



# Existing Exposure Situations: Challenges and the Current Work of ICRP

14<sup>th</sup> European ALARA Network Workshop  
ALARA in Existing Exposure Situations

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Christopher Clement  
ICRP Scientific Secretary



# Overview

- Introduction: ALARA and Existing Exposure Situations
- Characteristics of Existing Exposure Situations
- Radiological Protection in Existing Exposure Situations
- Example: Fukushima NPP accident

# Key Principles

## Justification

- Any decision that alters the radiation exposure situation should do more good than harm.

## Optimisation of Protection

- The likelihood of incurring exposure, the number of people exposed, and the magnitude of their individual doses should all be kept as low as reasonably achievable (**ALARA**), taking into account economic and societal factors.

### Application of **Dose Limits**:

- The total dose to any individual from regulated sources in planned exposure situations other than medical exposure of patients should not exceed the appropriate limits specified by the Commission.

# Exposure Situations

## **Planned** Exposure Situation

- planned operation of deliberately introduced sources including decommissioning, disposal, and rehabilitation

## **Existing** Exposure Situation

- already exists when a decision on control has to be taken, including natural background and residues from past practices operated outside the system

## **Emergency** Exposure Situation

- unexpected and requiring urgent action

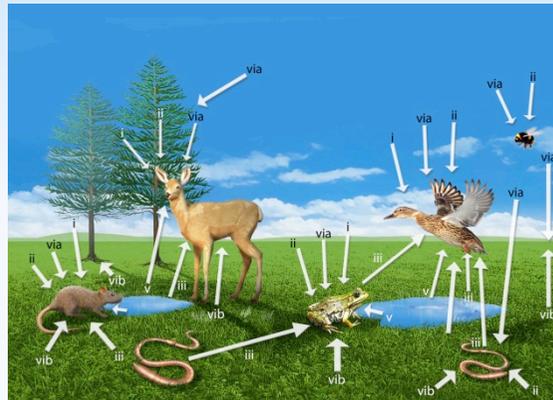
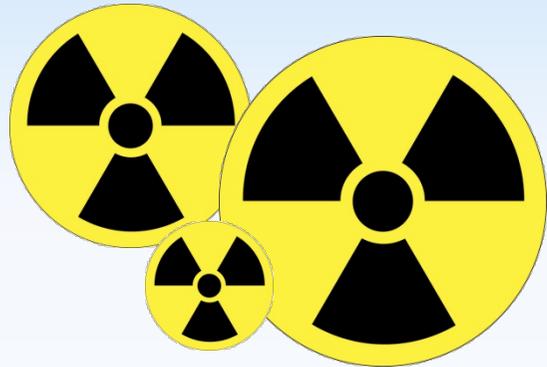
# Example Existing Exposure Situations

- Exposure in effected areas after a nuclear accident or a radiation emergency
- Exposure to radon in dwellings and workplaces
- Exposure to naturally occurring radioactive material
- Exposure of aircraft crew to cosmic rays
- Exposure on contaminated sites from past activities

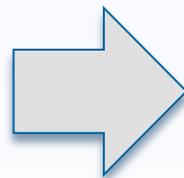
# ICRP Publications on Existing Exposure Situations

- **P111: ... Protection of People Living in Long-term Contaminated Areas After a Nuclear Accident or a Radiation Emergency**
- TG 81: Radiological Protection against Radon Exposure (*consultation on draft report complete*)
- TG 76: NORM
- TG 83: Protection of Aircraft Crew against Cosmic Radiation Exposure
- TG 84: Initial Lessons Learned from the NPP Accident in Japan vis-à-vis the ICRP System of Radiological Protection

# What is an Exposure Situation?



**Sources**



**Pathways**

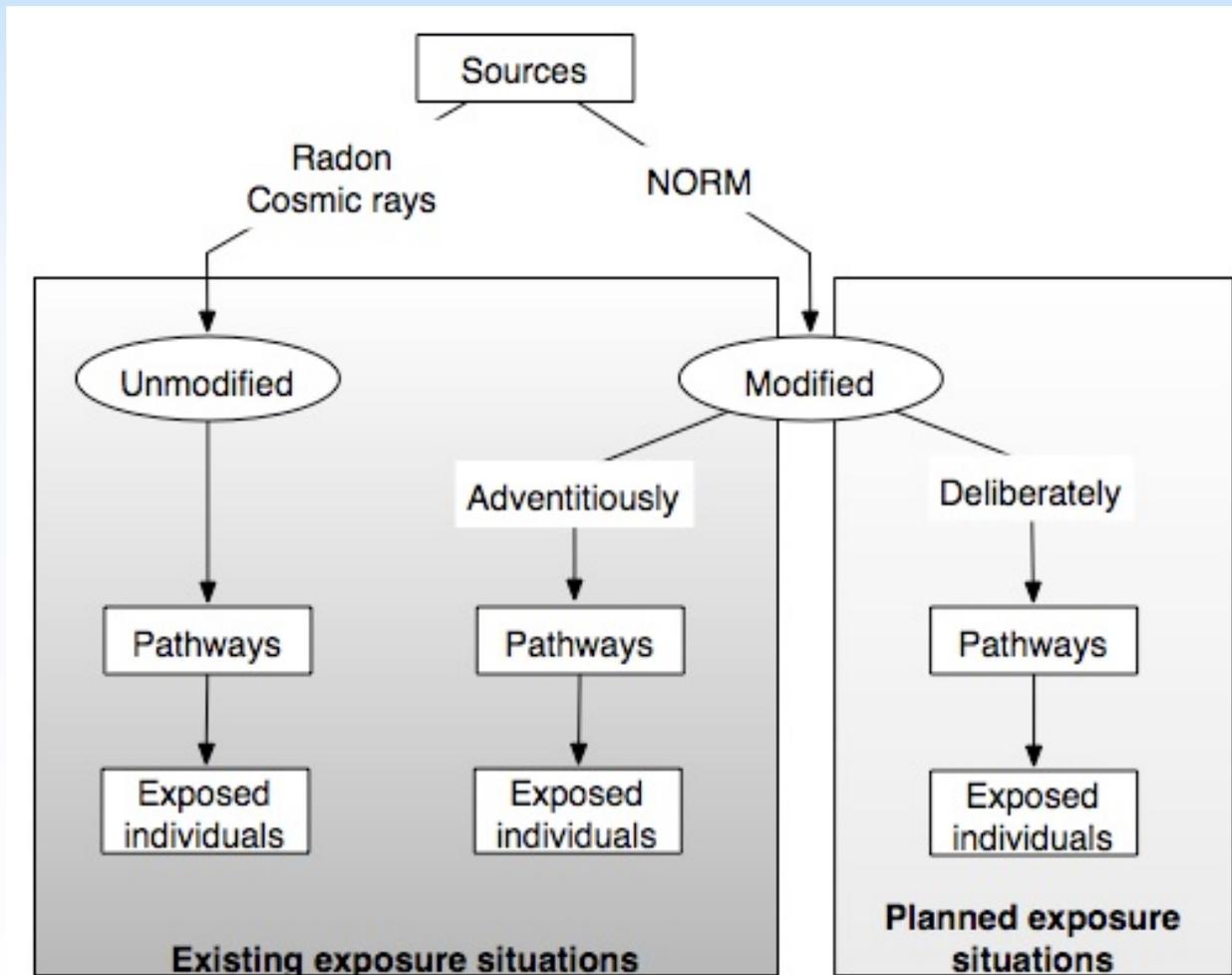


**Exposed individuals**

# Characteristics of Existing Exposure Situations

- Natural vs anthropogenic ?
- Public vs occupational exposures ?
- Controllability ?
- Timing of protective measures ?

# Existing ≠ Natural



Existing exposure situations can also arise from accidents and past practices

# Occupational, Public and Medical Exposure Categories

## **Occupational**

exposure of workers incurred as a result of their work

- Due to ubiquity of radiation limited to exposures at work reasonably regarded the responsibility of operating management

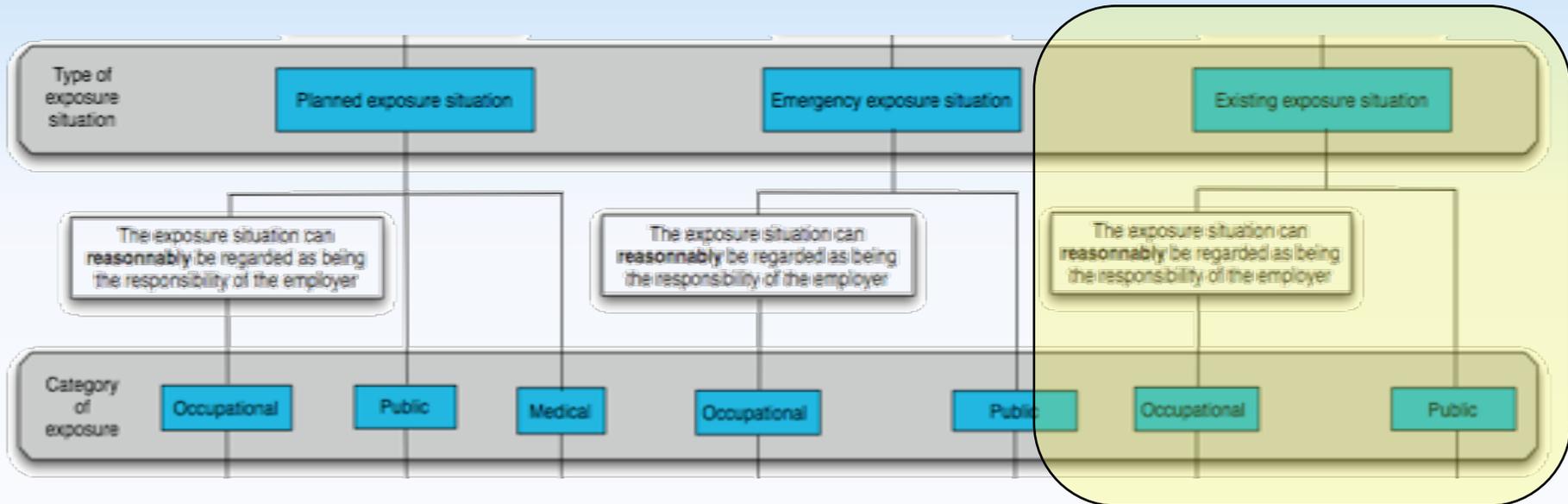
## **Medical**

exposure of patients in diagnostic, interventional, and therapeutic procedures

## **Public**

all exposures other than occupational and medical

# Existing ≠ Public



Existing exposure situations can result in both public and occupational exposures

# Existing Exposure Situations: Controllability

## Sources

- Generally not controllable



## Pathways

- Generally only partially controllable



## Exposures

- Controllable in principle, if not always in practice



# Controllability

	Sources	Pathways	Exposures
<b>Planned exposure situations</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>
<b>Emergency exposure situations</b>	<b>No</b>	<b>Partially</b>	<b>Partially</b>
<b>Existing exposure situations</b>	<b>No</b>	<b>Partially</b>	<b>Yes</b>

# Timing of Protective Measures

## **Planned Exposure Situation**

- Specific measures planned prospectively

## **Emergency Exposure Situation**

- General planning, but specific measures respond to evolving situation
- Urgent actions – failure to act may mean loss of opportunity to prevent or mitigate exposures

## **Existing Exposure Situation**

- Characterisation before taking action
- Protective measures not “urgent”
- Full control may take a long time

# Applying the System of Radiological Protection

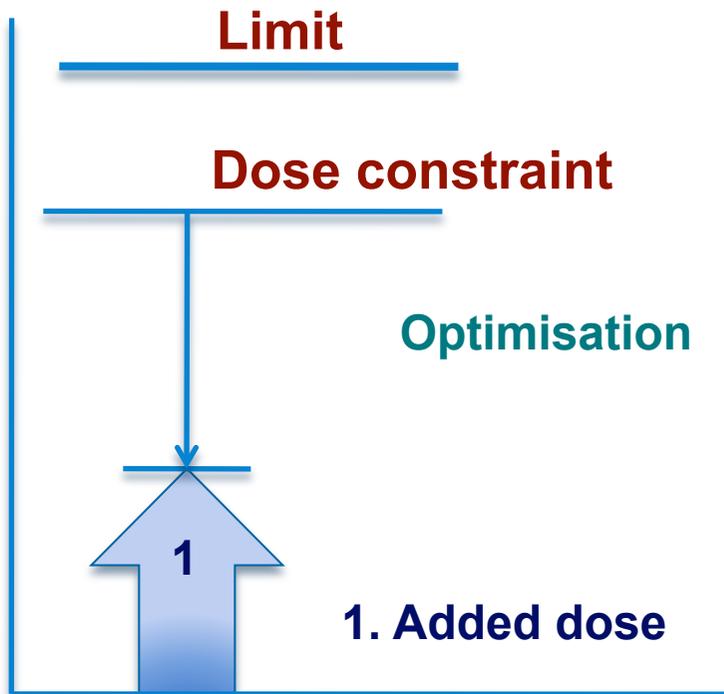
## ***Optimisation of protection with boundaries***

In ALL exposure situations  
For ALL categories of exposure

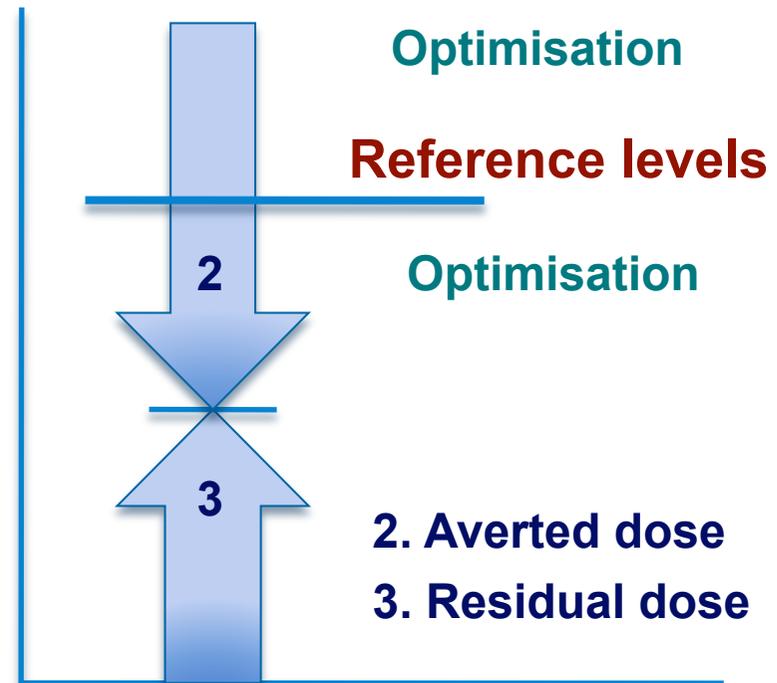
- Hard boundaries: dose limits
- Softer boundaries: dose and risk constraints, various reference levels

# Optimisation

**Planned exposure situations**  
(Identical to “practices”)



**Existing and emergency exposure situations**



# Reference Levels

- Used in optimisation of protection to restrict individual doses
- Initial intention is to not exceed, or to remain at, these levels
- Ambition is to reduce all doses to levels that are as low as reasonably achievable, economic and societal factors being taken into account

ICRP *Publication 103* ¶ 225

# Post-Accident Radiological Protection (Fukushima Accident)

## Complex Problem!

- Many factors: health, environmental, economic, social, psychological, cultural, ethical, political, etc.
- One key is effectively involving the local population and professionals in management of the situation
- Authorities at national and local levels create conditions and provide means to involve and empower the population

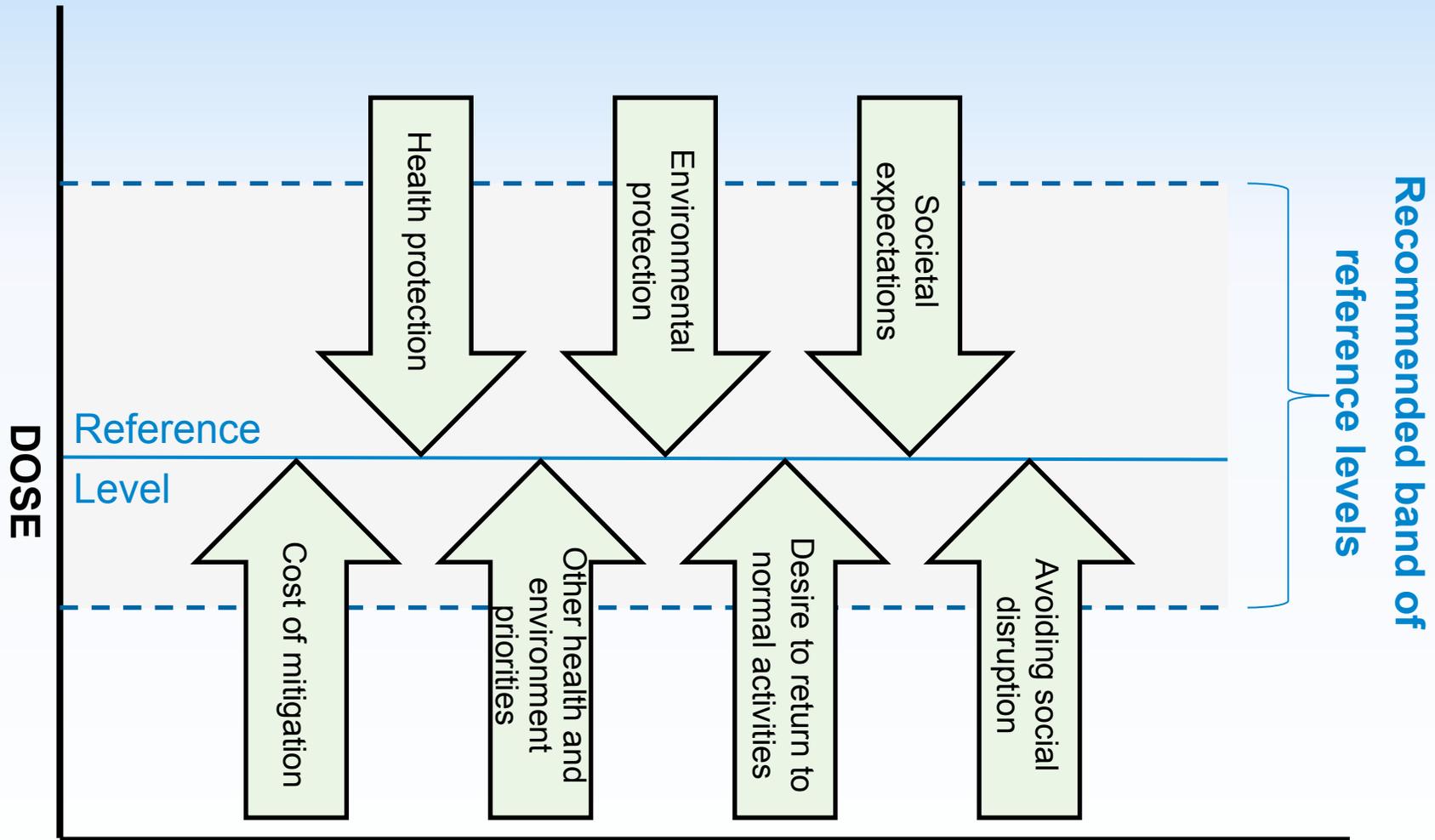
# Protection Strategy

- Protection strategy = many protective actions
- Optimise the entire protection strategy, not only individual protective actions
- Protective actions are implemented:
  - centrally
  - locally by authorities, experts, and professionals
  - as self-help actions with the support of authorities

# Reference Levels

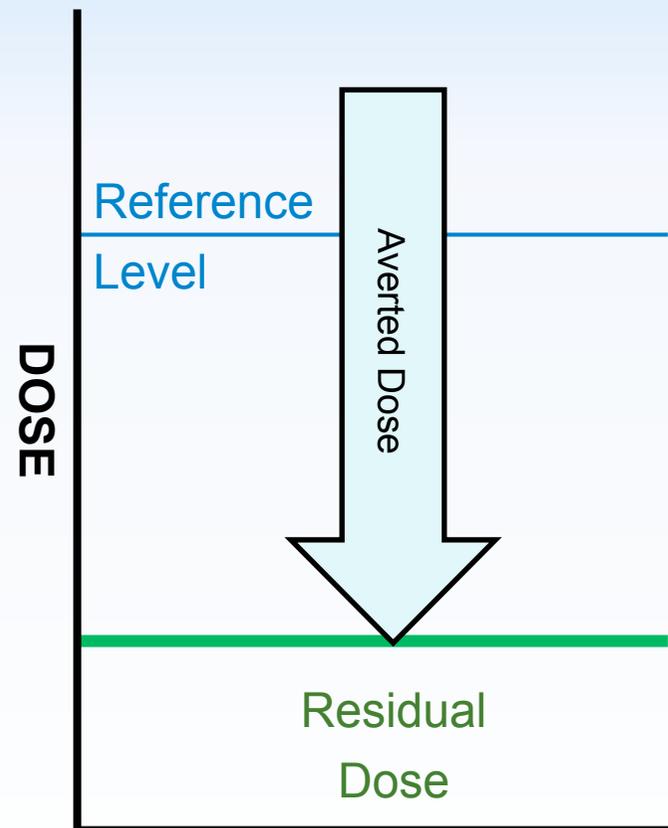
- Optimisation is guided by reference levels (timeframes shown are relevant to Fukushima)
- Protection of public:
  - emergency exposure situation (months): 20–100 mSv
  - existing exposure situation (few years): lower end of 1–20 mSv per year
  - long-term (decade or more): 1 mSv per year
- Values of reference levels and timeframe will vary from place to place depending on local conditions

# Selection of Reference Levels

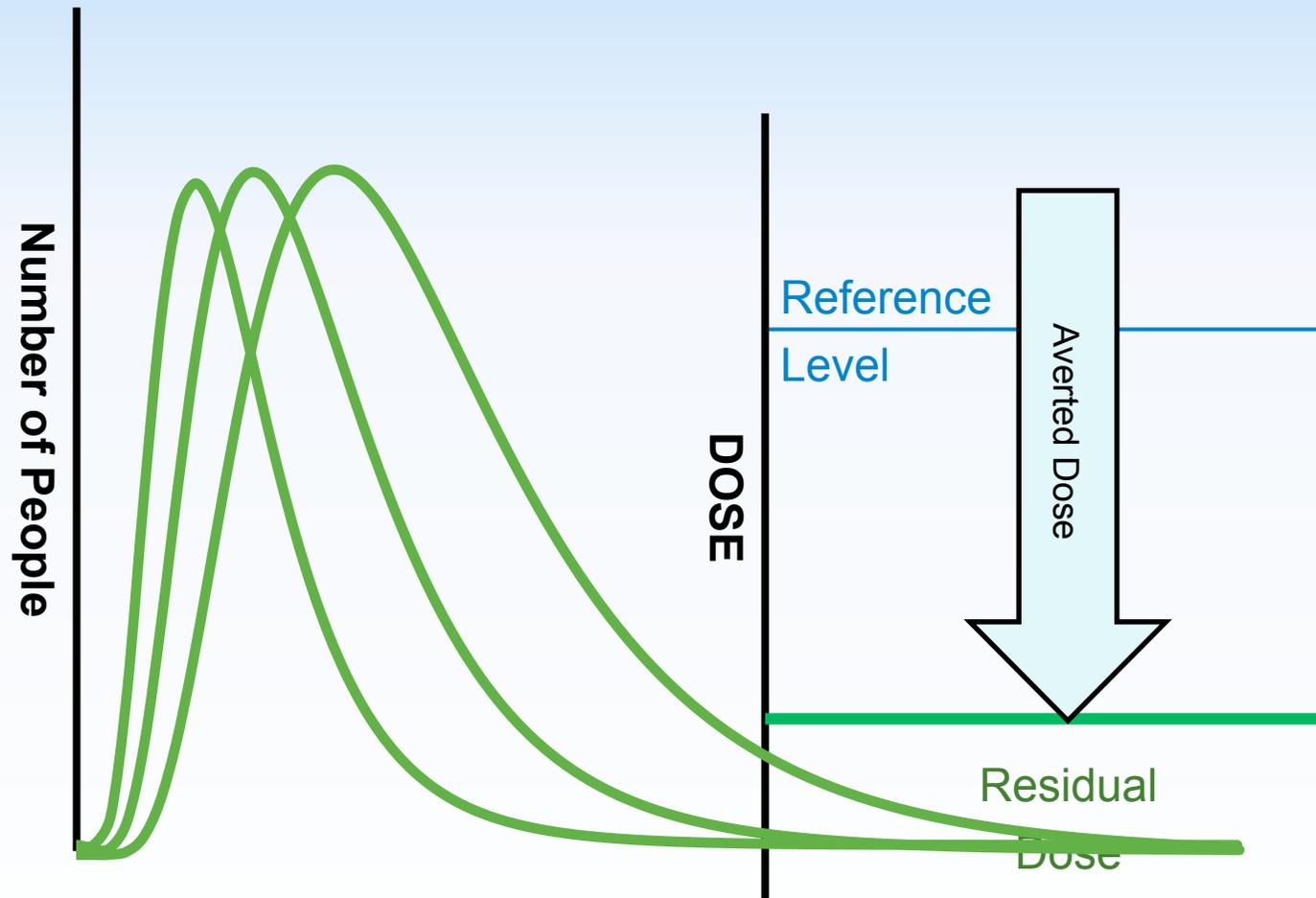


# Optimisation of Protection

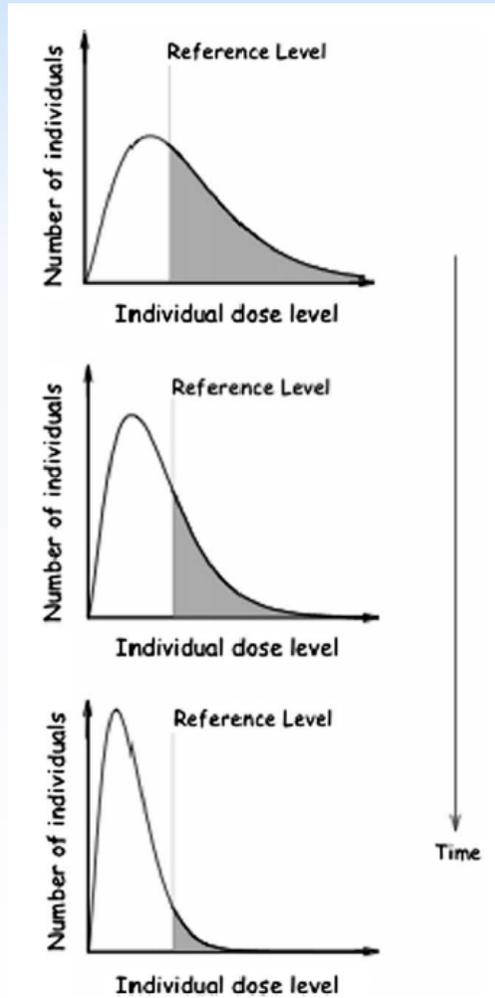
- **Balance** radiation and other **risks** with **benefits**
- Take actions to reduce doses below reference levels



# Residual Dose over Time



# Residual Dose over Time



- Focus on the most exposed people
- Actions taken will decrease doses

# Actions by Authorities

- Cleaning buildings, soils and vegetation
- Monitoring environment and produce
- Waste management
- Surveillance
- Information, guidance, instruction and equipment (e.g. for measurements)
- Specific information for specialised groups

# Self-Help Actions

## **Local professionals and population monitoring:**

- Dose rates in living areas
- Local foodstuff
- Internal exposure of themselves and people for whom they have responsibility (children, elderly)

***To help adapt habits to maintain exposure as low as reasonably achievable***

## **Facilitated by authorities providing:**

- Conditions and means for monitoring
- General information on the exposure situation
- Information on ways to reduce doses
- Local forums involving the population and experts

# Fukushima Dialogue Initiative

## Joint Initiative

ICRP -- Date City -- Fukushima Prefecture -- Radiation Safety Forum, Japan -- Association for Futures Creation of Tamura & Children, Ethos in Fukushima -- Fukushima Medical University -- Research Institute for Soil Science and Agrochemistry of National Academy of Science of Belarus -- Belarusian branch of Russian-Belarusian Information Centre on the Problems of the Consequences of the Catastrophe at Chernobyl Nuclear Power Plant -- Committee of Radiation Protection and Public Health/OECD-NEA -- Institute of Radiation Protection and Nuclear Safety, France -- Norwegian Radiation Protection Authority, Norway -- Nuclear Safety Authority, France

- Sharing ICRP recommendations directly with communities in Japan
- Learning for ICRP to improve future recommendations
- Transferring experience from communities affected by Chernobyl
- Facilitating discussions between local stakeholders



# Fukushima Dialogue Initiative

- 1) Rehabilitation of Living Conditions after the Fukushima Accident: Lessons from Chernobyl and ICRP Recommendations (Fukushima City, November 26-27, 2011)
- 2) To understand what has been accomplished so far in Date City, and discuss obstacles and ways to further improve living conditions (Date City, February 26-28, 2012)
- 3) Focus on foodstuff, examining challenges faced by producers, consumers, and everyone in-between (Date City, July 7-8, 2012)
- 4) Possibly focusing on education (tentatively November 10-11, 2012)

# ICRP

[www.icrp.org](http://www.icrp.org)

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