



**United Nations**

# **Report of the United Nations Scientific Committee on the Effects of Atomic Radiation**

**Seventieth session  
(19–23 June 2023)**

**General Assembly**

**Official Records  
Seventy-eighth Session  
Supplement No. 46**



# **Report of the United Nations Scientific Committee on the Effects of Atomic Radiation**

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United Nations • New York, 2023

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[12 July 2023]

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## Chapter I

### Introduction

1. The mandate of the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) was first set out in General Assembly resolution 913 (X), adopted in 1955. In Assembly resolution 3154 A–C (XXVIII), adopted in 1973, the Committee was further requested to consider the risks of ionizing radiation from all sources.<sup>1</sup> In pursuit of its mandate, the Committee thoroughly reviews and evaluates global and regional exposures to radiation. The Committee also evaluates evidence of radiation-induced health effects in exposed groups and advances in the understanding of the biological mechanisms by which radiation-induced effects on human health or on non-human biota can occur. Those evaluations provide the scientific foundation used, inter alia, by the relevant agencies of the United Nations system in formulating international standards for the protection of the public, workers and patients;<sup>2</sup> those standards, in turn, are linked to important legal and regulatory instruments.
2. Exposure to ionizing radiation arises from naturally occurring sources (such as radiation from outer space and radon gas emanating from rocks on the Earth) and from sources with an artificial origin (such as medical diagnostic and therapeutic procedures; radioactive material resulting from nuclear weapons testing; energy generation, including by means of nuclear power; unplanned events; and workplaces where there may be increased exposure to artificial or naturally occurring sources of radiation).

<sup>1</sup> The United Nations Scientific Committee on the Effects of Atomic Radiation was established by the General Assembly at its tenth session, in 1955. The terms of reference of the Committee are set out in resolution 913 (X). The Scientific Committee was originally composed of the following Member States: Argentina, Australia, Belgium, Brazil, Canada, Czechoslovakia (later succeeded by Slovakia), Egypt, France, India, Japan, Mexico, Sweden, Union of Soviet Socialist Republics (later succeeded by the Russian Federation), United Kingdom of Great Britain and Northern Ireland and United States of America. The membership of the Scientific Committee was subsequently enlarged by the Assembly in its resolution 3154 C (XXVIII) to include the Federal Republic of Germany (later succeeded by Germany), Indonesia, Peru, Poland and the Sudan. By its resolution 41/62 B, the Assembly increased the membership of the Committee to 21 members and invited China to become a member. In its resolution 66/70, the Assembly further enlarged the membership of the Committee to 27 and invited Belarus, Finland, Pakistan, the Republic of Korea, Spain and Ukraine to become members. In its resolution 76/75, the Assembly further enlarged the membership of the Committee to 31 and invited Algeria, Iran (Islamic Republic of), Norway and the United Arab Emirates to become members.

<sup>2</sup> For instance, relevant international safety standards that take into account the findings of the Scientific Committee include: (a) the international Fundamental Safety Principles, which are jointly sponsored by the European Atomic Energy Community, the Food and Agriculture Organization of the United Nations (FAO), the International Atomic Energy Agency (IAEA), the International Labour Organization (ILO), the International Maritime Organization, the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (OECD/NEA), the Pan American Health Organization (PAHO), the United Nations Environment Programme (UNEP) and the World Health Organization (WHO); and (b) the *Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards – General Safety Requirements Part 3*, which are co-sponsored by the European Commission, FAO, IAEA, ILO, OECD/NEA, PAHO, UNEP and WHO. Both international standards were established under the aegis of IAEA.

## Chapter II

### Deliberations of the United Nations Scientific Committee on the Effects of Atomic Radiation at its seventieth session

3. The Scientific Committee held its seventieth session in Vienna from 19 to 23 June 2023.

4. The Scientific Committee took note of and discussed General Assembly resolution 77/119 on the effects of atomic radiation. The Committee heard statements from one member State, India, and from the following observers: the European Union, the International Atomic Energy Agency (IAEA), the International Labour Organization (ILO) and the World Health Organization (WHO). The Russian Federation made use of its right of reply, and Ukraine later submitted a written statement in exercise of its right of reply. The recorded statements, including those made in exercise of the right of reply, are available from the Committee's secretariat.

5. The Scientific Committee also noted and discussed other issues addressed in the resolution. Those discussions are summarized in chapter II, section D (Administrative issues), of the present report.

#### A. Present programme of work<sup>3</sup>

##### 1. Second primary cancer after radiotherapy

6. At its sixty-sixth session, in 2019, the Scientific Committee endorsed the plan to initiate an evaluation of second primary cancer after radiotherapy in 2019, and at its sixty-seventh session, in 2020, the Committee took note of the updated content of the report and the progress made in the literature research. At its sixty-eighth session, in 2021, the Committee clarified that the meta-analysis of second primary cancer risks after radiotherapy should be based on absorbed organ doses considering the quality of dose assessment in the publications to be evaluated. At its sixty-ninth session, in 2022, the Committee discussed the progress and the first draft of its evaluation on second primary cancer after radiotherapy. The Committee emphasized the importance of that evaluation, which is intended to raise awareness in the scientific and medical communities and in national authorities with respect to the fact that cancer treatment by radiation, while contributing to the effective treatment of increasing numbers of patients, may in some patients result in second primary cancer several years later. Quantification of the risk of second primary cancer induction after radiotherapy and evaluations of the factors affecting that risk require data (e.g. on dose distributions) that are often difficult to obtain retrospectively.

7. At its seventieth session, the Scientific Committee reviewed a second draft of its evaluation on second primary cancer after radiotherapy. In response to numerous constructive comments, the technical evaluation of radiation oncology, biology, dosimetry and epidemiology relevant to the development of second primary cancer after radiotherapy will be revised substantially. Considering the increasing international interest in this topical matter, a completed evaluation is envisioned for approval at the Committee's seventy-first session, in 2024.

##### 2. Epidemiological studies of radiation and cancer

8. At its sixty-sixth session, the Scientific Committee agreed to update annex A to the UNSCEAR 2006 report<sup>4</sup> and commenced its evaluation of epidemiological studies

<sup>3</sup> Updates to the working titles of all evaluations in the present programme of work will be considered by the Committee at its seventy-first session.

<sup>4</sup> *Effects of Ionizing Radiation: United Nations Scientific Committee on the Effects of Atomic Radiation 2006 Report to the General Assembly*, vol. I (United Nations publication, 2008), annex A.



of radiation and cancer by establishing an expert group and initiating a comprehensive literature review based on the principles and criteria for ensuring the quality of the Committee's reviews of epidemiological studies of radiation exposure.<sup>5</sup> At its sixty-seventh and sixty-eighth sessions, the Committee discussed the progress reports on the evaluation and took note of the updated workplan, which had been revised owing to delays caused by the coronavirus disease (COVID-19) pandemic. The submission of the final report for approval by the Committee was postponed to 2025. At its sixty-ninth session, in 2022, the Committee welcomed the progress made in the evaluation.

9. At its seventieth session, the Scientific Committee acknowledged the significant progress made by the expert group<sup>6</sup> in drafting the scientific annex on the selected cancer sites and in summarizing the literature review on epidemiological studies of radiation and cancer. In addition, the Committee endorsed the methodology for lifetime cancer risk calculations for four proposed scenarios. It also acknowledged the timely development of the evaluation, which is scheduled for approval at the Committee's seventy-second session, in 2025.

### 3. Evaluation of public exposure to ionizing radiation

10. At its sixty-sixth session, the Scientific Committee agreed to commence its evaluation of public exposure to ionizing radiation, updating annex B to the UNSCEAR 2008 report.<sup>7</sup> Following the commencement of that project in 2020, the Committee discussed progress reports at its sixty-seventh and sixty-eighth sessions and took note of the updated workplan, which had been revised owing to delays caused by the COVID-19 pandemic. The Committee endorsed the updated timeline for completion of the annex by 2024. Furthermore, after the UNSCEAR 2008 report, the Committee evaluated radiation exposures of the public arising from electricity generation considering the principal relevant commercial technologies, both nuclear and non-nuclear, in the UNSCEAR 2016 report.<sup>8</sup> In doing so, the Committee reviewed and updated its methodology for estimating exposures of the public due to radioactive discharges. At its sixty-ninth session, the Committee supported the application of that methodology as part of the current evaluation.

11. At its seventieth session, the Scientific Committee acknowledged the significant progress made by the expert group<sup>9</sup> in its literature review and analysis of the scientific data submitted by 53 Member States through the UNSCEAR global survey on public exposure and the data provided by international organizations (Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), European Commission, IAEA, Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (OECD/NEA), United Nations Environment Programme (UNEP), Office for Outer Space Affairs and WHO). The Committee welcomed the nomination of new national contact persons by Member States and encouraged them to provide data through the global survey on public exposure by July 2023. The Committee endorsed the methodology and approach regarding quality criteria to be applied in the evaluation as presented in the appendix to the draft annex entitled "Methodology and quality criteria for evaluating public exposure to ionizing radiation". The Committee reiterated its expectation of approval of the annex as scheduled at its seventy-first session, in 2024.

<sup>5</sup> *Sources, Effects and Risks of Ionizing Radiation: United Nations Scientific Committee on the Effects of Atomic Radiation 2017 Report to the General Assembly* (United Nations publication, 2018), annex A.

<sup>6</sup> The expert group includes 26 experts from eight Member States and one observer from the International Agency for Research on Cancer.

<sup>7</sup> *Sources, Effects and Risks of Ionizing Radiation: United Nations Scientific Committee on the Effects of Atomic Radiation 2008 Report to the General Assembly*, vol. I (United Nations publication, 2010), annex B.

<sup>8</sup> *Sources, Effects and Risks of Ionizing Radiation: United Nations Scientific Committee on the Effects of Atomic Radiation 2016 Report to the General Assembly with Scientific Annexes* (United Nations publication, 2016).

<sup>9</sup> The expert group includes 53 experts from 20 Member States and four observers from international organizations (European Commission, IAEA, OECD/NEA and WHO).

**4. Evaluation of diseases of the circulatory system from radiation exposure**

12. At its sixty-seventh session, in 2020, the Scientific Committee agreed to commence an evaluation of diseases of the circulatory system resulting from radiation exposure. At its sixty-eighth session, it endorsed the project plan for commencement in 2021. At its sixty-ninth session, in 2022, the Committee considered the progress report on that evaluation and acknowledged the work performed by the expert group in setting up the literature review.

13. At its seventieth session, the Scientific Committee welcomed the considerable work carried out by the expert group and discussed the initial results of the literature search. It provided feedback on the scope of topics and literature search methods to be included in the review, endorsed the proposed structure of the evaluation and the updated timeline, according to which approval is planned for 2025. In addition, the Committee requested that the expert group prepare a progress report and a first draft of the scientific annex, including the results of the literature review, for the seventy-first session, in 2024.

**5. Nervous system effects of ionizing radiation**

14. At its sixty-seventh session, the Scientific Committee agreed to initiate an evaluation on nervous system effects of ionizing radiation as part of its programme of work for the 2020–2024 period. At its sixty-eighth session, the Committee endorsed the project plan presented by the ad hoc working group on effects and mechanisms for initiating the work. The Committee requested the secretariat to establish an expert group on nervous system effects of ionizing radiation.

15. At its seventieth session, the Scientific Committee welcomed the initiation of the new evaluation on nervous system effects of ionizing radiation and the establishment of the expert group. It also endorsed the timelines for the implementation of the evaluation, with the Committee's approval of the report expected in 2027. The Committee requested a progress report, including the methods for literature search and review, initial search terms and a description of search results, for the seventy-first session of the Committee, in 2024.

**6. Strategy to improve collection, analysis and dissemination of data on radiation exposure, including consideration of the Committee's ad hoc working group on sources and exposure**

16. At its sixty-ninth session, the Scientific Committee approved the 2022 strategy to improve the collection, analysis and dissemination of data on radiation exposure, which had been prepared by the ad hoc working group on sources and exposure. In the implementation of the new strategy, two small groups of experts in the areas of medical exposure and occupational exposure were formed, and a third group, on public exposure, will be formed after the completion of the Committee's evaluation of public exposure to ionizing radiation, which is expected in 2024.

17. The two small groups of experts developed a methodology to screen relevant publications and continue to monitor any further developments. It is envisaged that a recommendation will be made as to whether or when more comprehensive research is required, or whether research directed towards a specific topic should be undertaken. That recommendation will be included in the Scientific Committee's future work programme for discussion at its seventy-first session, in 2024.

18. At its seventieth session, the Scientific Committee endorsed the proposed actions by the ad hoc working group on sources and exposure to improve engagement with national contact persons and agreed to:

(a) Reinforce the network of national contact persons through the creation of a directory for the exchange of experiences, good practices, information and training material;

(b) Update and improve the UNSCEAR online platform in different languages;

(c) Introduce alternate national contact persons to ensure continuity of engagement by each Member State;

(d) Produce brief information leaflets that can be used by national contact persons in their own countries to promote the Committee's data-collection activities.

19. The Scientific Committee welcomed the growing number of national contact persons. However, for the ongoing evaluation of public exposure to ionizing radiation, only 53 out of the 104 Member States who had nominated national contact persons had also shared data with the Committee. Participation in recent evaluations of medical exposure and occupational exposure was also low. For the Committee to improve its future evaluations of population exposure to ionizing radiation and to fulfil its mandate, it is vital to engage national contact persons and encourage them to share exposure data from their countries even when such data are limited. The Committee urges Member States to encourage and support the engagement of national contact persons, who are requested to:

(a) Coordinate data collection at the country level;

(b) Cooperate with technical experts to complete UNSCEAR questionnaires;

(c) Submit data officially to the UNSCEAR secretariat through its online platform;

(d) Approve additional material as supporting information (e.g. scientific articles or national reports);

(e) Correspond with the UNSCEAR secretariat when difficulties arise;

(f) Raise awareness of UNSCEAR surveys and of the Committee's work in general.

20. The Scientific Committee extended the work of the ad hoc working group on sources and exposure until its seventy-first session, in 2024, to support the implementation of the Committee's strategy to improve data collection, analysis and dissemination. The ad hoc working group will continue to monitor the progress of data collection and enhance engagement with the network of national contact persons.

## **7. Implementation of the public information and outreach strategy for 2020–2024**

### **(a) United Nations Environment Programme booklet *Radiation: Effects and Sources***

21. The UNEP booklet entitled *Radiation: Effects and Sources* was first published in 1985 and updated in 1991 to expand public knowledge about levels of exposure to ionizing radiation and possible associated effects. It provides information on basic science related to radiation (origin, quantities and units), on radiation effects (on humans and the environment) and on radiation sources (natural and artificial). In 2016, it was updated on the occasion of the sixtieth anniversary of the inception of the Scientific Committee. At its seventieth session, the Committee re-emphasized the importance of broader dissemination and future updates of the booklet. The Committee encouraged and appreciated the availability of the booklet in 15 languages,<sup>10</sup> including the three recent versions in Hindi, Indonesian and Persian launched at the seventieth session, and welcomed the planned update of the booklet.

<sup>10</sup> Arabic, Chinese, Czech, Dutch, English, French, German, Hindi, Indonesian, Japanese, Korean, Persian, Portuguese, Russian and Spanish.

**(b) Dissemination of the Committee's findings**

22. At its sixty-sixth session, the Scientific Committee adopted a public information and outreach strategy for the period 2020–2024 to guide the work of the secretariat and the Committee in their outreach and communication activities involving different stakeholders. The strategy complemented the outreach activities planned for annex B to the UNSCEAR 2020/2021 report, entitled “Levels and effects of radiation exposure due to the accident at the Fukushima Daiichi Nuclear Power Station: implications of information published since the UNSCEAR 2013 report”. At its sixty-seventh session, the Committee took note of the progress report and acknowledged the postponement of outreach activities on the update of the UNSCEAR 2013 report owing to delays caused by the COVID-19 situation, and encouraged close cooperation with international organizations to further promote the Committee's findings.

23. At its sixty-ninth session, the Scientific Committee took note of the progress report from the secretariat and provided feedback on ongoing and planned future outreach activities. The Committee proposed a new approach for outreach activities, including additional social media content to promote awareness of radiation effects. The Committee acknowledged that the newly developed website provided easy access to its reports and to General Assembly resolutions in all official languages of the United Nations. The Committee expressed its support for the secretariat's efforts to continue dissemination of the Committee's work.

24. At its seventieth session, the Scientific Committee took note of the progress report and acknowledged the successful outreach events organized in Japan in July 2022, the successful launch and use of the new website, online webinars and related social media, and the importance of sharing knowledge and experiences with young professionals.

25. The Scientific Committee is scheduled to review and adopt a new public information and outreach strategy at its seventy-first session, in 2024.

**B. Update on the Committee's long-term strategic directions**

26. At its sixty-sixth session, the Scientific Committee approved its long-term strategic directions and plan for the period 2020–2024 as set out below.

**1. Establishing working groups on sources and exposure and on effects and mechanisms**

27. At its seventieth session, the Scientific Committee prolonged the mandate of the ad hoc working group on effects and mechanisms to continue its activities until the Committee's seventy-first session, in 2024. The prolongation would allow the ad hoc working group to continue supporting and monitoring progress in the implementation of the programme of work, to evaluate new scientific developments relevant to the work of the Committee and to work with the secretariat to continue the preparation of the Committee's future programme of work for the period 2025–2029, for discussion at its seventy-first session.

28. Also at its seventieth session, the Scientific Committee prolonged the mandate of the ad hoc working group on sources and exposure with a focus on the implementation of the updated strategy for improving the collection of data on radiation exposure. The Committee noted that the ad hoc working group would monitor the literature, provide advice to the Bureau and Committee for ongoing data collection and evaluate available and new data sources relevant to the Committee's exposure evaluation, in order to work with the secretariat in preparation for the Committee's future evaluations on medical, occupational and public exposure to ionizing radiation.

**2. Inviting, on an ad hoc basis, scientists from other States Members of the United Nations to participate in the Committee's evaluations**

29. The Scientific Committee noted that the secretariat and the Bureau had taken steps to involve scientists from other States Members of the United Nations<sup>11</sup> in supporting the Committee in conducting ongoing evaluations. That was particularly relevant for the ongoing evaluations on public exposure to ionizing radiation from natural and other sources and on second primary cancer after radiotherapy.

**3. Increasing the Committee's efforts to present its evaluations and summaries thereof in a manner that attracts readers without compromising scientific rigour and integrity**

30. The Scientific Committee referred to the outreach activities reported in paragraphs 21 to 25 above.

**4. While maintaining its lead in providing authoritative scientific evaluations to the General Assembly, liaising closely with other relevant international bodies to avoid duplication of efforts**

31. The importance of the Scientific Committee's findings in providing the scientific evidence on the basis of which decisions are made by the international community and safety standards are developed has also been demonstrated in the period since the sixty-ninth session of the Committee. The Committee noted that its secretariat was a member of the Inter-Agency Committee on Radiation Safety. The Scientific Committee also noted that the secretariat continued to collaborate with IAEA, participating as an observer to the IAEA Commission on Safety Standards, Emergency Preparedness and Response Standards Committee and Radiation Safety Standards Committee. The secretariat was also cooperating with several other organizations, including the International Commission on Radiological Protection and the International Radiation Protection Association.

32. The Scientific Committee welcomed and supported the continued cooperation of the secretariat with entities within the United Nations system and with other intergovernmental organizations with a view to promoting the Committee's work and exploring synergies and joint activities that would contribute to that work and support the collection and analysis of scientific data. The Committee specifically acknowledged the framework agreements signed with WHO and CTBTO in 2022, as well as the engagement with the European Commission, ILO, the International Civil Aviation Organization, OECD/NEA, the Office for Outer Space Affairs and the International Commission on Radiological Protection, and requested the secretariat to report on cooperation with other entities at the seventy-first session.

### **C. Future programme of work**

33. At its sixty-fifth session, in 2018, the Scientific Committee established the ad hoc working group on effects and mechanisms to support the Bureau and the secretariat in monitoring the progress of the current scientific evaluations and in evaluating new scientific developments between the sessions for consideration by the Committee.

34. In line with its present programme of work, the Scientific Committee decided to commence a new evaluation of radiation effects on the eye as soon as the resources and workload of the secretariat allowed, and it requested the ad hoc working group on effects and mechanisms to prepare a preliminary project plan for an evaluation of radiation effects on the immune system. Furthermore, it discussed the evaluation documents provided by the ad hoc working group on six potential topics identified at the sixty-ninth session for the future programme of work for the period 2025–2029. The Committee requested the ad hoc working group to further amend the evaluation

<sup>11</sup> Austria, Italy, Netherlands (Kingdom of the) and Switzerland.

documents on three of those potential topics in preparation for a decision on the future programme of work to be taken at the seventy-first session, in 2024.

35. The Scientific Committee acknowledged the activities undertaken by the ad hoc working group on effects and mechanisms and by the secretariat to further improve the procedures followed by expert groups when performing their structured and transparent evaluations of the scientific literature.

36. Bearing in mind the high-quality and important scientific work conducted by the ad hoc working group on effects and mechanisms in monitoring the Scientific Committee's programme of work, the Committee prolonged the mandate of the ad hoc working group for one year to support and monitor progress in the implementation of the present programme of work, to evaluate new scientific developments and to propose the next programme of work, for the period 2025–2029, for approval at the Committee's seventy-first session, in 2024.

#### **D. Administrative issues**

37. The Scientific Committee took note of General Assembly resolution 77/119 on the effects of atomic radiation, in which the Assembly:

(a) Requested UNEP to continue, within existing United Nations resources, to service the Committee and to disseminate its findings to Member States, the scientific community and the public and to ensure that the administrative measures in place were appropriate so that the secretariat was able to adequately and efficiently service the Committee in a predictable and sustainable manner;

(b) Encouraged the Committee to stand ready to carry out unplanned additional work, in strict compliance with its mandate, and in coordination with IAEA and other relevant international organizations, as appropriate, including in the context of military actions;

(c) Requested the Secretary-General to strengthen support for the secretariat in order to adequately and efficiently provide service to the Committee in a predictable and sustainable manner, and to effectively facilitate the use of the invaluable expertise offered to the Committee by its members, and to report to the Assembly at its seventy-eighth session on those issues.

38. The Scientific Committee also recalled and highlighted that the effective, sustainable and timely completion of its ongoing and planned programmes of work continued to contribute to the achievement of the Sustainable Development Goals, in particular those relating to good health and well-being (Goal 3), healthy oceans and seas (Goal 14), conserving life on land (Goal 15) and revitalizing the Global Partnership for Sustainable Development (Goal 17).

39. While the Scientific Committee acknowledged that contributions made to the general trust fund by six Member States<sup>12</sup> had allowed some work to progress, that method of funding continued to be neither predictable nor sustainable. The Committee welcomed General Assembly resolution 77/119, in particular paragraph 23, in which the Assembly requested the Secretary-General to strengthen support for the secretariat of the Committee. In 2022, the Assembly endorsed the resolution on the proposed regular budget increase for consultants (experts) and for reinforcing the secretariat with two staff members as of 2024. Approval of the increase as part of the proposed programme budget for 2024 is expected in December 2023 and is essential for providing adequate and efficient long-term service to the Committee in a predictable and sustainable manner. It will also effectively facilitate the use of the invaluable expertise offered to the Committee by its members.

40. The Scientific Committee continues to call upon all States Members of the United Nations and international organizations to invest in scientific education and

<sup>12</sup> Australia, Austria, Belgium, Germany, Norway and Spain.

programmes at all levels and to support radiation research programmes to ensure that the crucial work of the Committee can be sustainably maintained in the future.

41. The Scientific Committee updated its governing principles for the Committee's work in order to reflect the process of development of its scientific evaluations. It also adopted a procedure for the preparation of the Committee's scientific annexes and reports for publication.

42. The Scientific Committee agreed to hold its seventy-first session in Vienna from 20 to 24 May 2024.

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