnel collector situated at least 1 m above ground level. The funnel should be of at least 30 cm diameter and have a rim. It should be made of a material (e.g., polythene) which does not cause losses of radionuclides due to adsorption. The funnel should drain into an ion exchange column containing anion and cation exchange resin covered with a filter plug. In regions where precipitation may take the form of snow, the collector should be fitted with a heating unit.

5. A raingauge should be available near the collector. Sampling should be carried out for consecutive periods of one month each. At the end of a sampling period the ion exchange column should be detached and sent to the same central laboratory which carries out the air measurements for the station. This laboratory should carry out determinations of the same nuclides as mentioned under (a) (ii).

(c) General Remarks

6. For countries not having laboratories sufficiently well equipped for dealing with these samples, arrangements may be made for the measurements to be carried out at the laboratories of IAEA or of several Member States who have volunteered to accept samples for analysis. UNSCEAR as well as IAEA can also assist in the standardization of sample collection and analysis.

Network

7. In the first instance an average density of one station for every twenty degree square would be adequate for international exchange of data. As far as possible sampling stations of existing national networks should be employed. The density of the international network may be increased, if found necessary after gaining sufficient experience.

8. The sampling stations should be chosen as far as possible away from industrial and densely populated centres and artificial sources of radioactivity. Furthermore they should be located, whenever possible, close to centres convenient for mailing to the laboratory analysing the samples.

9. The recommended density would require detailed γ-spectrum analysis of about two hundred samples per month (120 for air samples and 80 for rain samples). If the co-operation of well-established nuclear laboratories (about 15) for carrying out the analysis is enlisted, the plan can be implemented if each laboratory undertakes to analyse about 15 samples of the international network per month, on an average.

10. It should be noted that only information from the stations in the above-mentioned network will be transmitted by telecommunication systems, whereas the data from all existing stations should be collected for publication (see paragraphs 15 and 16).

Codes*

11. The following code form may be used for reporting daily observations:

RADAC (II)iii (YY)$P_1P_2P_3$ $Q_1E_1P_1k_1k_1$ $Q_2E_2P_2k_2k_2$...

where

RADAC = symbolic letters

II = block number

iii = international station number (if observation is not made at a meteorological station, the number of the nearest meteorological station shall be used)

YY = day of the month on which filter is removed

P_1, P_2, ..., ... = power of 10 of radioactivity concentration

Q_1, Q_2, ..., ... = meaning of radioactivity report (see Table I)

E_1, E_2, ..., ... = number of days (to the nearest 24 hours) between filter extraction and radioactivity analysis

k_1k_1, k_2k_2, ..., ... = first two significant figures of radioactivity concentration

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* These codes are still subject to revision and should be examined by CSM, if the desirability of transmission of radioactivity data is agreed.

Notes: 1. If levels of radioactivity concentration lie below those indicated in TABLE I, the group $Q_1E_1P_1k_1k_1$ will be coded as Q_1E_1000, where Q_1 and E_1 will take on their appropriate values.

2. If no observation is made or none is available then the group $Q_1E_1P_1k_1k_1$ will read 00999

3. A message for each station will be transmitted irrespective of whether the observation is missing, unavailable or below that indicated in TABLE I.

12. The following code form may be used for reporting monthly data:

RAMAC (II)iii YYYyy $P_1P_2P_3R_1R_1$ $Q_1Q_1P_1k_1k_1$ $Q_2Q_2P_2k_2k_2$...

where

RAMAC = symbolic letters

II = block number

iii = international station number (if observation is not made at a meteorological station, the number of the nearest meteorological station shall be used)

YYY = day of year (beginning with January 1 as 001 and December 31 as 365) at the end of the period of the composite filter or precipitation

yy = number of days over which the composite filter or precipitation sample is collected

P_1, P_2, ... = power of 10 of radioactivity concentration

R_1R_1 = total precipitation for the month (code 3587 in Vol.B, WMO Publication No.9, T.P.4)

Q_1Q_1
Q_2Q_2
...
... = meaning of radioactivity report (see TABLE II)

k_1k_1
k_2k_2
...
... = first two significant figures of radioactivity concentration

Notes: 1. All values will be transmitted

2. If a part of sample is lost or otherwise unavailable, $Q_1Q_1P_1k_1k_1$ etc. will be coded as Q_1Q_1999 where Q_1Q_1 will be taken from TABLE II. If entire sample is lost or unavailable Q_1Q_1 will be given as $Q_1Q_1 = 00$

13. The procedure for transmission of meteorological information as recommended by CSM and published in publication No.9, Volume C - Transmission, Chapter I, are equally applicable to all types of reports containing results of observations on atmospheric radioactivity.

14. The daily message should be filed at regular times but no special priority should be assigned so that they can be passed between times of peak load. The monthly message should be filed at regular times 30 days* after the end of the month but no special priority should be assigned so that they can be passed between times of peak load.

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* Subject to review

TABLE I

DAILY RADIOACTIVITY MEASUREMENTS

Q_1

Volumes will be corrected to standard conditions of 20°C and 76 cm Hg. Isotopic values will also be corrected for decay to sampling date.

Code Number 0	Meaning	Units
1	Gross gamma radiation greater in energy than 1.0 Mev[1]	10^{-12} curies/cubic meter
2	Iodine-131	10^{-15} curies/cubic meter
3	Barium-Lanthanum-140	10^{-15} curies/cubic meter
4	Zirconium-Niobium-95	10^{-15} curies/cubic meter

Additional numbers will be assigned as required.

[1] Values of gross gamma radiation equal to or less than 1.0 x 10^{-12} curies per cubic meter* will be encoded as $P_1k_1k_1 = 000$

(*) This threshold value subject to review.

TABLE II

MONTHLY RADIOACTIVITY MEASUREMENTS

Q_1Q_1, Q_2Q_2, Q_3Q_3, etc.

All air concentration values will have their volumes corrected to standard conditions of 20°C and 76 cm Hg. All precipitation concentrations will be expressed in terms of equivalent water content of precipitation. All isotopic values will be corrected to the mid-point of the sampling period.

Code Number	Meaning	Half-Life
00		
	Code Numbers 1-49 will be assigned to air concentration observations in units of 10^{-18} curies per cubic meter.	
	Numbers 1-20 are assigned to fission products.	
01	Iodine-131	8.0 days
02	Barium-140	12.8 days
03	Barium and Lanthanum-140	~ 12.8 days
04	Cerium-141	32.5 days
05	Ruthenium-103	41.0 days
06	Strontium-89	50.4 days
07	Yttrium-91	58.0 days
08	Zirconium-95	63.3 days
09	Zirconium and Niobium-95	~ 63.3 days
10	Cerium-144	290 days
11	Ruthenium-106	1.0 years
12	Antimony-125	2.4 years
13	Promethium-147	2.5 years
14	Strontium-90	28 years
15	Cesium-137	30 years

Numbers 16-20 will be assigned as required.

Numbers 21-30 are activation or special artificial radioisotopes.

21	Iron-59	45.1 days
22	Tungsten-185	74 days
23	Tungsten-181	140 days
24	Rhodium-102	210 days
25	Zinc-65	245 days

Code Number	Meaning	Half-Life
26	Manganese-54	300 days
27	Iron-55	2.9 years

Numbers 28-30 will be assigned as required.

Numbers 31-40 are heavy artificially produced radioisotopes which will be assigned as required.

Numbers 41-50 are naturally produced radioisotopes.

41	Polonium-210	138 days
42	Lead-210	22.0 years
43	Phosphorus-32	14.3 days
44	Phosphorus-33	24 days
45	Beryllium-7	53.6 days
46	Sulfur-35	87.1 days
47	Sodium-22	2.6 years
48	Silicon-32	~ 700 years

Number 49 will be assigned as required.

Code numbers 51-99 will be assigned to precipitation water concentrations observations expressed as 10^{-18} curies per liter of equivalent water (except for tritium). When these units are multiplied by the amount of precipitation in centimeters collected during the same interval of time, the result is a deposition per unit area of 10^{-16} curies per square meter.

Numbers 51-70 are assigned to fission products.

51	Iodine-131	8.0 days
52	Barium-140	12.8 days
53	Barium and Lanthanum-140	~ 12.8 days
54	Cerium-141	32.5 days
55	Ruthenium-103	41.0 days

Code Number	Meaning	Half-Life
56	Strontium-90	50.4 days
57	Yttrium-91	58.0 days
58	Zirconium-95	63.3 days
59	Zirconium and Niobium-95	~63.3 days
60	Cerium-144	290 days
61	Ruthenium-106	1.0 years
62	Antimony-125	2.4 years
63	Promethium-147	2.5 years
64	Strontium-90	28 years
65	Cesium-137	30 years

Numbers 66-70 will be assigned as required.

Numbers 71-80 are activation or special artificial radioisotopes.

71	Iron-59	45.1 days
72	Tungsten-185	74 days
73	Tungsten-181	140 days
74	Rhodium-102	210 days
75	Zinc-65	245 days
76	Manganese-54	300 days
77	Iron-55	2.9 years

Numbers 78-80 will be assigned as required.

Numbers 81-90 are heavy artificially produced radioisotopes which will be assigned as required.

Numbers 91-99 are naturally produced radioisotopes.

91	Polonium-210	138 days
92	Lead-210	22.0 years
93	Phosphorus-32	14.3 days

Code Number	Meaning	Half-Life
94	Phosphorus-33	24 days
95	Beryllium-7	53.6 days
96	Sulfur-35	87.1 days
97	Sodium-22	2.6 years
98	Silicon-32	~ 700 years
99	Tritium (in Tritium units of T/H x 10^{-18})	12.3 years

Storage and Publication of Data

15. In accordance with Resolution 12 (EC-XIV), the Secretary-General of WMO is already endeavouring to arrange for some Members to accept responsibility for the central collection and publication under WMO sponsorship of certain atmospheric radioactivity data, including monthly mean data on the gross radioactivity of surface air. Corresponding daily values should be collected and published locally.

16. From the above it seems that WMO is already taking steps which will satisfy at least partially the requirements of the UN resolution as regards publication of the data. It may be possible to extend the WMO scheme to include the remaining data, or alternatively these data may be collected and published under the auspices of UNSCEAR. Until these arrangements are completed, Members should arrange for the permanent storage of all their atmospheric radioactivity data.

Provision of Equipment and Training of Observers

17. In those countries where assistance is required in obtaining the necessary equipment and in training the observers in its use, WMO in conjunction with IAEA will endeavour to provide such assistance.

Action before Implementation of the Plan

18. If in the light of the comments received from IAEA and UNSCEAR, the plan is considered to be feasible, WMO should send a copy to Members with the request that details be supplied of the stations that could participate in the operation of the plan. Members should also be asked to state whether they would require special arrangements to be made for the analysis of the samples. From the information provided by Members, WMO in consultation, as required, with UN and IAEA will make a selection of stations to form a network in accordance with the principles set out in paragraph 14 above.

19. At the same time WMO, with the help of IAEA and UNSCEAR, should compile a list of nuclear laboratories that would be willing to accept samples for analysis. In this connexion it should be noted that the following countries and agencies have already offered the use of their laboratories for analysing samples collected in other countries in response to a request from the Secretary-General of the United Nations :

Argentina, Australia, Belgium,
Canada, Denmark, France, IAEA,
India, Israel, Italy, Japan,
Norway, Sweden, Union of Soviet Socialist Republics,
United Kingdom, United States of America, WHO.

Implementation of the Plan

20. When the plan is officially approved, the WMO Secretariat should send to Members a copy of the plan in its final form, together with a list of the measuring stations, details of the arrangements for the analysis of samples and information about the telecommunications channels to be used for the collection and distribution of the messages. WMO will also notify the date for the plan to come into force.

21. Implementation of the plan will inevitably be gradual but communication facilities should be immediately made available by WMO so that there will be no delay in the dissemination of any reports that are received.

22. In the early stages it is probable that many stations will not be using equipment which meets the specifications laid down in paragraphs 1 to 5 above. Reports from these stations should nevertheless be included and efforts should be made to modify the equipment as required as soon as practicable.

23. As opportunity allows, new stations should be established to fill in the main gaps in the existing network. The equipment and observational programme should be in accordance with paragraphs 1 to 5 above.

24. WMO, in conjunction with UNSCEAR and IAEA, should review the scheme twelve months after its inception with a view to assessing its effectiveness and the need to continue it or modify it in any way.