Update on the work of ICRP TG120 on radiation emergencies and malicious events

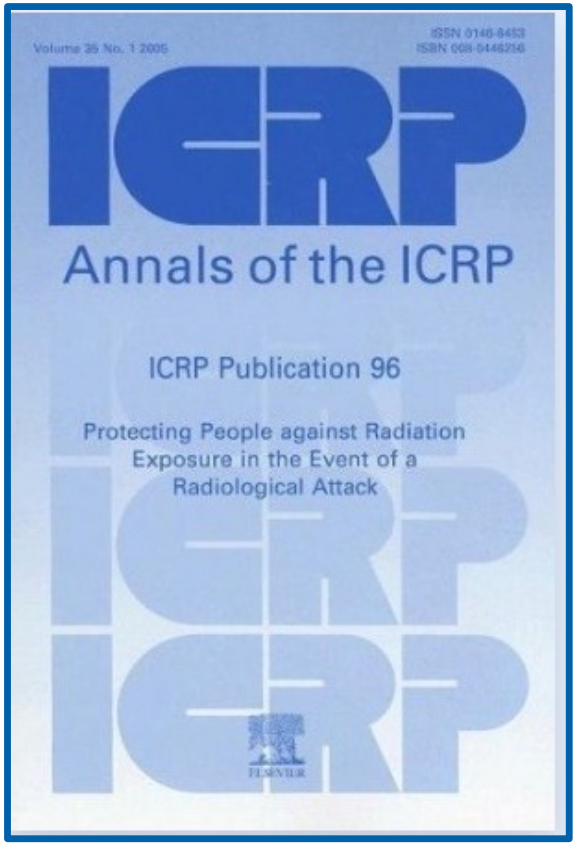
NERIS Workshop 2024
11 November 2024
Rome

Anne Nisbet
ICRP Committee 4 (member)
ICRP TG120 (chair)

Outline

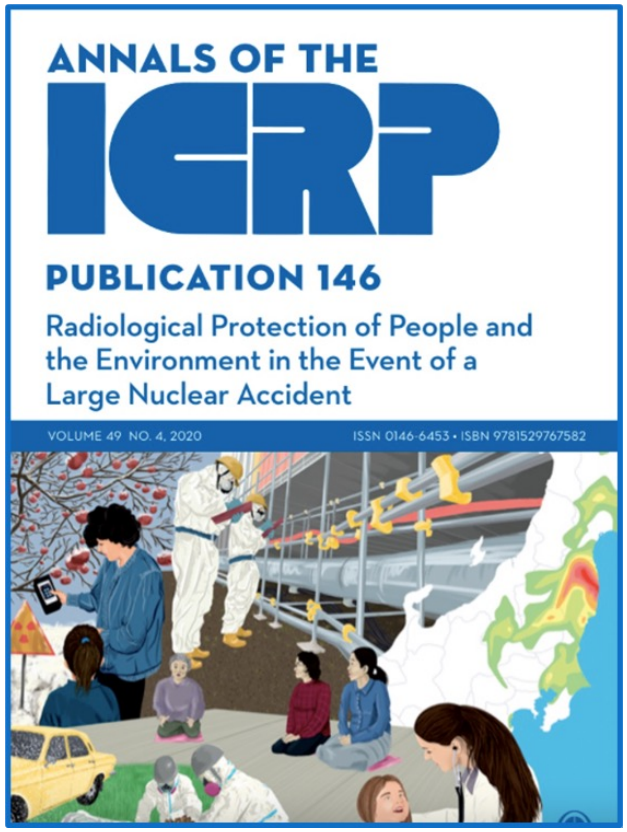
- **Overview of previous ICRP recommendations for radiation emergencies & malicious events**
- **Overview of work of ICRP Task Group120**
  - Mandate & membership
  - Scope and case studies
  - Public protection in event of a nuclear detonation
  - TG120 report - content
  - Communicating with the public during a radiation emergency
  - TG120 progress
  - TG120 timeline

ICRP Publication 96



- Prompted by terrorist attacks in 2001
- Published in 2005
- Focus on radiological attacks (RDDs)
- Based on 1990 recommendations from ICRP Pub 60
  - Practices & intervention
  - Averted dose for urgent actions
- Refers to ICRP Pub 82 (1999) for prolonged exposure situations
  - Generic criteria for intervention
  - Exclusion levels for commodities

ICRP Publication 146



- Published in 2020
- Focus on large nuclear accidents (NPP)
- Prompted by learning from Fukushima NPP accident in 2011
- Supersedes ICRP Pub 109/111 (2009)
- Based on 2007 recommendations from ICRP Pub 103
  - Exposure situations
  - Dose criteria for optimisation of protection
  - Stakeholder engagement

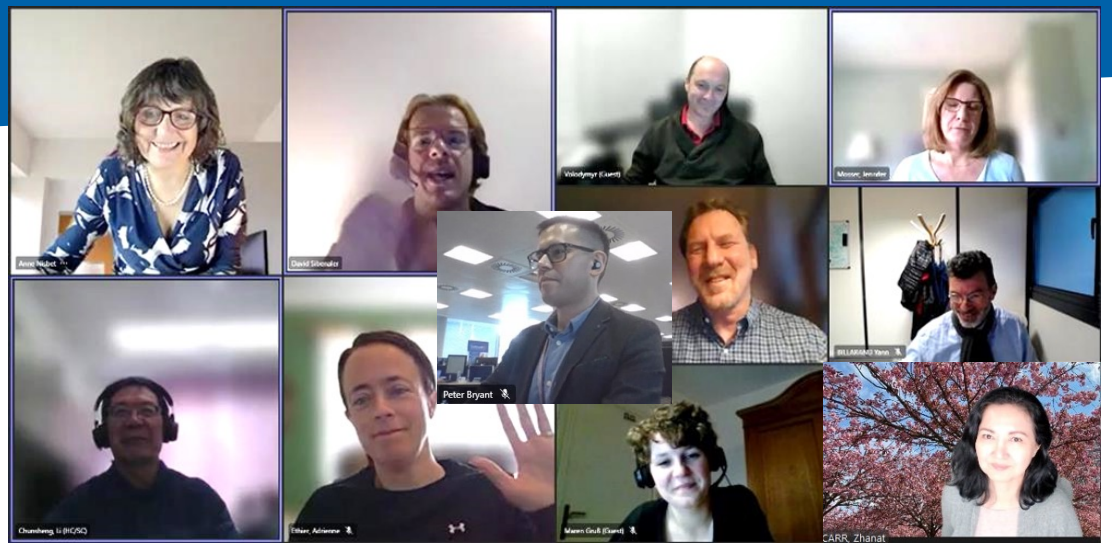
ICRP TG120: Mandate

The Task Group will develop ICRP recommendations for radiation emergencies and malicious events*. These recommendations will complement those given in Publication 146 for large nuclear accidents.

* Since September 2022, this now includes nuclear detonation

Membership

Anne Nisbet (**Chair**), C4, UK
Chunsheng Li, Canada
Jennifer Mosser, USA
Peter Bryant, UK
Yann Billarand, C4, France
Volodymyr Berkovskyy, C2, Ukraine
Brooke Buddemeier, USA
Zhanat Carr (WHO)
Mentees (communication):
Maren Gruß, Germany
David Sibenaler, Australia



C4: Critical reviewers:
Julie Burtt, Eduardo Gallego, John Takala
MC: Critical reviewers:
Werner Rühm, Michiaki Kai
ICRP Scientific secretariat:
Adrienne Ethier, Win Thuzar (intern)

Scope

Radiation accidents

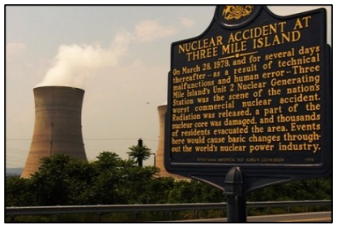
- Accidents at nuclear facilities
  - Criticalities
  - Operating faults
  - Fires/explosions
- Transport (plane, train, road, satellite, sea)
- Lost, damaged or stolen sources
- Nuclear medicine isotopes

Malicious events

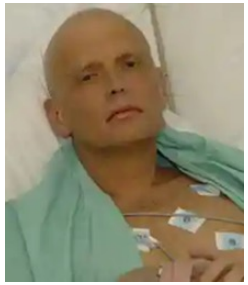
- Radiation Exposure Device (RED)
- Radiological Dispersal Device (RDD)
  - Explosive
  - Covert
- Contamination of food & drinking water
- Sabotage of nuclear facilities
- Nuclear weapon detonation



Windscale 10 October 1957



Three Mile Island 28 March 1979







Case studies & hypothetical scenarios

Scenario type	What/where	Cause	Specifics
Accident	Nuclear facility	Criticality	Tokaimura, Japan (1999)
		Operating fault	Three Mile Island (1979)
		Fire/explosion	Windscale (1957)
			Kyshtym (1957)
			Techa River (1961)
			Hanford (1976)
	Inadvertent theft, damage, loss of sources. Orphaned sources	Theft	Goiania (1987)
		Damage to sealed source	Harborview (2019)
		Lost/orphaned	Chile (2005)
	Transport	Satellite	Cosmos 954 (1978)
		Plane	Palomares (1966)
	Other	Nuclear medicine isotopes	Birmingham hospital (2018)
Malicious	Sabotage	Nuclear facility	Hypothetical Military attack
	Nuclear weapon detonation	Explosive (airburst)	Hiroshima (1945)
		Explosive (ground burst)	Hypothetical 10kT
	RDD	Explosive	Hypothetical RDD
	RED	Covert	Hypothetical RED
	Poison Individuals	Food and drink	Litvinenko (2006)

Scenario summary template

Topic	Sub-headings
Description	What happened; radionuclides; type of release - airborne/aquatic; HASS; affected environments; scale
Timelines & duration	Phases: response (threat, early and intermediate); recovery (long-term)
Exposure pathways	External exposure; Internal exposure; direct exposure
RP criteria & protective actions	Dose criteria applied; protective actions implemented; if/how protection decisions were justified; if/how protection was optimised; SDGs considered?
Consequences: Human and society	Radiation-induced health effects: tissue reactions, cancer & heritable diseases; Non-radiological impacts: mental health, psychological, other. Societal impact
Consequences: Affected biota	Radiation-induced effects: direct damage, changes in biodiversity; Impact on ecosystem services, pets and livestock;
Stakeholder engagement	How, when and who
Communication	When, what, how, impact
Lessons learned	What worked well and why. What could be improved

Public protection in case of a nuclear detonation

- Prompted by war in Ukraine
- ICRP TG120 was asked to prepare general advice for public protection
- More detailed guidance covering much broader range of topics, including protection of responders will be published in ICRP TG120 report

www.icrp.org/protection-nuclear-attack.html

Advice for the Public on Protection in Case of a Nuclear Detonation

Clear instructions & information

THE FIRST 10 MINUTES

THE FIRST 24 HOURS

THE NEXT 48 HOURS

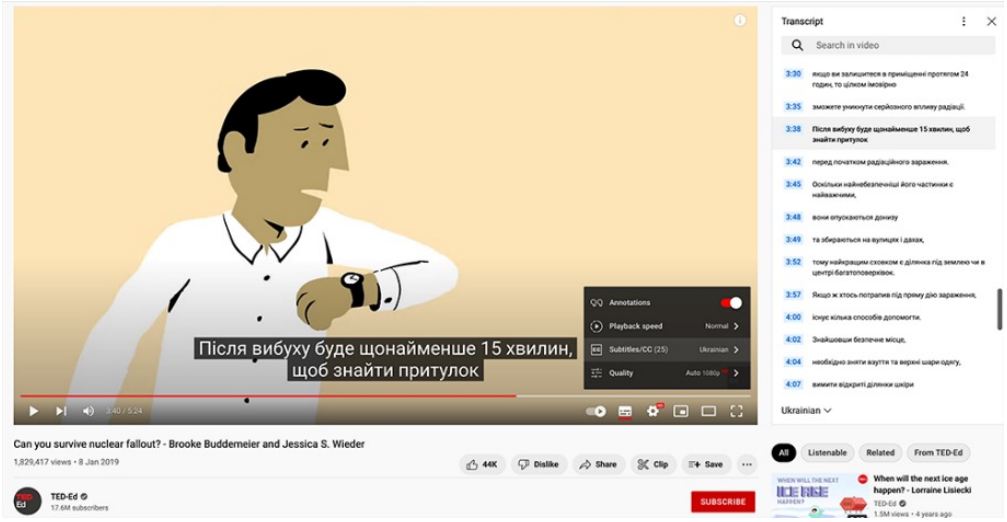
UNDERSTAND THE HAZARDS

HOW TO BE PREPARED FOR A NUCLEAR DETONATION

RESPONDING TO ALERTS

Link to 5 min TedEd video

“Can you survive nuclear fallout?”



First 10 minutes

Be inside before the fallout arrives. After a detonation, you will have 10 minutes or more to find an adequate shelter before fallout arrives. If a multi-story building or a basement can be safely reached within a few minutes of the explosion, go there immediately. The safest buildings have brick or concrete walls. Underground parking garages and subways can also provide good shelter.

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The best thing you can do after a nuclear detonation is go inside. Put as much material as possible between you and the radioactive material outside.

First 24 hours

- **If exposed to fallout:**
  - Remove outer layers of clothing
  - Wipe or wash exposed skin
- **Tune in to any available media**
- **Remain inside, unless threatened by an immediate hazard or informed by authorities that it is safe to leave**
  - If, you are an essential worker, you may be released for short period to perform critical duties

Five minute video is available (subtitles in many languages) on how to prepare for and survive, a nuclear detonation

Next 48 hours

- **If told to remain in shelter**
  - Stay inside, unless life-threatening injury or other serious threat or hazard
    - Do not go outside to collect loved ones
  - Consume stored food and water sparingly. Do not harvest/eat food from outside
  - Support care of vulnerable people – set up a first aid station in protected shelter
  - Only request help, if life threatening medical condition
- **If told to evacuate (from home)**
  - Take medicine, change of clothes, mobile phone, medical/legal papers
  - Take disaster supplies (torch, radio, first aid kit, food & water, cash, cards)
  - Do not return home, until told to do so
  - For pets, bring cage, leash, food, medication

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TG120 Report

Section 2: General considerations

Section 3: Emergency response

Section 4: Recovery

Section 5: Preparedness & planning

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Section 2: General considerations

Subsection	Detail
Scenarios	• Accidents (4 categories)) • Malicious events (5 categories)
Timelines	• Response: early response; late response; recovery; transition to normal living
Exposure pathways	• Direct external; airborne; aquatic
Consequences: people	• Affected populations (members of the public, responders) • Radiation induced health effects • Non-radiological health effects • Impact on society and economy
Consequences: environment	• Affected biota (flora, fauna, soil, groundwater • Radiation induced health effects on biota • Non-Radiological Effects and sustainable decision making
Goals and objectives of RP in emergencies	• Goals and objectives • Principles of protection (justification, optimization & reference levels; dose limits) • Application of dose criteria (emergency exposure, existing exposure)
Stakeholder engagement & communication	• Processes for engagement • Role of communication

Section 3: Emergency response

Activity	Imminent release	Early response phase First hour – first days	Late response phase Days – weeks
Assessment against radiological criteria			
Monitoring, dosimetry			
Modelling			
Rescue, life saving			
Triage, decontamination			
Medical countermeasures			
Protective actions			
MHPSS			
Environmental protection			
Communication			
Stakeholder engagement			

Communicating with the public during a radiation emergency

TG120 recruited mentees

- To develop simple, and effective social media messages
- To support the drafting of the communication section of the Task Group's Report

Social media – benefits and challenges

Benefits

- Fast distribution of information
- Increased outreach
- Two-way dialogue
- Monitoring of social media
- Increased visability

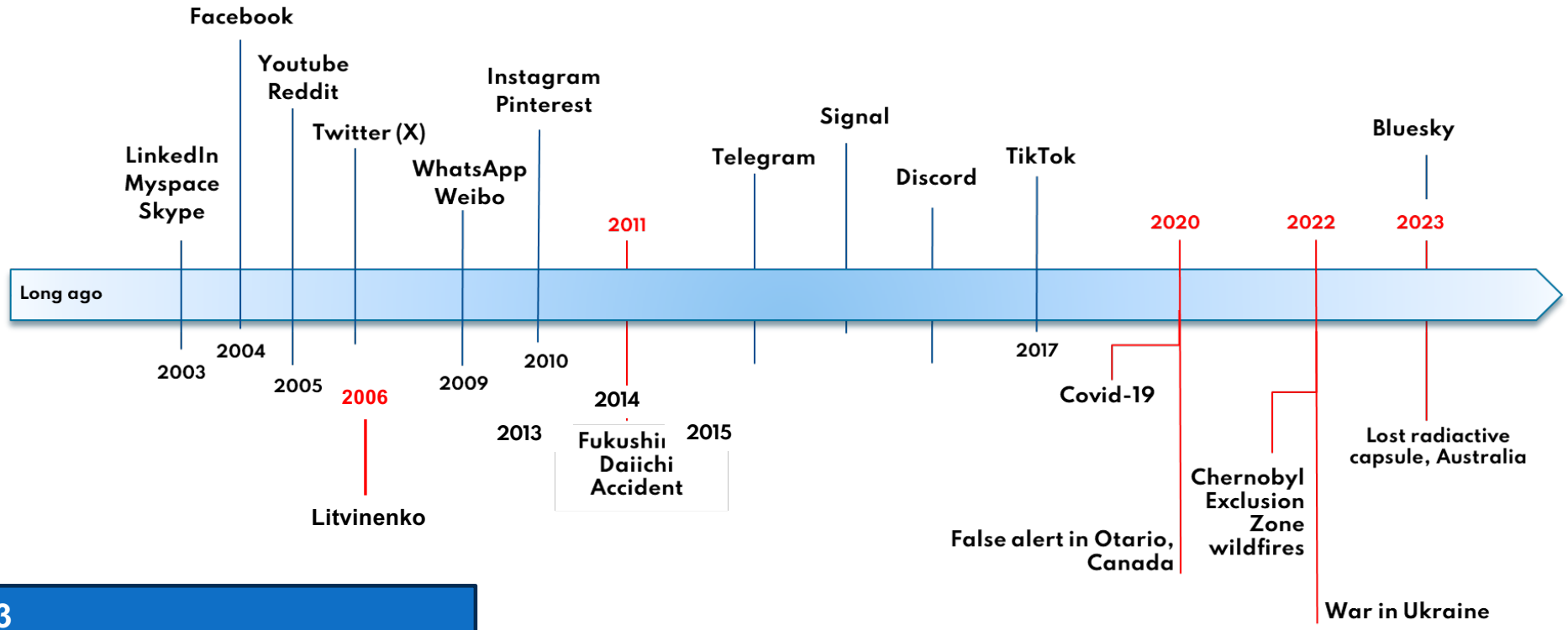


Challenges

- Too many voices
- Conflicting information
- Misinformation & disinformation
- Polarization & politisation
- Resource-intensive

Acknowledgement: Maren Gruß

Social media communication: history



Pre 2003
Windscale (1957); Palomares (1966); TMI (1979); Chernobyl (1986); Goiania (1987); Tokai mura, (1999)

Acknowledgement: Adapted from Maren Gruß

Learning from past radiation emergencies

- **TG120 examining communication strategies used in the past to derive social media templates for a wide range of emergencies**
- **Series of topical meetings:**
  - Litvinenko (2006)
  - Goiania (1987)
  - Harborview (2019)
  - Birmingham hospital (2018)
  - Australian lost capsule (2023)
  - US Radiological Assistance Programme (RAP) terrorist scenarios
- **‘Communication in radiation emergencies’ – already covered by IAEA, WHO, IRPA etc. Therefore, ICRP advice must add value**

TG120 Progress

- Critical review of Pub 96 and Pub 146
- Populated detailed templates for 15 case studies, 3 still to complete
- Webpage on ‘Public Protection in case of Nuclear Detonation’ (Oct 22)
- Drafted Chapter 2 on ‘General Considerations’ of TG Report
- Convened 11 TG meetings (mix F2F and online)
- Convened 8 online ‘topical’ meetings (e.g. ND, RP criteria, communication)
- Significant outreach 2023/24:
  - ConRad (Munich), REMPAN (Seoul), ERPW (Dublin), ICRP Symposium (Tokyo). SRP (Eastbourne); IRPA (Orlando)
- Recruited 2 mentees to provide input on communication (Mar 23-Feb 26)
- Workshop planning (Apr 2025)

TG120 Timeline

Phase 1 (Oct 21 – Mar 25):

- Preparation of materials

Phase 2 (Apr 25 – Sep 25):

- Workshop(s) and continue preparation of materials

Phase 3 (Oct 25 – May 26):

- Draft report for SLO & public consultation

Phase 4 (Dec 26):

- Publish final report

Thank you for listening

Any questions?

Contact me:

annenisbet0@googlemail.com



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