

International Experts' Meeting on Radiation Protection after the Fukushima Daiichi Accident: Promoting Confidence and Understanding IAEA; Vienna, Austria; 17 – 21 February 2014

Session 2:

Response of International Organizations

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The Future: Expectations

**Graded Response from the International
Organizations to Lessons Learned**

Radiological protection issues arising during and after the Fukushima nuclear reactor accident

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Michiaki Kai⁶, Shizuyo Kusumi⁷, Jai-Ki Lee⁸, Hans-Georg Menzel⁹,
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Shunichi Yamashita^{10,12} and Yoshiharu Yonekura^{2,13}

Some Identified Issues for the International Organizations to consider

1. ...Radiation Risks
2. ...Quantities/Units
3. ...Internal Exposure
4. ...Occup. Protection
5. ...Public Protection
6. ...Psychological Effects
7. ...Monitoring
8. ...‘*Contamination*’

1.

Radiation Risks

Misunderstandings on risk coefficients

- **On the one hand, the concept of risk of radiation exposure is misunderstood.**
- **On the other hand, risk coefficients intended for radiation protection purposes have been incorrectly used to attribute future hypothetical deaths to the accident, by simply multiplying their values by collective doses of low individual doses over large populations.**

WHO Health Risk Assessment of the Fukushima Daiichi Nuclear Accident

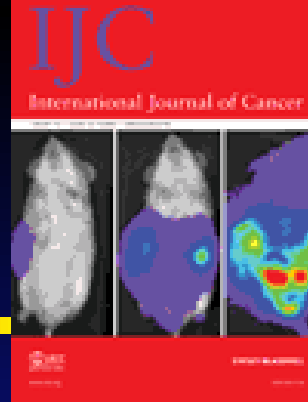
- **Statement:**

...for thyroid cancer, the estimated lifetime risk increases by up to around 70% over baseline rates in females exposed as infants.

- **Caveats:**

- *...the assessment was based on the [WHO] preliminary estimate of radiation doses....*
- *...the calculated percentages 'represent estimated relative increases over the baseline rates and are not estimated absolute risks for developing such cancers'...*
- *...‘due to the low baseline rates of thyroid cancer, even a large relative increase represents a small absolute increase in risks’...*

Not new!



International Journal of Cancer
Volume 119, §6, pp 1224–1235
15 September 2006

REPORTED:

- ...[by 2006] Chernobyl may have caused about 1,000 thyroid cancer and 4,000 other cancers in Europe.
- ...by 2065 about 16,000 thyroid cancer and 25,000 other cancers may be expected due to radiation from the accident.

CAVEATS

- ...several hundred million cancers are expected from other causes...
- ...estimates are subject to considerable uncertainty...
- ...it is unlikely that the cancer burden could be detected...
- ...trends in cancer incidence and mortality in Europe do not indicate any increase in cancer rates that can be attributed to Chernobyl..



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Death toll from Japan nuclear catastrophe could top 500,000

DATE: 13 AUGUST 2011 POSTED BY : SPECIAL TO THE CANADIAN



John H. Large has been reported as having predicted that the death toll in the years ahead could top the 500,000 attributed to the Chernobyl accident of 1986 and warned that panicked repair attempts could lead to an even greater disaster. Mr. Large, a British nuclear engineer, said: "The Japanese don't know how to deal with it. They're ad-libbing."

"Just throwing water on to the reactors, when they cannot get inside to see what the situation is, could mean the fuel goes critical again."

"And while the radiation leak so far is only a tenth of that at Chernobyl, that was in a rural area with a low population. In Japan it's an urban, densely packed area so the potential numbers of deaths and cancers are much higher."

Mr. Large is an independent [nuclear engineer](#) and analyst primarily known for his work in assessing and reporting upon [nuclear safety](#) and [nuclear related accidents and incidents](#). [\[LINK\]](#) From the mid-1960s until 1986 Large was an academic in [Brunel University's](#) School of Engineering, where he undertook research for the [United Kingdom Atomic Energy Authority](#).

Mr. Large prepared a critical review of the preliminary report of the [IAEA](#) Fact Finding Mission undertaken to Fukushima Dai-ichi in May 2011. [\[LINK\]](#)[\[LINK\]](#)



Do you welcome and have reservations about Target taking over Zellers in Canada?

- ☐ Welcome it
☐ Have reservation

Vote

Result

[Blog](#) [Books](#) [Latest](#) [Culture](#)

- Manipulative Extraterrestrials control Earth suggests Dr. Michael Salla
- Humanized face of aliens control Earth suggests Dr. Michael Salla
- Perpetuated War and Canada's First Nations
- Toronto Housing Project linked to

UNSCEAR response



United Nations

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

**Fifty-ninth session
(21-25 May 2012)**

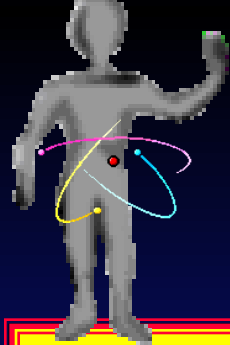
ATTRIBUTING HEALTH EFFECTS TO IONIZING
RADIATION EXPOSURE AND INFERRING RISKS

2.

Quantities and Units

Confusion on Quantities and Units

- **Quantities** and **units** used in radiation protection appear to be confusing and have jeopardized clear communication.



Activity
(Bq, curies)

Fluence
(cm^{-2})

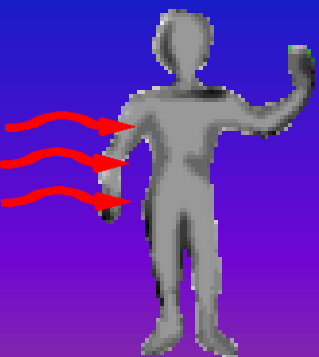
Absorbed Dose
(Gy, rad)

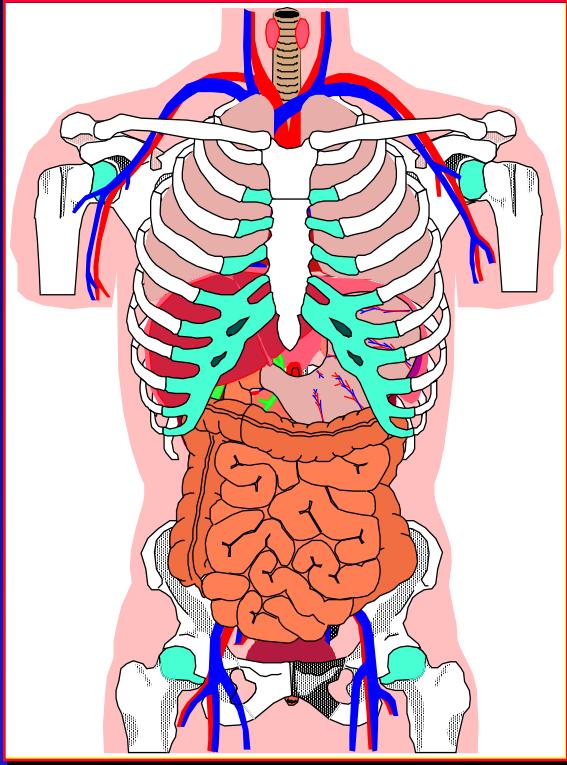
W_R

Equivalent Dose (organ)
(Sv, rem)

W_T

Effective Dose
(Sv, rem)





Standards:
Equivalent Dose



Monitoring
Dose Equivalent

Confusion

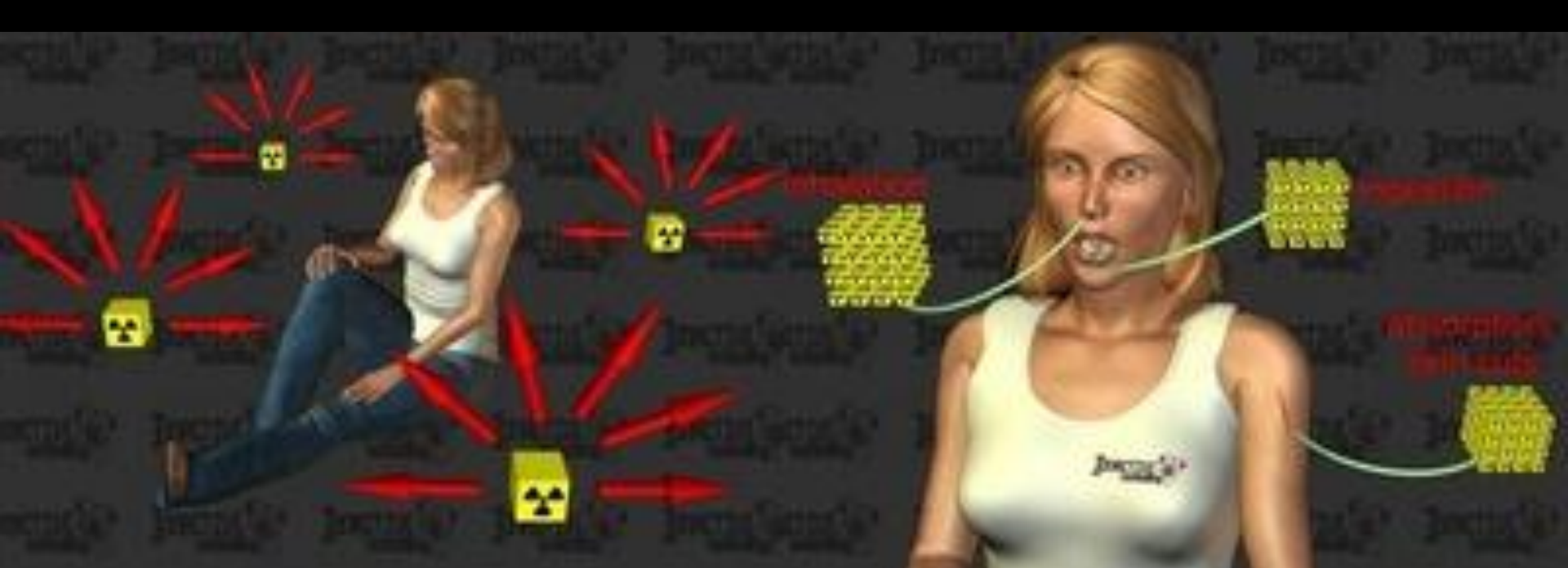
- The quantities **equivalent dose** and **effective dose** have a common unit, **sievert**. (confusion in the reporting of thyroid doses).
- Further confusion between the use of the quantity **equivalent dose** (等価線量) for radiological protection purposes and the quantity **dose equivalent** (線量当量) on which instruments are calibrated.

3.

Internal exposure

Concerns on internal exposure

- Internal exposures are perceived as more dangerous than external exposures.
- This created a lot of anxiety among the people.





United Nations Scientific Committee
on the Effects of Atomic Radiation

Fifty-ninth session
Vienna, 21 to 25 May 2012

Agenda item 4(e)
Technical discussions

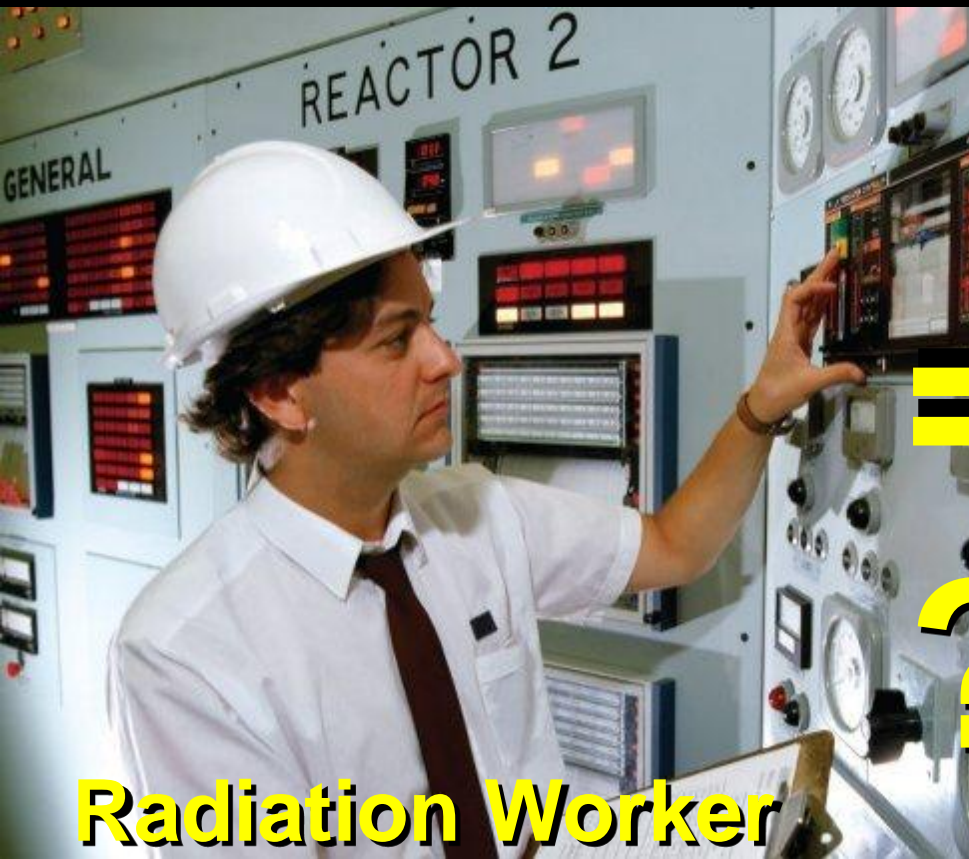
BIOLOGICAL EFFECTS OF SELECTED INTERNAL EMITTERS

4.

Occupational Protection

Protection of rescuers and volunteers

- There is a lack of *ad hoc* international protection systems applicable to ***rescuers and volunteers.***
- This complicates the regulation of the occupational doses of 'nuclear' workers.



=

?



Radiation Worker

Rescuer



Radiation Worker = Volunteers

?

5.

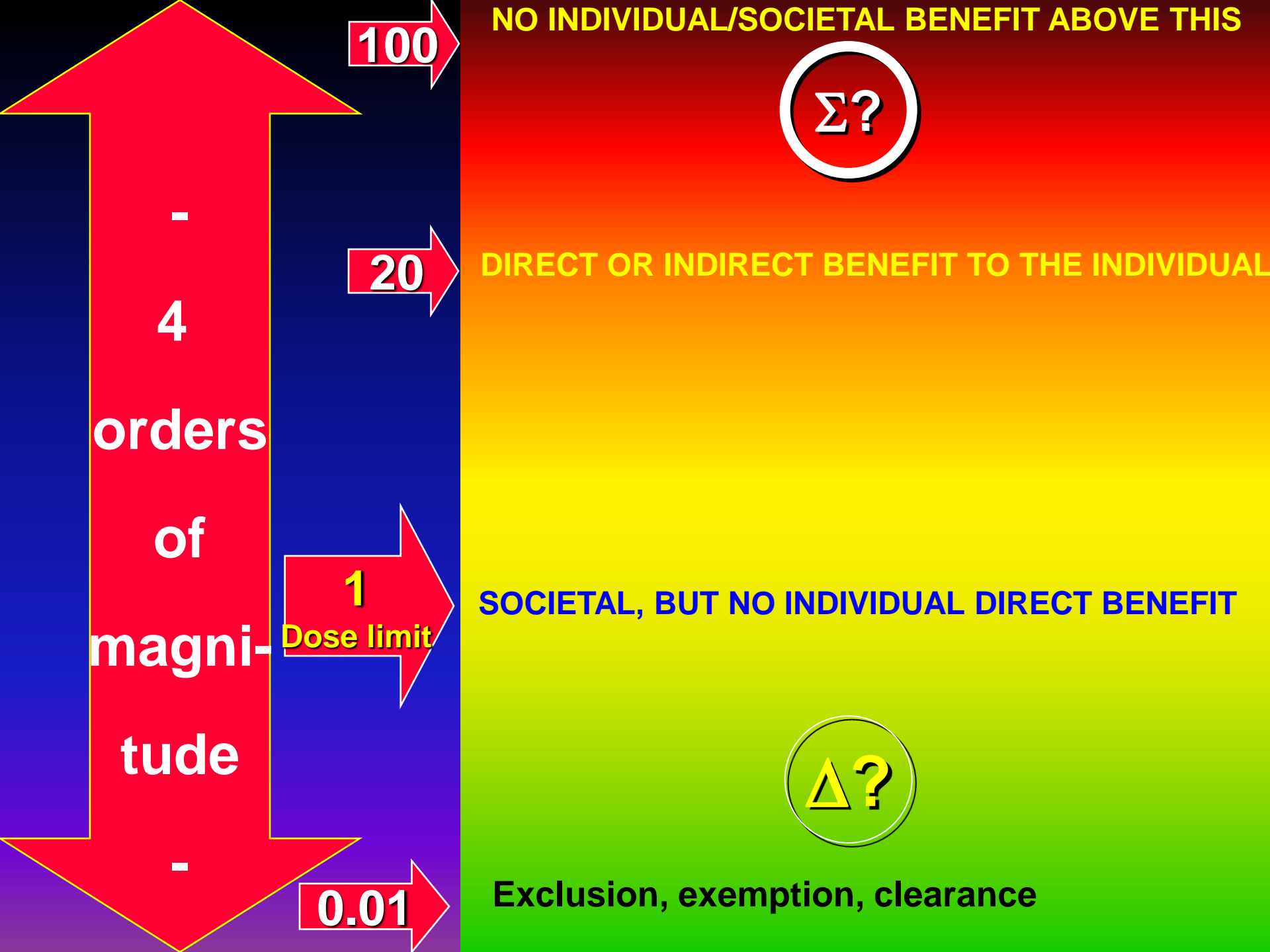
Lessons on Public Protection

Justification of severe countermeasures, such as evacuation



Level of Doses

- **The ICRP reference levels for the protection of the public are widely misunderstood by the public.**
- **As a result, the public feels unprotected.**




➤ A typical question from the public is:

Why doses of 20 to 100 mSv per year are allowed after the accident, when doses greater than 1 mSv per year were unacceptable before the accident?

➤ The Japanese expression for the 1mSv/y **dose limit**,

線量限度, [線= radiation, 量= amount, 限=border, 度=time]

is unequivocal: **amount of radiation dose not to be exceeded in the time.**



**Dose
limit that
is not a
limit?**

Are Children Properly Protected?



Parents are particularly concerned with the protection of children

UNSCEAR



30 April 2012

Original: English only

United Nations Scientific Committee
on the Effects of Atomic Radiation

Fifty-ninth session
Vienna, 21 to 25 May 2012

Agenda item 4(g)
Technical discussions

EFFECTS OF RADIATION EXPOSURE ON CHILDREN

Pregnancy

**Should I
terminate my
pregnancy?**



Importance of clarifying effects on pregnancy

6.

Psychological Effects

- **Psychological effects are dominant in the Fukushima aftermath.**
- **They are health effects in their own right**
- **However, they are basically ignored in radiation protection recommendations and standards**

The psychological aftermath

Common Symptoms after catastrophes

- * Depression
- * Grieving
- * Post-traumatic stress disorder (PTSD)
- * Chronic anxiety
- * Sleep disturbance
- * Severe headaches
- * Increased smoking and heavy alcohol use

Plus:

- * Anger
- * Despair
- * Long-term anxiety about health and health of children
- * Stigma

7.

Public Monitoring

Why members of the public are not monitored?



If it is done for them....



....why not for them

8.

‘Contamination’

Dealing with 'contamination'

- remediation of “contaminated” territories;
- disposing of “contaminated” debris and rubble;
- use of “contaminated” consumer products.

Annals of the ICRP

ICRP PUBLICATION 104

Scope of Radiological Protection Control Measures

Editor
J. VALENTIN

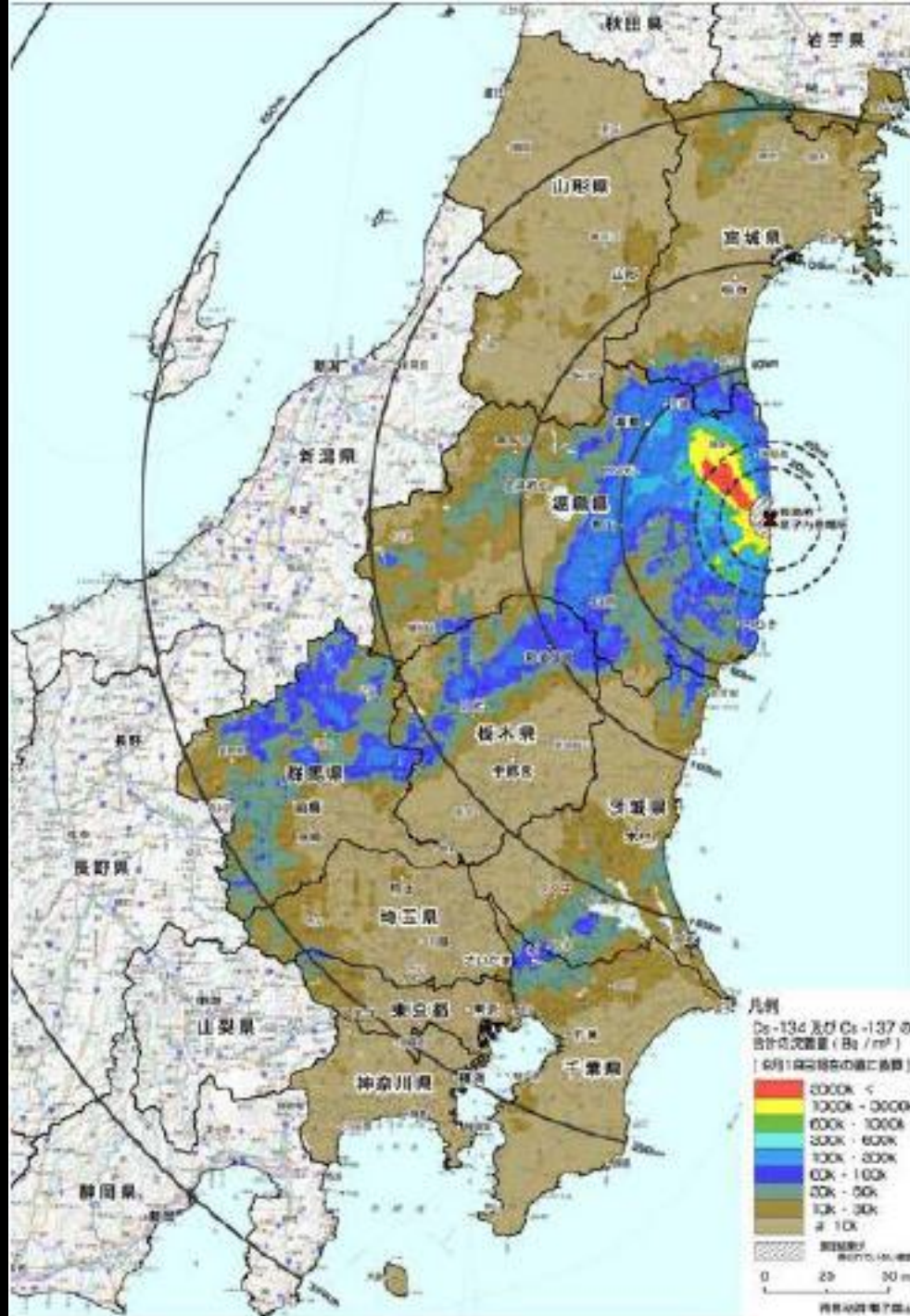
PUBLISHED FOR

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by

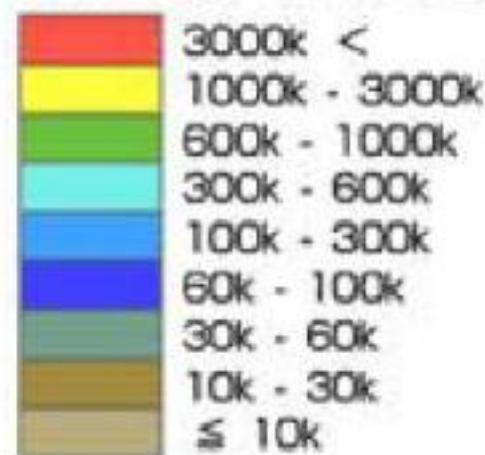


***'Contaminated'* Territories**



Cs-134 及び Cs-137 の
合計の沈着量 (Bq / m²)

[9月18日現在の値に換算]



測定結果が
得られていない範囲



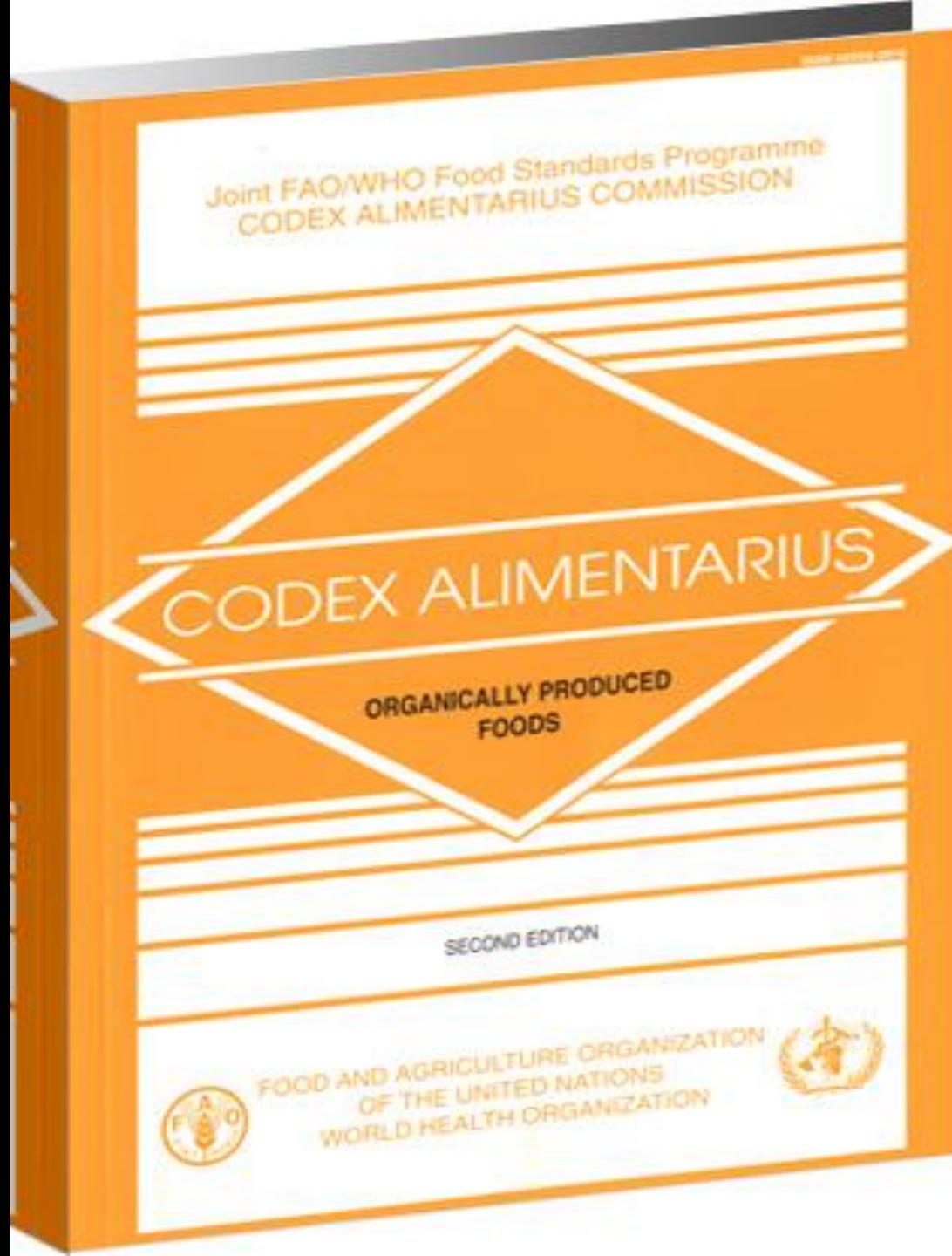
*Is it safe for me
and my family
to live here?*

***'Contaminated'* Rubble**



***'Contaminated'* Consumer Products**

Foodstuff



Guidelines for Drinking-water Quality

FOURTH EDITION

IAEA SAFETY STANDARDS SERIES

Application of the
Concepts of Exclusion,
Exemption and
Clearance


SAFETY GUIDE

No. RS-G-1.7



IAEA

International Atomic Energy Agency

A family of five is gathered around a low, dark wooden table in a traditional Japanese room with tatami flooring and shoji screens. An elderly woman in a grey kimono sits at the head of the table, pouring from a glass pitcher. A man in a green shirt sits to her left, reaching for food from a large, round, ornate wooden bowl filled with various small dishes. A woman in a white and black striped shirt sits to his left, holding a small cup. Two young children, a boy and a girl, are seated on the right side of the table, also eating. The room is brightly lit by natural light coming through the shoji screens. A red speech bubble with white text is positioned in the upper right corner of the image.

***Is it safe for
me and my
family to eat
this food?***

Epilogue

International Organizations my wish to:

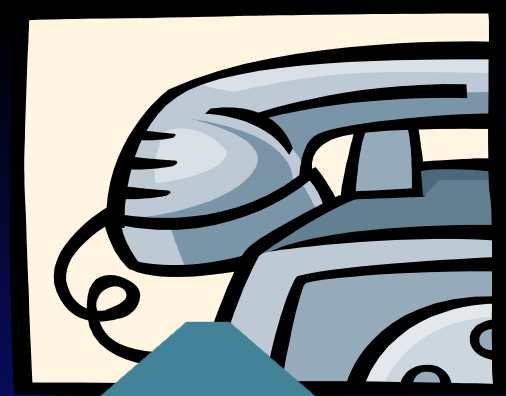
- **consider the Fukushima lessons and**
- **resolve their challenges.**

...and humbly recognize failures in communication

- **Public communication of international radiation protection policy is still an unsolved problem.**



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Thank you!

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