



United Nations Scientific Committee  
on the Effects of Atomic Radiation

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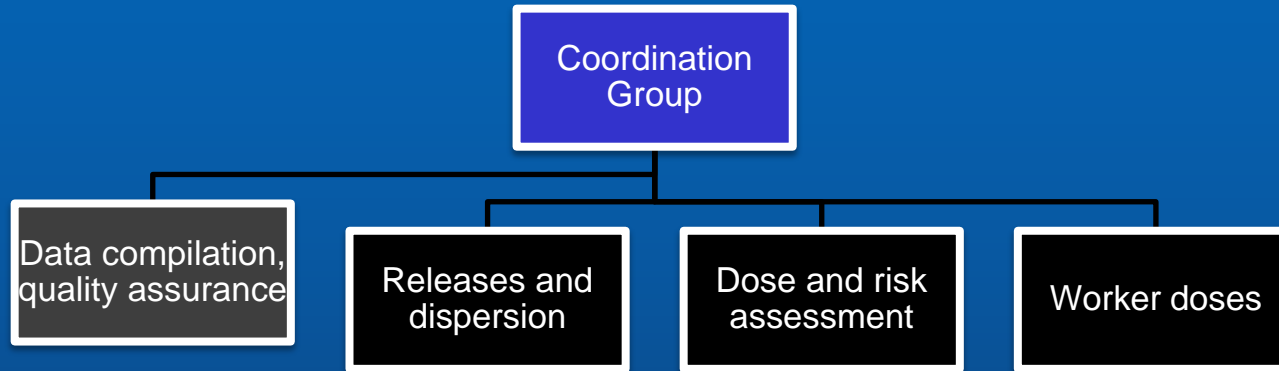
# UNSCEARs Assessment of the Levels and Effects of Radiation Exposure due to the Nuclear Accident after the 2011 Great East- Japan Earthquake and Tsunami

Wolfgang Weiss (GERMANY), chair CEG

International Academic Conference  
on Radiation Health Risk Management in Fukushima, February 2013

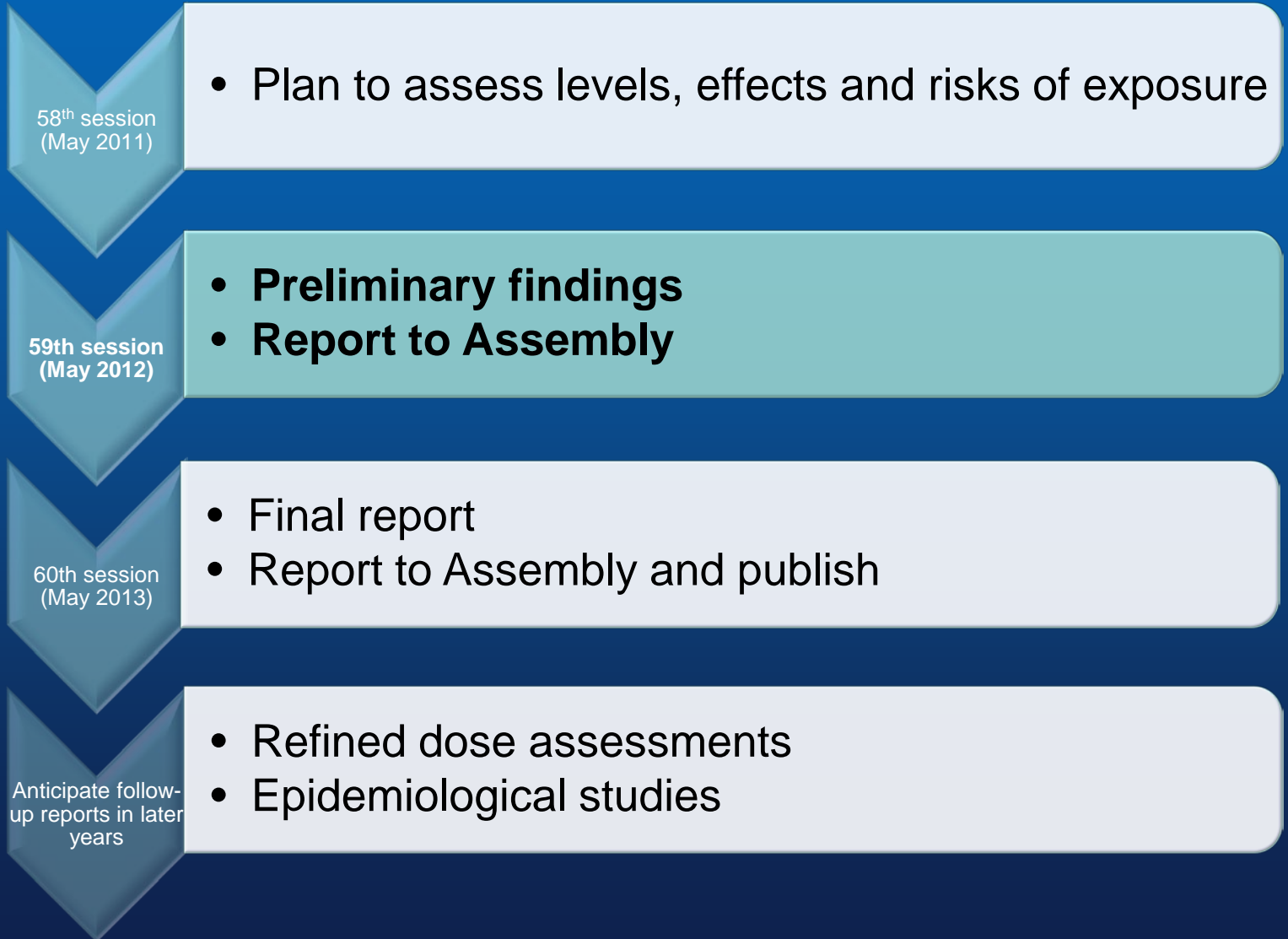


# The Coordination Expert Group (CEG)



- **Over 80 experts** offered as contributions-in-kind
- Attendance at meetings and work – **cost-free to UN**
- Project Manager and Coordinating Lead Writer engaged
- Channels to **Japanese experts**
- **Trust Fund** contributions provide buffer
- **International Organizations** contributing: CTBTO, FAO, IAEA, WHO, WMO

# Timetable for the assessment report



**No radiation health effects observed** among public or workers

**Six workers** received doses above 250 mSv; 170 received doses above 100 mSv; thyroid doses being estimated

Six workers died in first year – **not due to radiation**

Thyroid monitoring of 1,080 children: maximum dose reported was 35 mSv

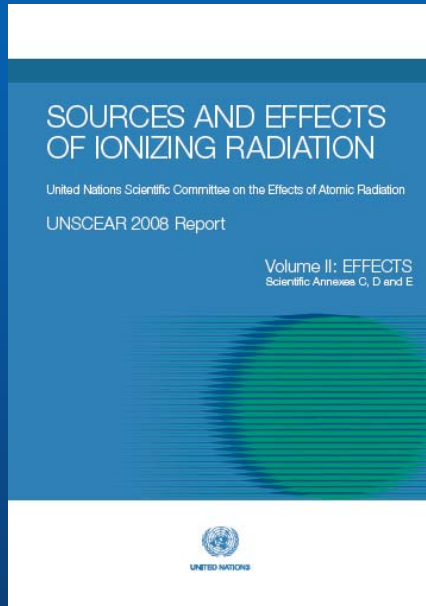
Highest exposures of wildlife in marine environment



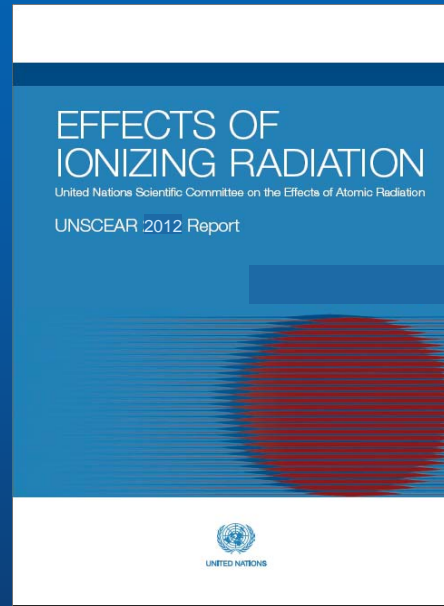
# Content

- Recent scientific findings
- UNSCEARs Fukushima assessment
- Epilogue

# Scientific findings



Health effects due to radiation from the **Chernobyl** accident



**Attribution** of increased cancer rates

**Uncertainty** in cancer risk estimates

## Work in progress

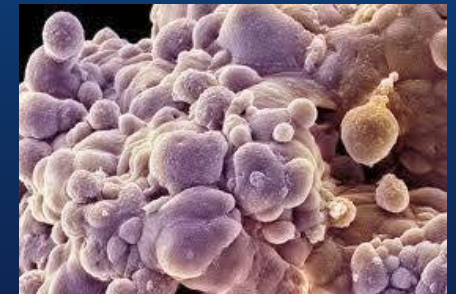
Radiation levels/effects from **Fukushima** accident (2013)

Radiation risks and effects on **children** (2013)

Biological effects of selected **internal** emitters (2014)

# Attribution of effects for an individual

- Certain tissue reactions **can** be attributed to radiation exposure
  - High acute absorbed doses
  - Other possible causes eliminated
- Cancer **cannot** be unequivocally attributed to radiation exposure
  - Other causes possible
  - No biomarker for radiation

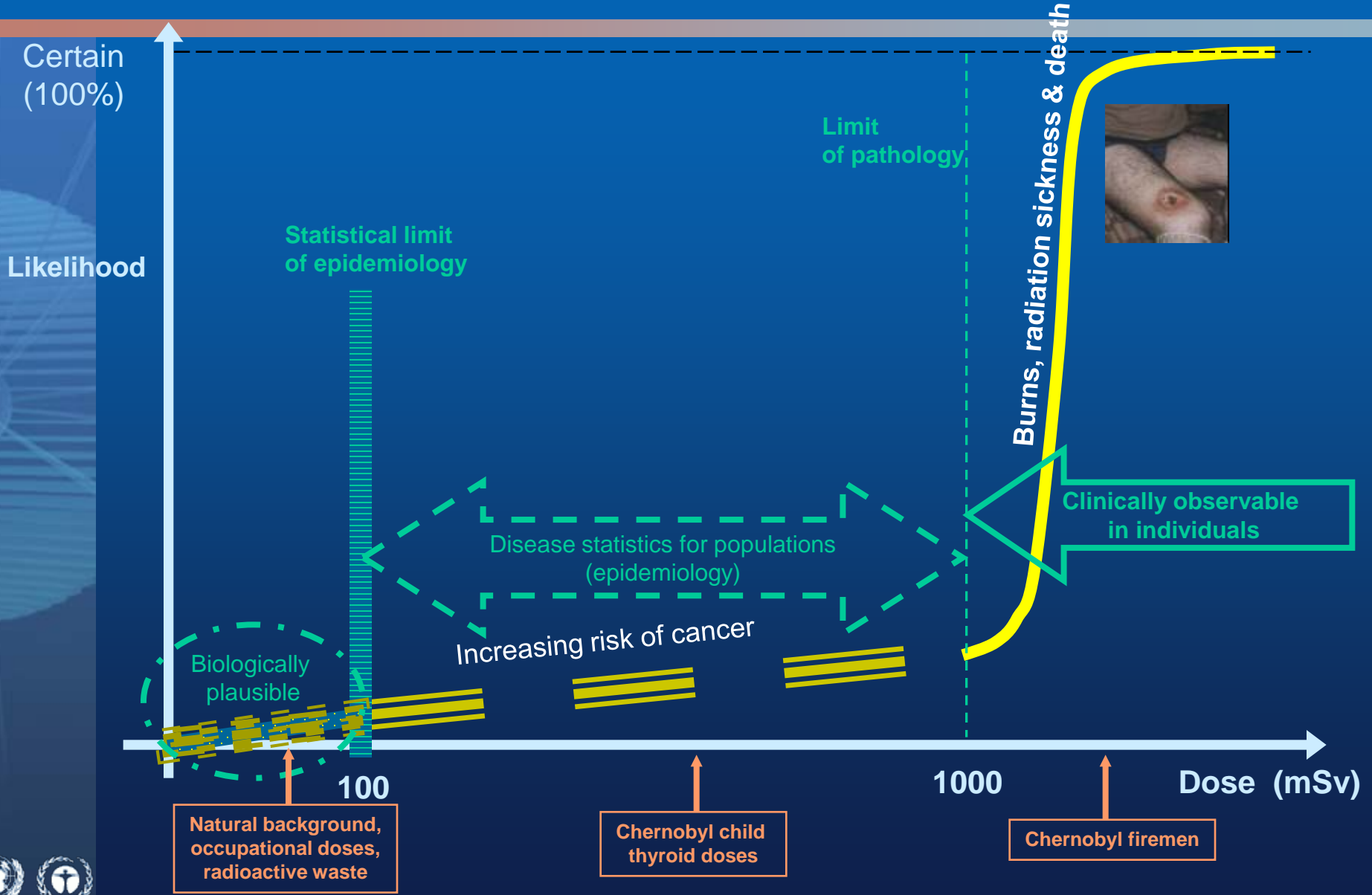


# Attribution of increased cancer rates

- **Increased rates of cancer** in a population **can** be attributed to radiation exposure:
  - If increase more than statistical uncertainties
- **At natural background levels, increased rates cannot be attributed reliably**
  - High uncertainties at low doses



# Radiation health effects



# UNSCEARs Fukushima assessment



**The aim of the assessment is to develop a comprehensive report with scientific annexes for the General Assembly, the scientific community and the public that evaluates information on the levels of radiation exposure due to the nuclear accident following the Great East-Japan earthquake and tsunami, and the associated effects and risks.**



# General aspects

**How confident is UNSCEAR in the representativeness and quality of the information, and of their assessment?**

**What is the likely impact on human health and environment?**

**For what time period are effects expected and of what type?**

**What are the unknowns and needs for future research or follow-up?**

**Source term**

**Environmental dispersion and deposition**

**Doses to members of the public**

**Doses to occupationally exposed persons**

**Effects on the natural environment**

**Health risk**

# Status of data submission from Japan

- **Source term, dispersion**
  - **Answers/Questions: 100%**
- **Public doses, biota**
  - **A/Q: 100%**
- **Worker doses**
  - **A/Q: 94%**
  - **additional confidential data received**

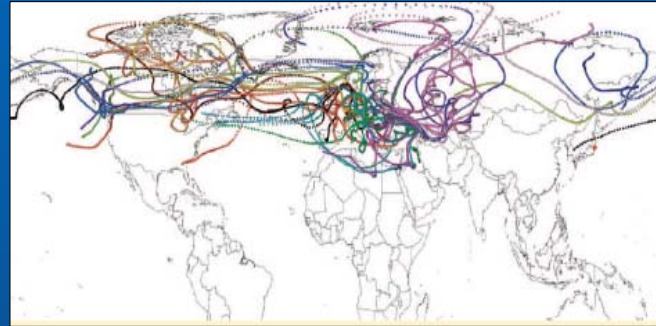
- CTBTO

- FAO

- IAEA

- WHO

- WMO



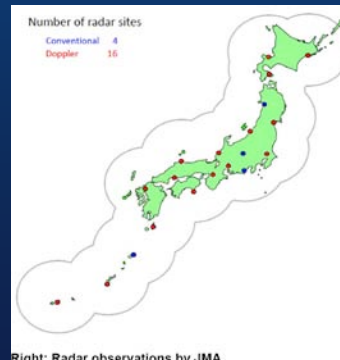
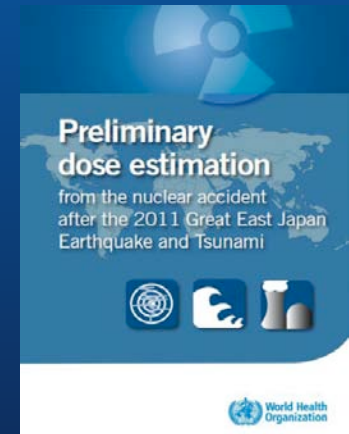
## IAEA Fukushima Monitoring Database

- IEC constructing database to record all data received through Official Contact Points
  - Japan
    - MEXT: Ministry of Education, Culture, Sports, Science, and Technology
    - NISA: Nuclear and Industrial Safety Agency
    - Permanent Mission of Japan
  - Member States data as reported to IEC
  - IAEA field teams
- Working with counterparts from MEXT

Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture



Database on Radionuclides Concentrations in Foodstuffs affected by the Fukushima Dai - ichi NPP Accident



Right: Radar observations by JMA.

# Status of the assessment report

## February 2013

**A first draft of the report to the Scientific Committee has been submitted to the members of the CEG and the chair of UNSCEAR.**

**Comments are expected by early March.**

**They will be incorporated in a consolidated draft which will be submitted to the representatives of UNSCEAR end of March to be discussed during the session of the Committee end of May.**



## Session document for 59<sup>th</sup> Session

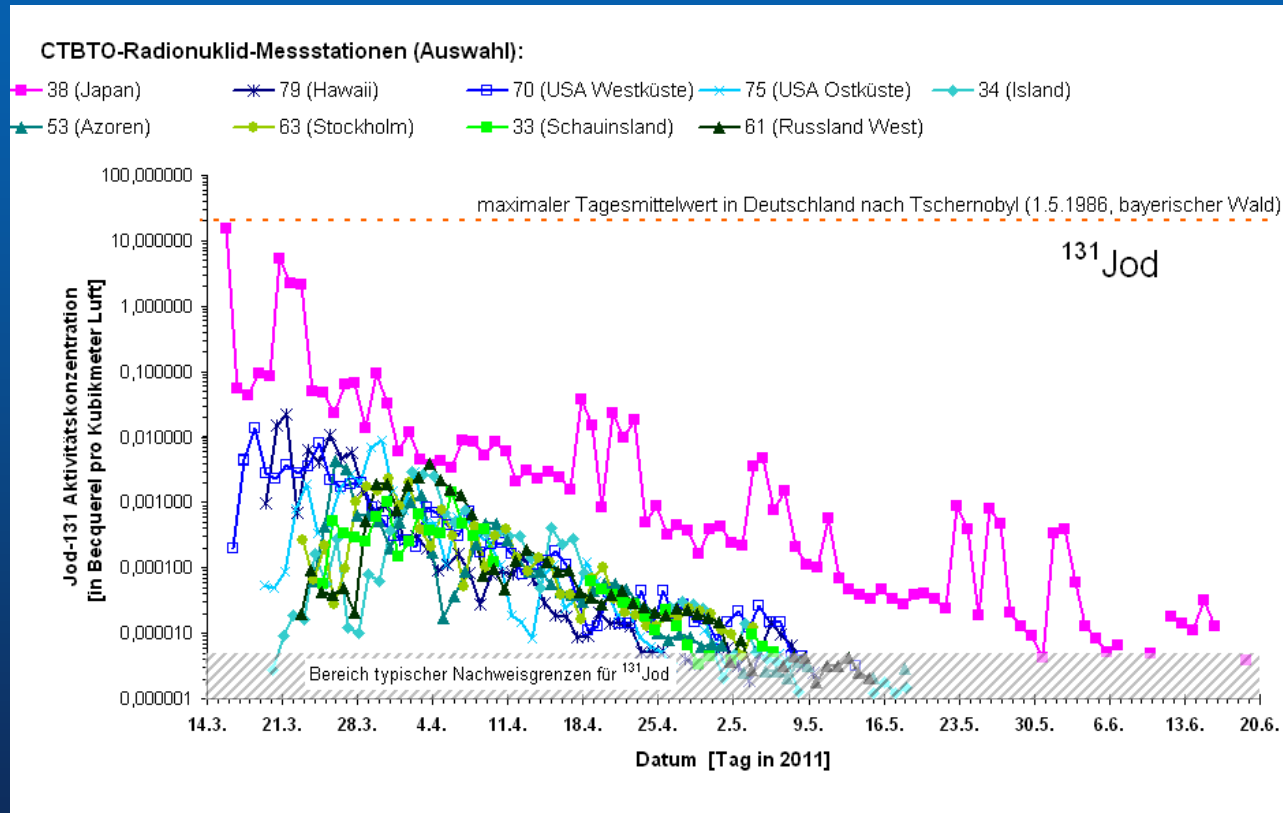
## Session document for 60<sup>th</sup> Session

Cover page (1 page) – note by secretariat		
Interim report: progress and preliminary findings (1 page) → GA 2012		
<b>Main text</b>	Assessments	<i>Progress &amp; proposals</i>
Appendix A	Assessments	<i>Progress &amp; proposals</i>
Appendix B	Assessments	<i>Progress &amp; proposals</i>
Appendix C	Assessments	<i>Progress &amp; proposals</i>
Appendix D	Assessments	<i>Progress &amp; proposals</i>
Appendix E	Assessments	<i>Progress &amp; proposals</i>

Cover page (1 page) – note by secretariat
Key findings (4 pages) → GA 2013
<b>Main scientific report</b> (20~30 pages)
<b>Detailed scientific report</b> (100~150 pages)
Appendix A (around 20 pages)
Appendix B (around 20 pages)
Appendix C (around 40 pages)
Appendix D (around 30 pages)
Appendix E (around 10 pages)
Appendix F (around 10 pages)

**Extended**

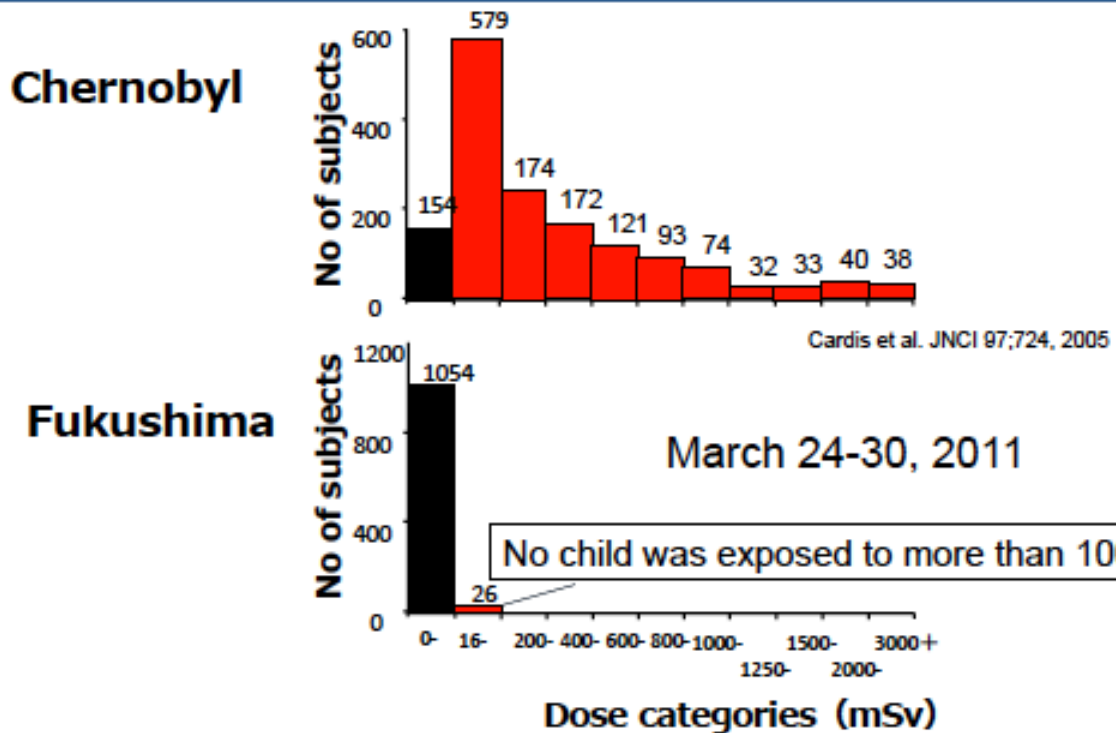
# Environmental impact Chernobyl - Fukushima



[www.bfs.de](http://www.bfs.de)

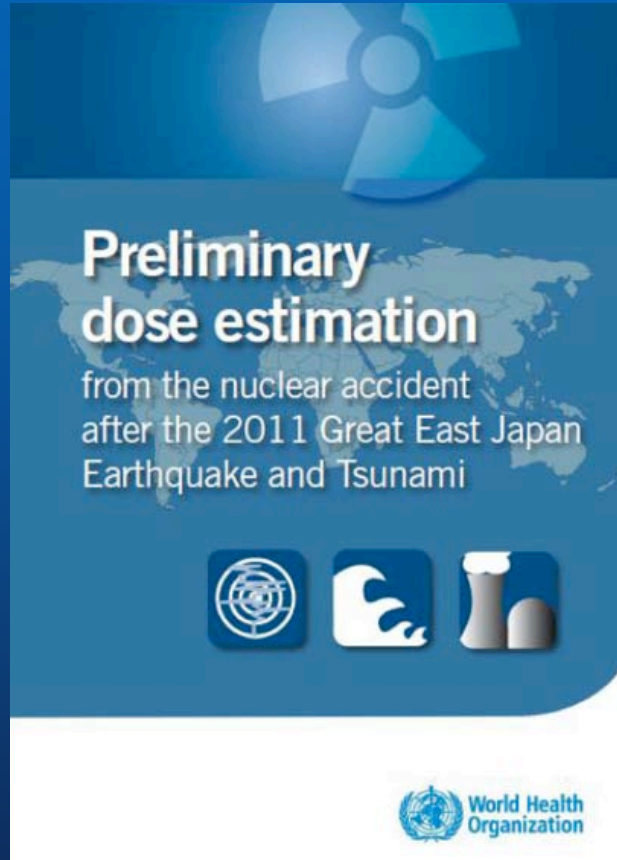
# Comparison of thyroid doses

## Comparison of thyroid dose between Chernobyl and Fukushima NTT accidents



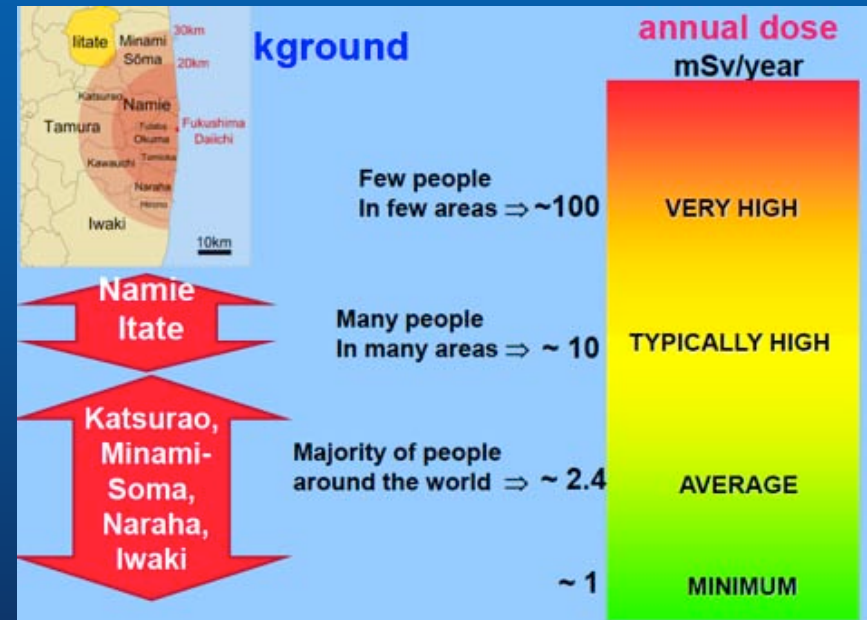
Shandala, 2012

# Preliminary dose and risk estimates



**Preliminary dose estimation**  
from the nuclear accident after the 2011 Great East Japan Earthquake and Tsunami

World Health Organization



Gonzales 2012

**Source term**

**Environmental dispersion and deposition**

**Doses to members of the public**

**Doses to occupationally exposed persons**

**Effects on the natural environment**

**Health risk**

# Population dose estimates

- The report builds on the preliminary dose estimation carried out by the World Health Organization (WHO) in 2012.
- It describes results of detailed dose assessments for the first full year after the earthquake and tsunami, based on measurements made during the first year and state-of-the-art models.
- The aim is to make realistic estimates of exposures of people living in Japan.

# Scientific challenges in dose assessment

## Retrospective Assessments

### Uncertainties

- Due to incomplete knowledge about time dependent nuclide composition via relevant pathways;
- Of the representativeness of the nuclide data
- Due to the a priori unknown individual behaviour of the population
- Of parameters of models used for dose assessment.

## Prospective Assessments

### Additional Uncertainties due to

- Unknowns in the efficiency of measures to further improve the environmental situation/to reduce the doses

- **Effective and thyroid doses for typical residents have been estimated. The doses are summed over the three main exposure pathways (external, inhalation and ingestion).**
- **Particular attention has been paid to the exposures of people living in the more affected areas of Fukushima Prefecture and the neighbouring prefectures.**
- **Exposures of those living in the rest of Japan have also been estimated.**



# Population dose estimates

- **The results are intended to be characteristic of the exposures received by a typical person in the population (i.e. representative of people with ‘average’ habits, such as food intakes, and behaviours) living in a particular region.**
- **Three main age groups are considered, infants aged 1 year old at the time of the releases, children aged 10 years and adults.**
- **The assessment includes exposures in the first year following the accident, exposures integrated for 10 years, and exposures up to age 80.**

# Population dose estimates

- **The assessment takes into account the protective measures put in place by the authorities; radiation exposures are estimated for the people who were evacuated from different locations at different times.**
- **A significantly reduced the radiation exposures that could have been received is estimated. This is particularly the case for settlements within the 20 km evacuation zone and the Deliberate Evacuation Zones, where the protective measures reduced potential exposures by up to a factor of 10.**

# Population dose estimates

**For the great majority of people in Japan, the additional radiation exposures received in the first year and subsequent years due to the radioactive releases from the accident at the Fukushima Daiichi NPS are less than the doses received each year from natural background radiation.**

**The districts within the 20 km evacuation zone (Futaba, Hirono, Namie, Naraha, Okuma and Tomoika) or the Deliberate Evacuation Zone (Iitate, Kawauchi and Katsurao) represent the highest doses.**

# Population dose estimates

**The estimates of total effective dose to adults over the periods of these evacuations were on average less than 5 mSv for those communities evacuated on 12 March 2011, and on average less than 10 mSv for those communities evacuated at later times. The estimates for the average thyroid equivalent dose from inhalation before and during the evacuation are less than 50 mSv for 1 year old infant evacuees.**

**Many Member States provided the Committee with information on measurements and exposure assessments that they had carried out for their own country as an input into this study and a review of the published literature was undertaken. An analysis of this body of information supports the results in the WHO preliminary exposure estimate: estimated doses were less than 0.01 mSv in the first year, which is well below levels that would be of any health concern.**

**The experience from both the Chernobyl and Fukushima accidents has clearly demonstrated the importance of distress and anxiety among the public and the workers, and concerns about the long-term implications of the accident.**

**The work of UNSCEAR will provide an independent authoritative assessment of the long-term implications of radiation exposure from the radionuclides in the environment.**

**The UNSCEAR assessment can contribute much to providing better background information to help improve understanding of the public and decision-makers about radiation and its effects.**

**The effects of long-lived radioactive material in the environment will likely continue to be of concern long after the physical recovery from the tsunami is complete. The global community will need to respond in a coordinated and thoughtful manner in the coming years.**

# Thank you for your attention



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