

Understanding Existing Exposure Situations

Jean-Francois Lecomte

IRSN-France

Member of ICRP Committee 4

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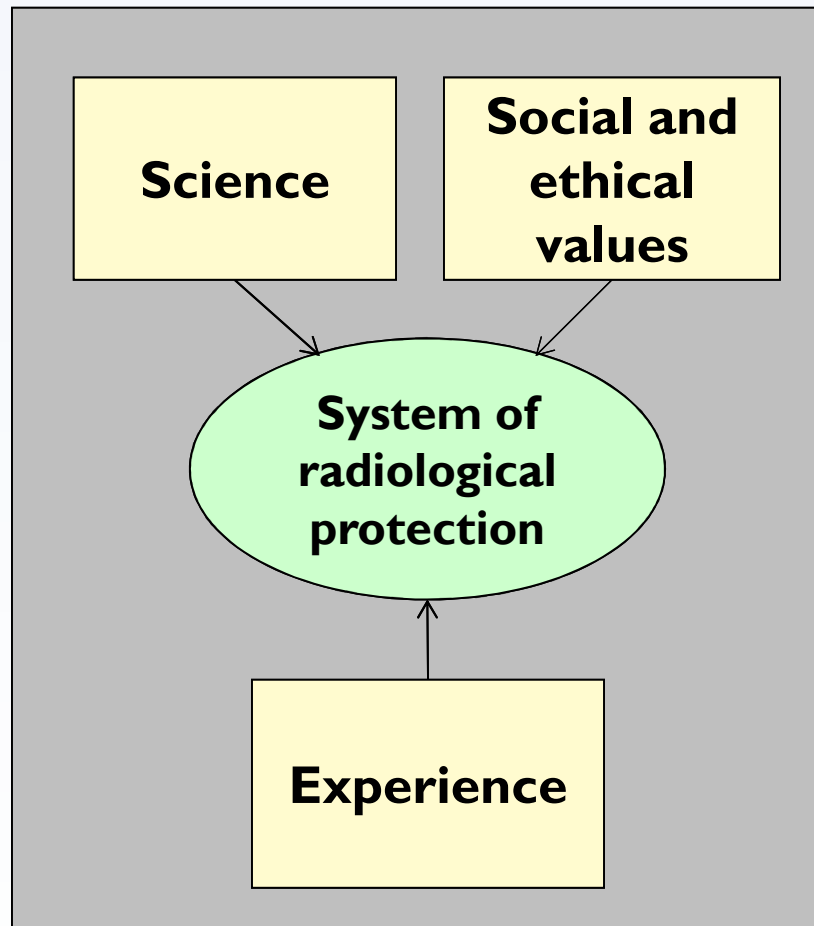
Seoul, Korea

20 October 2015

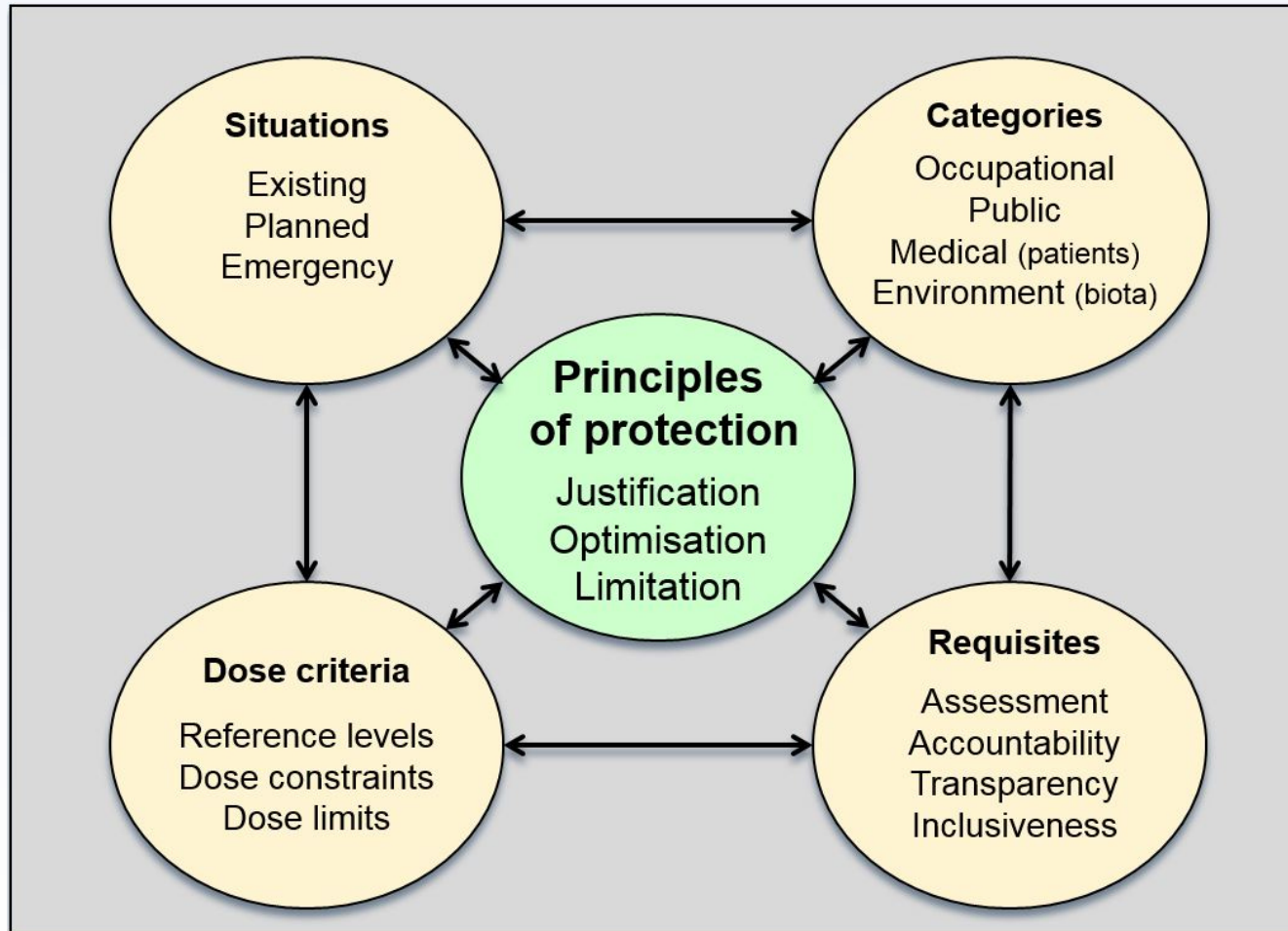
Setting the stage

- **System of RP developed gradually along 20th Century**
- **Until 2nd WW: focused on protection of medical staff**
- **After 2nd WW: focused on nuclear activities (ICRP 26, 60)**
 - Protection of workers inside installations
 - Protection of public outside
- **Change in 2007 to deal with other concerns (ICRP 103)**
 - Accidents, malevolent events
 - Natural exposures
 - Legacy of the past
- **Main changes from ICRP 60 to ICRP 103**
 - Practices/Intervention → Existing/Planned/Emergency Expo Sit
 - 1 common way: constrained optimisation
 - Stakeholder involvement
 - Protection of the environment

The 3 pillars of the RP system

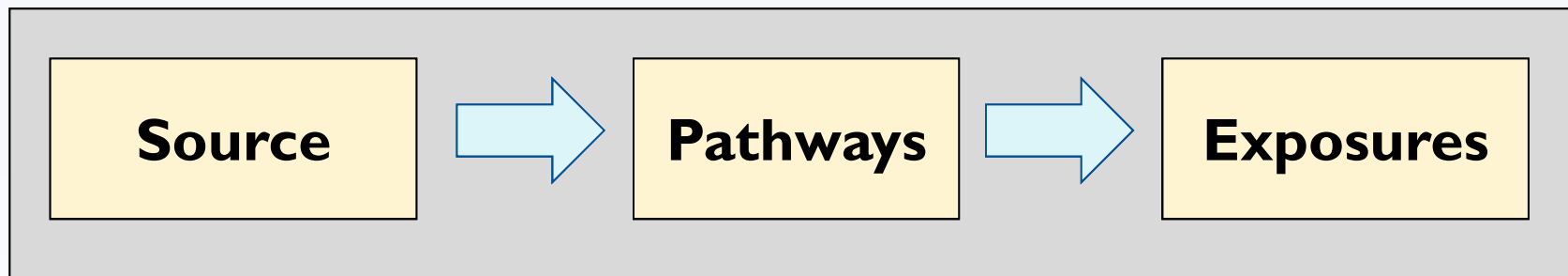


The RP system in ICRP 103



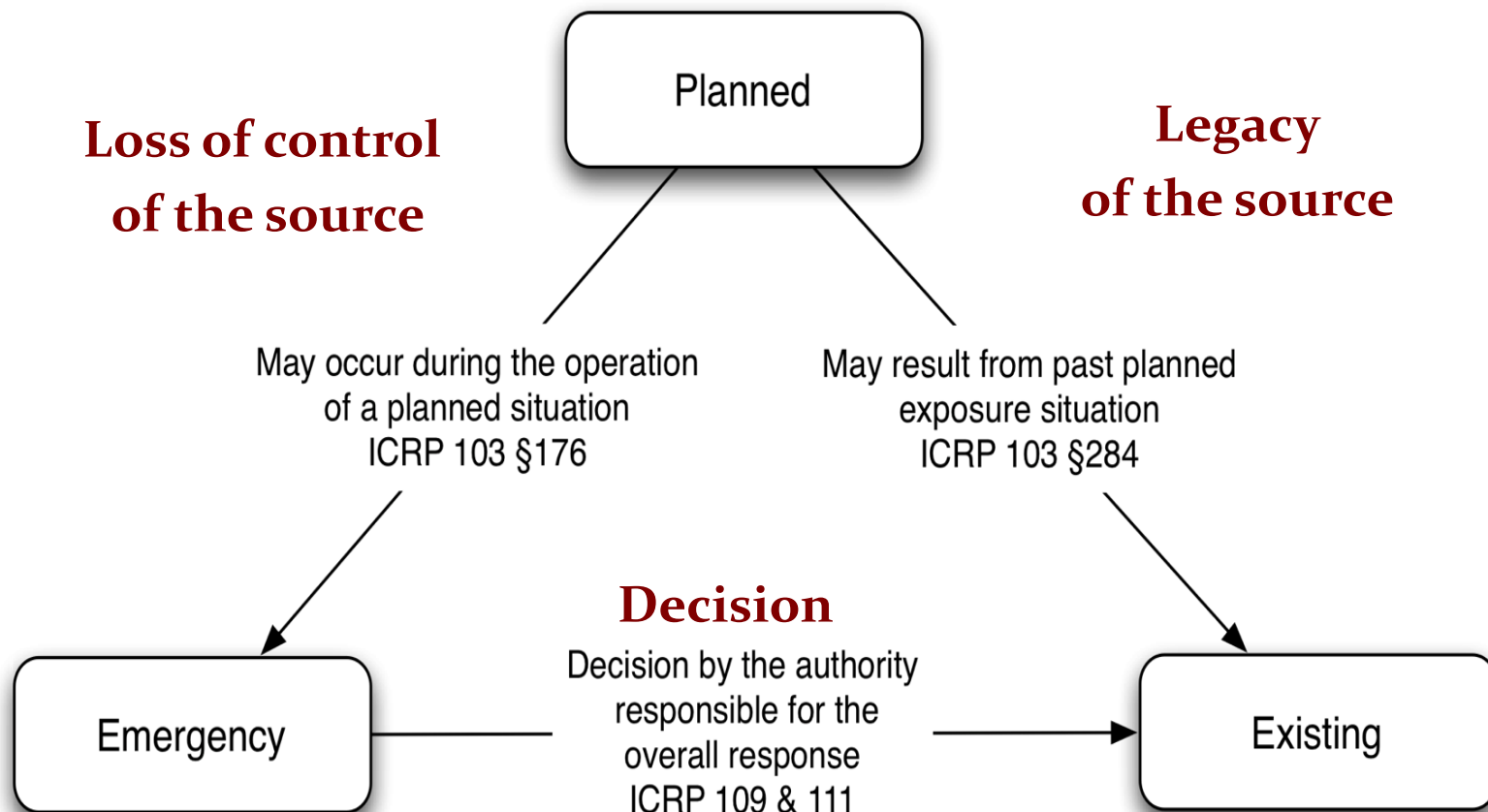
Notion of Existing Exposure Situation

- An exposure situation (ES) is the process causing human exposures from natural and man-made sources

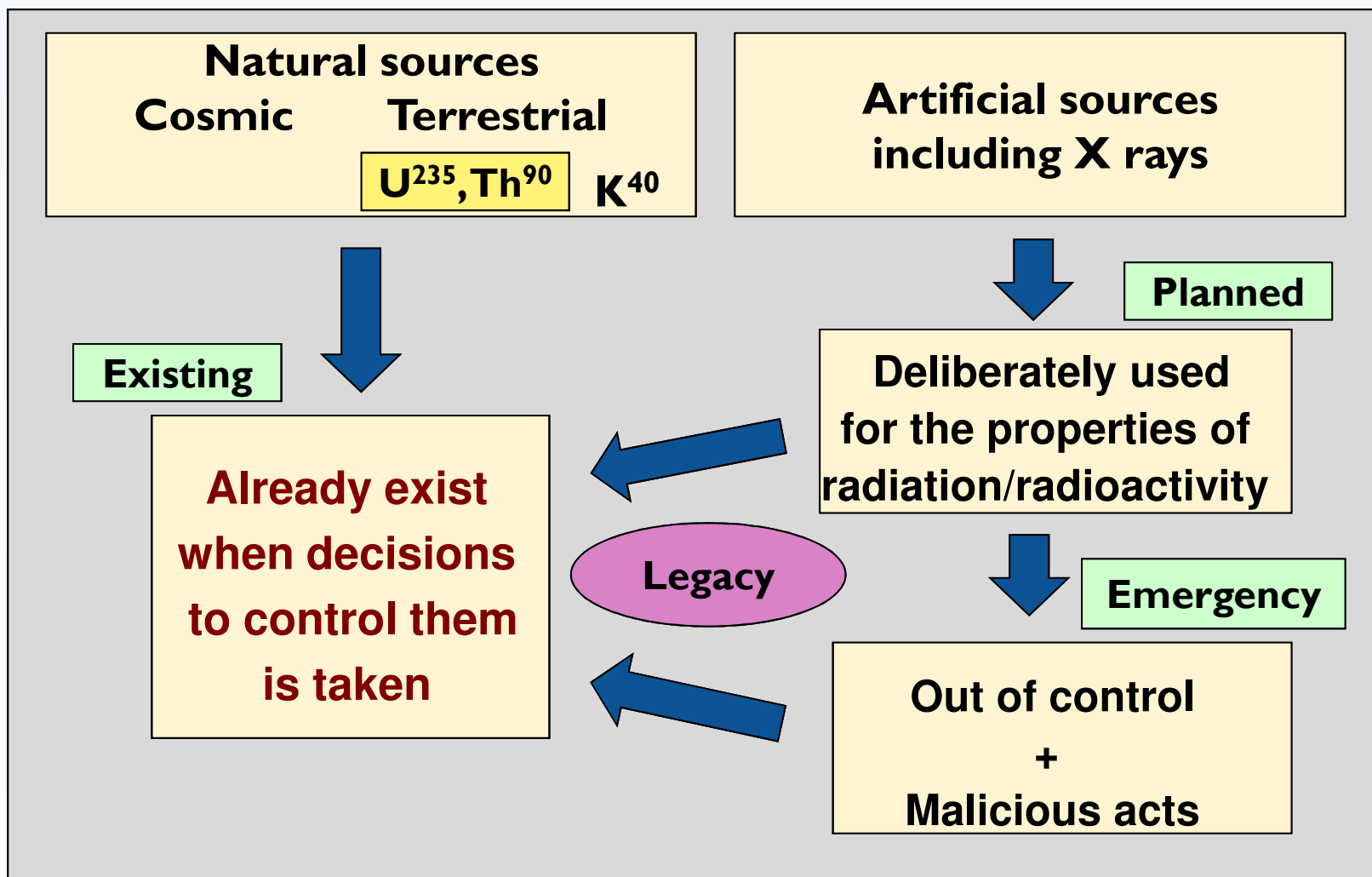


- Three types of ES: Existing, Planned and Emergency ES
- Existing ES: exposures resulting from **sources that already exist when decisions to control them are taken.**

Relationship between the exposure situations



Exposure situations



Examples of Existing ES

- **Natural sources**

- Cosmic radiation
- Radon
- NORM
- ...

- **Man-made sources**

- Contaminated sites (legacy of the past)
- Contaminated areas (post-accident situations)
- ...

Common features of Existing ES

- Exposures affect places of living and day to day activities
- Exposures **need to be measured** to characterize the situation
- Levels of exposure highly **dependant of individual behaviours**
- Generally a **wide spread of the individual dose distribution**
- **No potential** for accident
- Exposure can be controlled by individuals = **self-help protection**
- **Many stakeholders** are generally involved
- **Lack of RP culture** often present
- **RP closely related to many factors** (social, economic, political, ethical...) especially when controversial or sensitive situation

Exposure situations and time factor

- Existing ES: protective actions can be implemented **only after the characterisation** of the ES and it generally takes time to progressively reduce or maintain exposures
ALARA
- Planned ES: protective actions can be implemented **at any time** and are **effective immediately**
- Emergency ES: protective actions must be implemented **urgently and in a timely manner** to be effective
- Whatever the ES: protective actions can be envisaged and prepared **(planned) in advance**

Categories of exposure

- Existing exposure situation can lead to **public or occupational** exposure, not medical exposure
- The definition of **occupational exposure is a challenge**
 - Many workers adventitiously exposed
 - Source not deliberately introduced and operated
 - Source not necessarily used for radioactive properties
 - Partial responsibility on source, pathway, exposures
 - No potential for high doses
 - Classification of areas may be difficult to determine clearly

Occupational and Environmental exposures in Existing ES

- **Key elements to deal with exposure at work**
 - General responsibility of employer to protect employees
 - Management of the workplace rather than workers individually (like for other risks)
 - Resulting level of exposure of workers
 - Feature of the individual dose distribution
- **Environmental exposure**
 - See Committee 5 Publications (in particular ICRP 124)
 - Need to be complemented

3 Principles of protection

- **Justification: do more good than harm**
- **Optimisation of protection: all exposures should be kept ALARA**
 - Taking into account economic and societal factors
 - With restrictions on individual exposure to limit inequities in the dose distribution
- **Application of dose limits: the total dose to any individual should not exceed the appropriate limits**
- **Only Justification and Optimisation apply to Existing ES**

Application to Existing ES

- **Justification**

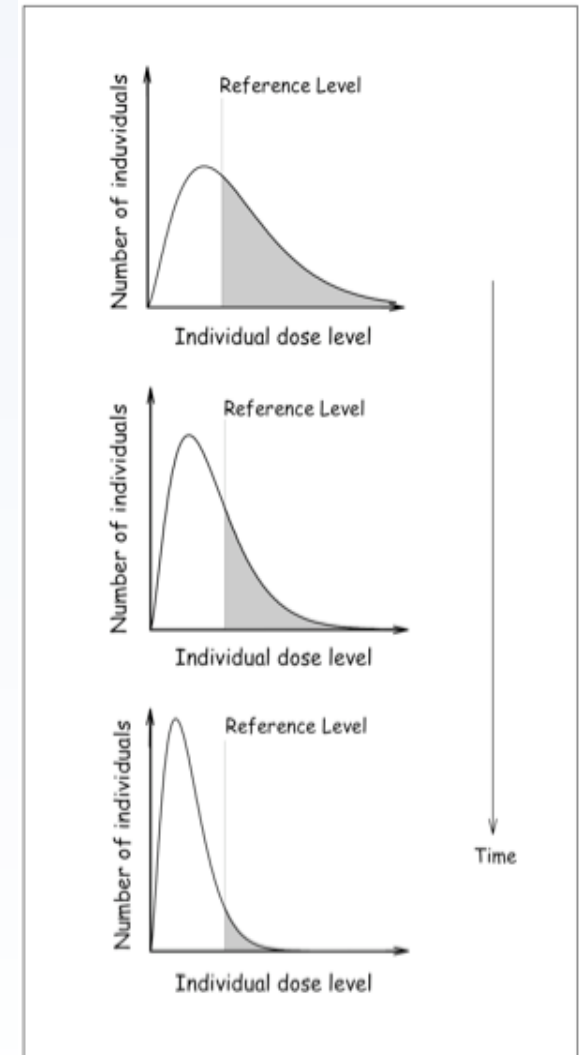
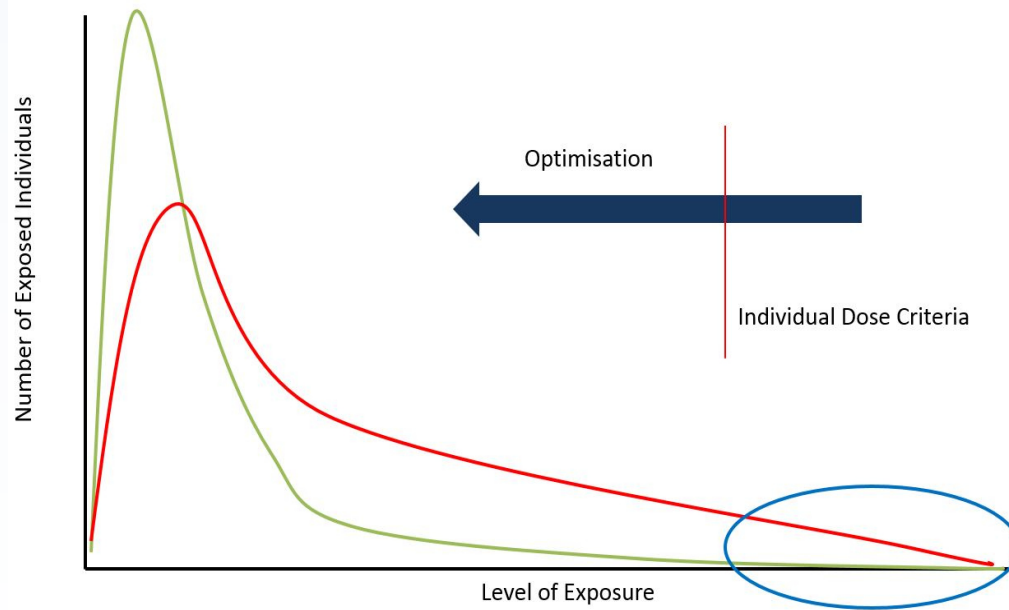
- Focussed on actions to control of the situation
- Actions on the source (if possible), pathways (mainly), individuals (a few cases)
- Characterisation of the situation is a prerequisite (who is exposed, when, where, how + feature of individual dose distribution)

- **Optimisation of protection**

- Key principle (very powerful to reduce doses in all ES)
- Associated with a dose criteria (restriction)
- Prevention: avoid unnecessary exposure
- Mitigation: reduce existing exposures ALARA

Optimisation process

- Implemented taking account prevailing circumstances
- Step by step process
- Move dose distribution towards lower levels
- Reduce (eliminate) individuals with dose > restriction



Existing ES versus Planned ES

- All parameters **cannot be anticipated** with same precision
- To be determined and framed **on a case by case basis**:
 - Status of the source
 - Classification of areas
 - Range of exposures
 - Distinction between public and occupational
- People including those responsible not always fully prepared and trained
- Need of a **graded approach**, more qualitative and less quantitative than in Planned ES
- Prudence and reasonableness need **pragmatism**

Stakeholders involvement

- A **crucial point**: take account of concerns and expectations
- Propose several options to stakeholders within **dialogue** before selecting the best one
- When exposure affect day to day life, involvement helps to:
 - Increase understanding
 - Maintain vigilance
 - Promote autonomy and accountability
- In some situations:
 - Self-help protective actions, with support
 - Co-expertise (support from RP professionals) beside actions from authorities: dissemination of RP culture, matter of dignity

Dose criteria (or restrictions)

- Called **Reference Level** in Existing ES
 - Not to go or stay above
 - Reduce doses ALARA below
- Typically in the **band 1-20 mSv/y** projected dose (ICRP 103)
- **May be below 1 mSv/y**. No recommendation on public vs occupational restrictions
- Selected taking account the **characteristics** of the ES
 - Nature of exposure
 - Benefit from the ES to individuals and society
 - Practicability of reducing or preventing exposures
 - Past experience
- **Can be changed** during optimisation process

RL adopted or proposed for Existing ES

Exposure situations	Occupational exposure	Public exposure
Cosmic radiation	5-10 mSv/y	5-10 mSv/y
Radon	10 mSv/y	10 mSv/y
NORM	20 mSv/y*	10 mSv/y* Long term = 1 mSv/y*
Contaminated sites	Not yet defined	Not yet defined
Contaminated areas	20 mSv/y*	Lower part of 1-20 mSv/y* Long term = 1 mSv/y*

* not yet approved by Committee 4

Requisites

- **Information** on the situation and **assessment of exposures** are basic requisites in all ES. May be applied differently
- Several requisites in ICRP 103: classification of areas, informed consent, education/training, dose monitoring, recording, health surveillance: mainly set for Planned ES
- Can be used in Existing ES
- **Current reflection** through dedicated Publications: characterisation of the ES, information, accountability for safety, stakeholders involvement, protection of environment, support of affected individuals, development of RP culture
- **Ethical values**: right to know, dignity, autonomy
- An existing ES can be managed as a Planned ES for regulatory convenience

Conclusion

- **A series of reports developed by Committee 4**
 - Radon (ICRP 126)
 - Cosmic radiation in aviation (TG 83)
 - NORM (TG 76)
 - Contaminated sites (TG 98)
 - Living in contaminated areas (TG 93)
- **Moving towards recommendations using a coherent and graded approach based on:**
 - Assessment of exposures and prevailing circumstances
 - Justification for action
 - Optimisation with restriction
- **Some issues still need reflection**
 - Protection of environment