



*Atoms for Peace*

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International Atomic Energy Agency

Agence internationale de l'énergie atomique

Международное агентство по атомной энергии

Organismo Internacional de Energía Atómica

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In reply please refer to: IAEA Report on the Fukushima Daiichi Accident  
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2016-06-22

Dear Mr Ueda,

In response to your letter related to the IAEA Director's General report on the Fukushima Daiichi Accident and the accompanying technical volumes, please find the replies to your questions enclosed in an annex.

Yours sincerely,

Gustavo Caruso

Director

Office of Safety and Security Coordination

Department of Nuclear Safety and Security

Enclosure: Replies to the questions of the Citizen Science Initiative Japan

## **Replies to the questions of the Citizen Science Initiative Japan**

*The responses below are provided on the following understanding:*

*The information presented in these replies does not necessarily reflect the views of IAEA Member States or organizations nominating experts to the Working Groups for the preparation of the technical volumes to the Report by the IAEA Director General on the Fukushima Daiichi Accident.*

*Great care has been taken to maintain the accuracy of information. Neither the IAEA, nor its Member States, however, assume any responsibility for consequences that may arise from its use, nor are any warranties made of any kind in connection with this document.*

*These replies are not intended to address issues of responsibility, legal or otherwise, for acts or omissions on the part of any person or entity.*

### ***Reply to question 1:***

The word “affected” is used in the report in a general sense.

### ***Reply to question 2***

The report uses the words “evacuation” and “relocation” in the same manner as in the IAEA safety standards. The IAEA safety standards embody an international consensus on what constitutes a high level of nuclear safety. However, it is for Member States to decide whether to adopt these safety standards. The recently published *Preparedness and Response for a Nuclear or Radiological Emergency* (IAEA Safety Standards Series No. GSR Part 7) relating to emergency preparedness and response do not use the concept of temporary relocation and resettlement *per se*, but they recognize that relocation may remain in place in the longer term (of the order of years) before being lifted. The decision to lift relocation, as with any other protective action, is for States or local authorities to take.

### ***Reply to question 3***

Figure 4.1 is shown as an example of the global models of the atmospheric dispersion of the selected radionuclide  $^{137}\text{Cs}$ .

$^{131}\text{I}$  is an important radionuclide for thyroid and as such, the measurements are usually undertaken close to the thyroid gland. Atmospheric modelling only does not allow the estimation of thyroid doses with sufficient accuracy.

### ***Reply to question 4***

The highest levels in the report refer to average levels in relatively small areas. The report does not include an inventory of ‘hot spots’, namely points of localized high activity concentration.

### ***Reply to question 5***

Technical Volume 3 discusses various measures implemented before 21 March 2011 in relation to potentially or actually contaminated food, milk and water (for further details, see Technical Volume 3, Section 3.3.2.5 on Restriction on ingestion of local produce, milk from

grazing animals, rainwater and wild grown products and Technical Volume 3, Section 3.3.3.2 on Protective actions relating to food and drink).

#### ***Reply to question 6***

Page 106 of Technical Volume 4 refers to “The projected external effective doses estimated for 2012 indicate that the district averaged doses to a representative person would have been less than 1 mSv in all prefectures except Fukushima Prefecture.” Table 4.2-11 on page 112 of Technical Volume 4 refers to the results from “7 October 2011–30 November 2012 Residents of Fukushima and neighbouring prefectures 32 811 subjects aged 4–93”.

#### ***Reply to question 7***

The use of dose equivalent rate measured at very short distance to the thyroid gland is a standard method used in population screening for thyroid doses.

The methods of dose estimation are explained in Chapter 4.2.2.1. *Background and Exposure Pathways* of Technical Volume 4. The number of 1080 comes from the reference [214] (FUKUSHIMA MEDICAL UNIVERSITY, “Response rates to the basic survey by district. Data as of 31 December 2014” (Proc. 18th Prefectural Oversight Committee Meeting for Fukushima Health Management Survey Fukushima, 2015).

#### ***Reply to question 8***

The exposures of the IAEA staff members were under the occupational exposure control of the IAEA, and none of the IAEA staff participating in activities of the IAEA expert mission to Japan exceeded the dose limits for workers. The dose of 2.5 mSv — which in any case is less than 10% of the international occupational limit — was incurred by one IAEA staff member who provided advice on protection and safety.

#### ***Reply to question 9***

The phrase “prevention of lifestyle related disease” is the phrase that has been quoted in English from the Fukushima Health Management Survey (<http://fmu-global.jp/fukushima-health-management-survey/>) available at the time of writing of the Report.

In order to ensure that the evacuees did not receive high doses most of the efforts were aimed towards them.

#### ***Reply to question 10***

Please see section 4.4.4 *Studies of Effects on the Thyroid* of Technical Volume 4, page 156: “Hyperthyroidism can also occur, but again at high doses (exceeding 15 Gy). Effects at low and medium doses have been difficult to quantify, and the magnitude of the effect remains unclear [334].”

#### ***Reply to question 11***

The available epidemiological information on the latency time for childhood thyroid cancer attributable to radiation exposure, mainly that arising from the Chernobyl accident experience, indicates that such latency time is around 5 years (see UNITED NATIONS, Sources and Effects of Ionizing Radiation (Report to the General Assembly), UNSCEAR 2008 Report,

Vol. II, Scientific Annexes C, D and E, Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), UN, New York (2011) and JACOB, P., KENIGSBERG, Y., GOILKO, G, Thyroid cancer risk in areas of Ukraine and Belarus affected by the Chernobyl Accident: Comparison with external exposures, *Radiat. Environ. Biophys.* **39** 1 (2000) 25-31.)

***Reply to question 12***

UNSCEAR has addressed the attribution of health effects to different levels of exposure to ionizing radiation, and has reached, inter alia the following conclusion: increases in the incidence of health effects in populations cannot be attributed reliably to chronic exposure to radiation at levels that are typical of the global average background levels of radiation (see A/67/46, Report of the United Nations Scientific Committee on the Effects of Atomic Radiation, Fifty-ninth session, 21-25 May 2012, General Assembly, Official Records, Sixty-seventh session, Supplement No. 46, para. 25 (f)).

The international radiation protection standards of the UN family, which are being established under the aegis of the IAEA, have adopted the so called linear no-threshold model (see INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION, The 2007 Recommendations of the International Commission on Radiological Protection, Publication 103, Elsevier, Oxford (2007)).

***Reply to question no 13:***

After a nuclear accident, health surveys are very important and useful but the report underlined that they are different from epidemiological study. The epidemiological studies are key elements to explore health effects in large populations subsequent to enhanced exposures to radiation doses, e.g. for the survivors of the atomic weapons in Hiroshima and Nagasaki.

***Reply to question no 14:***

In international radiation protection standards, a reference level represents the level of dose or risk, above which it is judged to be inappropriate to plan to allow exposures to occur, and below which optimisation of protection should be implemented in emergency or existing controllable exposure situations. The chosen value for a reference level will depend upon the prevailing circumstances of the exposure under consideration. It is recommended that the reference level in the aftermath of an accident should fall in the band between 1-20 mSv per year. The issue on reference levels and the goals of reduction are explained in more detail in Technical Volume 5 (page 16):

***Reply to question no 15***

Following the International Commission on Radiological Protection (ICRP) recommendations as well as the IAEA safety standards, the primary criterion for remediation is defined by the additional annual effective dose. However, annual effective doses received by people cannot be directly measured. Therefore, once a reference level is defined, secondary criteria can be defined (e.g. in terms of gamma dose rate [ $\mu\text{Sv/h}$ ] or in terms of activities deposited per unit area on the ground [ $\text{Bq/m}^2$ ]), which directly correspond to the primary criterion. Such quantities can be easily measured and, therefore, facilitate the implementation of remediation measures and the validation of their effectiveness.

***Reply to question no 16:***

Both ICRP recommendations and the IAEA safety standards have no fixed criteria for the completion of decontamination. It is recommended that the additional effective dose should be in the range of 1-20 mSv/y. It is for the Member States to decide on the reference levels to be selected.