Lessons learned regarding societal and socio-economic consequences for implementing the ICRP System of radiological protection

ICRP Workshop on Lessons for radiological protection from the Chornobyl and Fukushima Daiichi NPPs accidents

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Michiaki KAI
Thierry SCHNEIDER
With the support of:
Nobuhiko BAN
and Toshimitsu HOMMA

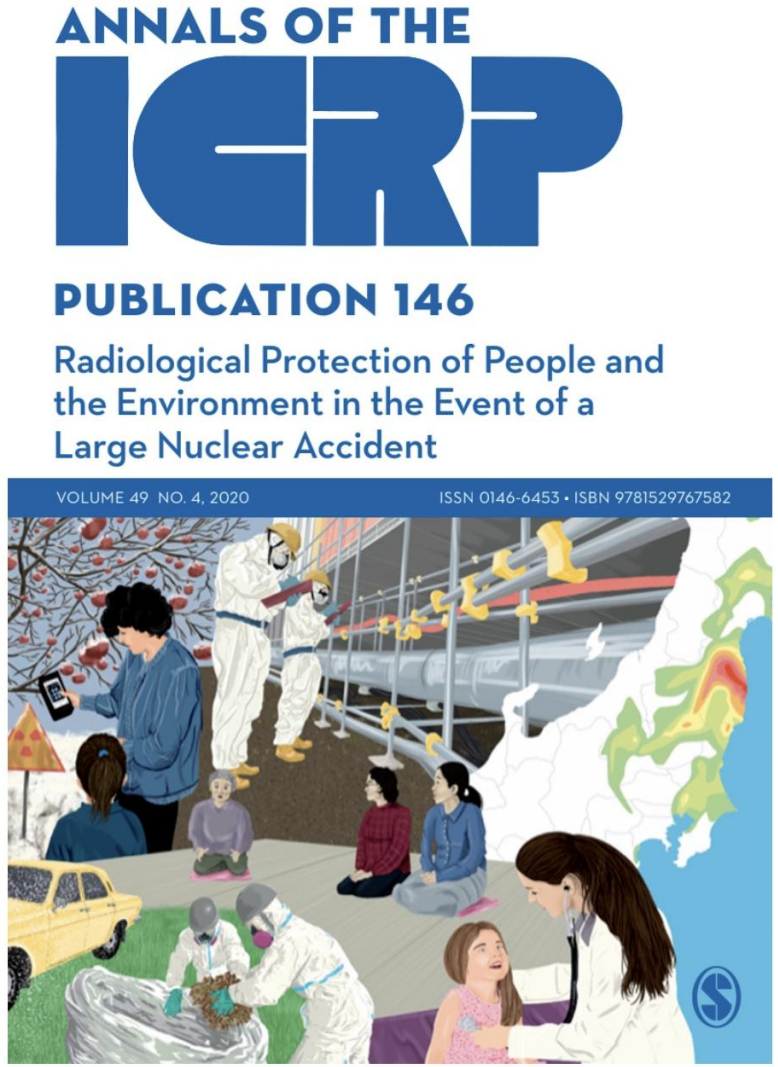
Introduction

Publication in 2020 of ICRP Pub 146

- Highlight key lessons from Chornobyl and Fukushima accidents
- Focus on managing intermediate and long-term phases

On-going process of reviewing and revising ICRP general recommendations

- Current programme of work
- Proposal for cooperation



Lessons from experience

- **Chornobyl and Fukushima accidents clearly emphasised that after a nuclear accident:**
  - People are **lost**
  - **No longer trust** the authorities and experts
  - Gradually **lose control** of their daily life
  - Under a **threat to their autonomy and dignity**

- **The return to the original state is generally not possible:**
  - Fully removing radioactivity is **not achievable**
  - Many human and societal consequences are **irreversible** (departures, etc.)
  - Breakdown of communities leads to **divisions and complex dilemmas**

- **The socio-economic dynamic is confronted to an altered context with new constraints (demography, image, environment...)**

Main societal and socio-economic consequences of large nuclear accidents (1)

Societal consequences

The Chornobyl and Fukushima nuclear accidents had **similar consequences in terms of the societal impacts** of the presence of radioactive contamination

- Presence of radioactivity **upsets the well-being** of individuals and induces modification of the demography of communities due to numerous departures among the population
- Protective actions of the accident **affects lifestyle and relationships between affected people**, restrictions in daily life, modification of living and working conditions and the side effects of decontamination and compensation mechanism
- **Collapse of trust** in experts and authorities; **disintegration of families** and social ties
- An accident generates an attitude of **rejection towards affected areas** and any goods produced there
- It also generates **stigma and discrimination** against people from affected areas

Main societal and socio-economic consequences of large nuclear accidents (2)

Psychological consequences

- An accident generates many **concerns** and considerable **fear** of radiation.
- Studies reported an elevated rate of **depression** and **post-traumatic stress disorder** among the responders who were directly confronted by the disaster scene

  In Fukushima, 247 of 2775 (8.9%) individuals suffered psychological distress which was related to anxiety about the impact of radiation on health (Hayashi,2020)

  In Chornobyl, the excess number of suicides suggests long-term psychiatric and substance use problems tied to Chernobyl-related stressors (Rahu, 2023)
- Concerns about **potential harm to children's health**, particularly regarding hereditary effects

Main societal and socio-economic consequences of large nuclear accidents (3)

Economic consequences

- Profound **changes in the agricultural sector** and fishing if the affected country is concerned
- Impacts on critical **infrastructure** (utilities, public transport, food and water supplies…) and supply chains
- Constraints for **maintaining economic activities** for employers and employees

Health impacts of changes in lifestyle associated with protective actions

- Long-lasting physical health effects due to **change in lifestyle** during the recovery phase : lack of exercise, poor diet, substance abuse, restricted access to medical facilities…
- Effects observed: Obesity, diabetes, cardiovascular and circulatory diseases, hypertension and chronic kidney disease…
- Diabetes risk in terms of **loss of life expectancy** among residents were 5.9-fold and 33-fold higher than those attributed to average radiation (Murakami,et al. 2017)

Justification of protective actions

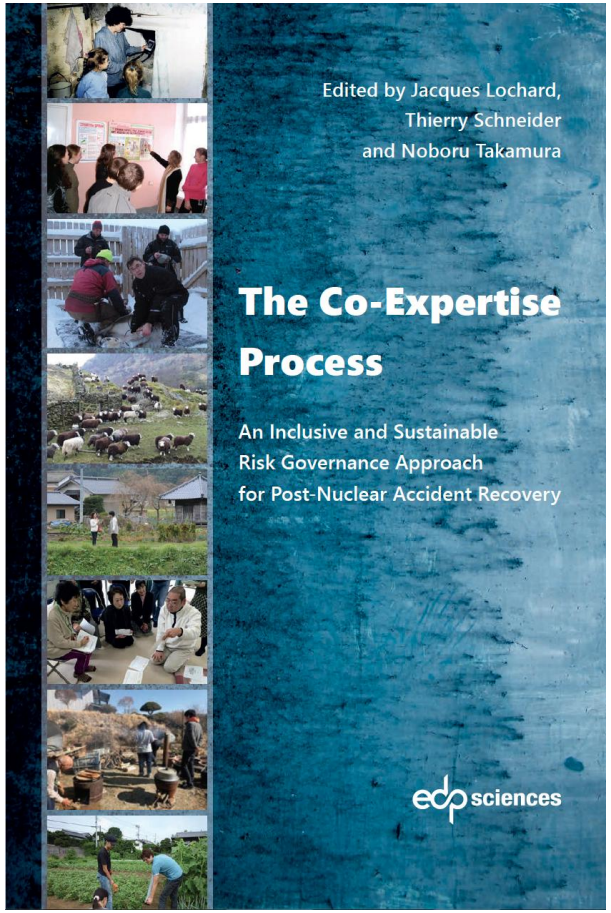
- **Evacuation and sheltering** of people are the most delicate decisions.
- Studies suggested that
  - Evacuating the elderly is not the best course of action in the event of an accident. (Nomura, 2013)
  - Evacuating from facilities such as nursing homes posed a greater risk than the radiation exposure of a few hundred mSv (Murakami, 2015)
  - Lengthy and unattended sheltering could also be harmful (Shimada et al., 2018)
- Against this background, **there were fear of radiation, myths and misinformation**
- Lessons learned from the Fukushima accident suggest that the **unplanned evacuation of elderly or medically supervised people** from nursing homes may have caused more harm than good for these people
- Decision on implementing protective actions such as evacuation and sheltering must be made in order to **maximise the well-being considering all hazards as well as the overall benefit to society**

Lifting of protective actions

- **Lifting of protective actions** is a difficult decision during the early and intermediate phase.
- Requires that actions no longer be considered necessary
  - The decision to **prohibit return to these affected areas should be justified** with due recognition of the severity
- The assessment should be **shared**
  - Decisions on allowing to return to their homes involve an **extensive dialogue** with the affected people
  - It is important to **provide inhabitants with full details** about the living and working conditions
  - **Characterisation of the radiological situation** is sufficiently well achieved to allow effective decisions regarding the environment, foodstuffs, goods, and people

Communication and dialogue: Developing radiological protection culture

- Defined as ‘the knowledge, know–how and means enabling citizens to make **informed choices and behave wisely** in situations involving potential or actual exposure to ionizing radiation’
- RP culture allows citizens:
  - To **interpret** the results of the measurements of radiation
  - To **build** their own benchmarks in relation to the radioactivity present in their daily life
  - To **make their own decisions** to protect themselves and their loved ones (self-help protection)
  - To **assess the effectiveness** of the protective actions implemented by themselves or by authorities and organisations
- Making people as much as possible **autonomous** with respect to radiation i.e. able to make **informed decisions** given the prevailing circumstances with a key role of **co-expertise process**



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Governance of socio-economic activities

- **Continuing or restoring the production** not always manageable.
- Deploying a **socio-economic programme** for ensuring the community resilience in affected areas requires the adoption of governance mechanisms
- Re-establishing the **link with the consumers** and organising the the vigilance on the long-term are necessary
- It is of primary importance to rely on the **involvement of local communities**

Key lessons from the accidents

All health-related consideration is required as well as radiation-related health risk

- **Health impacts of changes in lifestyle** associated with protective actions
- Unplanned evacuation of **elderly or medically supervised people** from nursing homes may have caused more harm than good for these people
- Decision regarding evacuation and sheltering must be made in order **to maximise the well-being** considering all hazards.

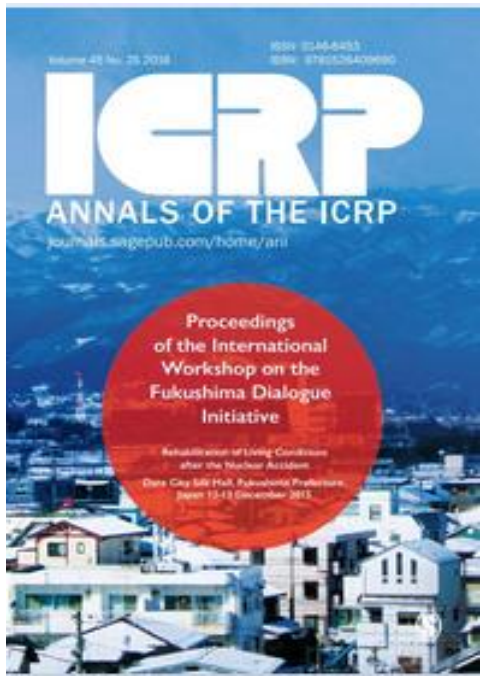
Ethical consideration

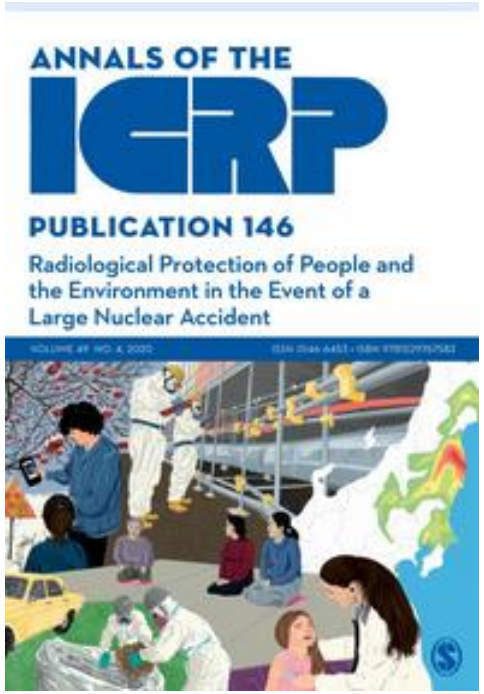
- Making people as much as possible **autonomous,** i.e. able to make **informed decisions** given the prevailing circumstances

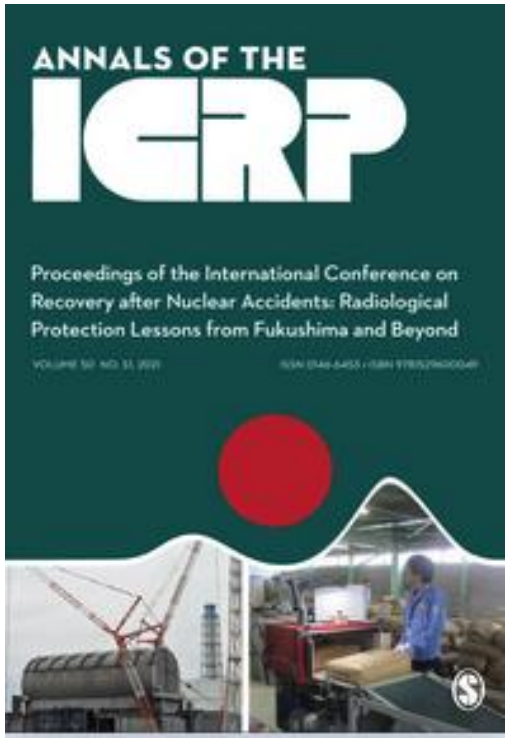
Communication, dialogue and co-expertise

- Loss of information and communications lead to **psychological impacts**
- Communication aims at **avoiding misinformation and misunderstandings** that could have adverse effects
- Maintaining and strengthening **community ties** are crucial
- **Radiological protection culture** needs to be developed.

A series of publications from ICRP







Review & Revision of the System of Radiological Protection

The System of RP is robust and has performed well

however

it must adapt to changes in science and society to remain fit for purpose

A quarter century has passed
since the last review was initiated

Some key societal and socio-economic topics for emergency and recovery: An ICRP Perspective

- Considering the tolerability of risk and looking for reasonableness
- Applying the principle of justification
- Reviewing the application of exposure situations
- Sustainability of protective actions and sustainable development
- Applying the ethical values

Considering the tolerability of risk and looking for reasonableness (TG114)

- Key role in the **selection of reference levels** to guide the optimisation and set up the border for tolerability with due consideration of the different post-accident phases
- Significant **uncertainties** due to exceptional circumstances, impacting the search for reasonableness
- Focus on the **stepwise process** and key role of the dynamics during the different phases of managing the consequences of the accident
- Decision-making process relying on **multifactor considerations** evolving according to the specific context and the characteristics of the situations
- **Stakeholder involvement** essential to ensure a good and sustainable level of protection
- **Ethical values** at the core of the search for reasonableness and tolerability with a focus on the respect of dignity and autonomy of citizens and the aim to ensure decent living and working conditions

Applying the principle of justification (TG124)

Broadening the scope

- From "**Prevention and mitigation of health detriment of radiation**"
- To "**Maintenance and improvement of well-being under exposure situation**"

Key aspects

- Ethical considerations
- Sustainability
- Stakeholder involvement
- Link with optimisation
- Protection strategy for emergency

Reviewing the application of the approach in terms of exposure situations (ICRP TG 127)

- **Some key challenges for emergency and recovery:**
  - **Transition** from one type of exposure situation to another:
    - Considering the different phases of the accident from emergency to recovery
    - Anticipating the evolution of the management in time and space
  - Selection of **reference levels**:
    - Adapted to each phase of the accident
    - Reflecting the characteristics of the situation
    - Addressing the expectations of the local communities
  - **Classification of workers/responders** and application of the system

Sustainability of protective actions and sustainable development

- **Key role of justification for the transition from emergency to recovery**
  - *"This decision should also take into account the **information available on the sustainability of societal and economic activities.** It is necessary to decide, among other things, the areas where the population is not allowed to stay in view of the high residual levels of exposure and **the difficulty to maintain suitable living and working conditions**, and the areas where, given the exposure situation, people are allowed to **live permanently if they wish to do so**." (ICRP Pub 146, 2020, Para 56)*

- **Conditions and means for recovery**
  - ***Characterisation** of the radiological situation and system of radiological **monitoring** for the people and the environment*
  - ***Co-expertise process** and mechanisms for the **involvement** of local stakeholders in the **decision-making process***

  (ICRP Pub 146, 2020, Para 175)

Applying the ethical values (TG129)

- **Some issues to be addressed for emergency and recovery following a nuclear accident:**

  - Define and apply the concept of **well-being**
  - Feedback experience on decision-making and communication on **health effects** with due consideration to the **current knowledge and uncertainties** including effects for **future generations**
  - Analyse the challenges related to **equity** in decision-making processes
  - Survey the **perception** of inhabitants on their **autonomy** and investigate the deployment of **co-expertise** process

Concluding remarks

- **Chornobyl and Fukushima accident largely challenge the application of the system of radiological protection**
  - Selection of relevant **radiological criteria**
  - Application of **optimisation** and addressing **low level of exposures**
  - **Transition** from one phase to another and **lifting** of protective measures
  - Addressing the **long-term issues** and link with **sustainable development**
  - Role of **stakeholders** and applying **ethical values**
  - …
- **Currently, ICRP is in the process of reviewing and revising the general recommendations**
  - Opportunities to embark some **lessons learned from Chornobyl and Fukushima**
  - Better address **social and human dimensions, ethical issues, complexity of risk management and risk governance and sustainability of protective measures**

Thank you for your attention