

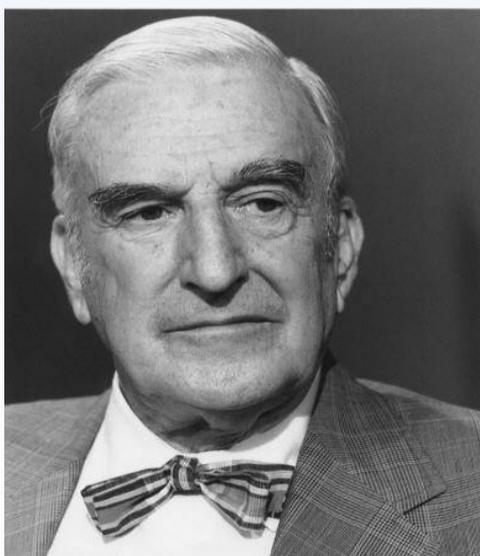
## Some Considerations about the Ethical and Social Dimensions of the Radiological Protection System

**Jacques LOCHARD**  
**Vice Chair of ICRP**  
**Director of CEPN - France**

Master and Doctorate Program "Nuclear Science and Technology"  
Technical University of Madrid (UPM)  
4 February 2015, Madrid, Spain

*This presentation has neither been approved nor endorsed by ICRP*

## Ethics in radiological protection - A long tradition -



**Lauriston S. Taylor (1902 – 2004)**  
Chair of ICRP from 1937 to 1962

“Radiation protection is not only a matter for **science**. It is a problem of **philosophy**, and **morality**, and the utmost **wisdom**.”

The Philosophy Underlying Radiation Protection  
Am. J. Roent. Vol. 77, N° 5,  
914-919, 1957  
From address on 7 Nov. 1956

## Wisdom

- A basic definition of wisdom is the quality of having **experience, knowledge, and good judgement** (Oxford dictionary)
- In its popular sense, wisdom is attributed to a person who takes **reasonable** decisions and act accordingly
- As a **virtue**, wisdom is the disposition to **behave and act** with the highest degree of adequacy under any given circumstances often in line with an ethics combining **self-awareness** and that of **others, temperance, prudence, sincerity** and **discernment** based on **reasoned knowledge**

## A brief historical perspective about the evolution of the ICRP system of radiological protection (1)

- The system of radiological protection developed gradually during the XXth century integrating advances in **knowledge** about the effects of radiation, the evolution of the **ethical and social values** as well as the feedback experience from its practical implementation
- Until the Second World War the Commission was only dealing with the **protection of medical staffs**
- After the war the focus was on nuclear energy and radiological protection developed to protect workers **inside** nuclear installations and the public **outside**. This resulted in a coherent and effective regime of radiological protection based on solid concepts and principles (ICRP 60)

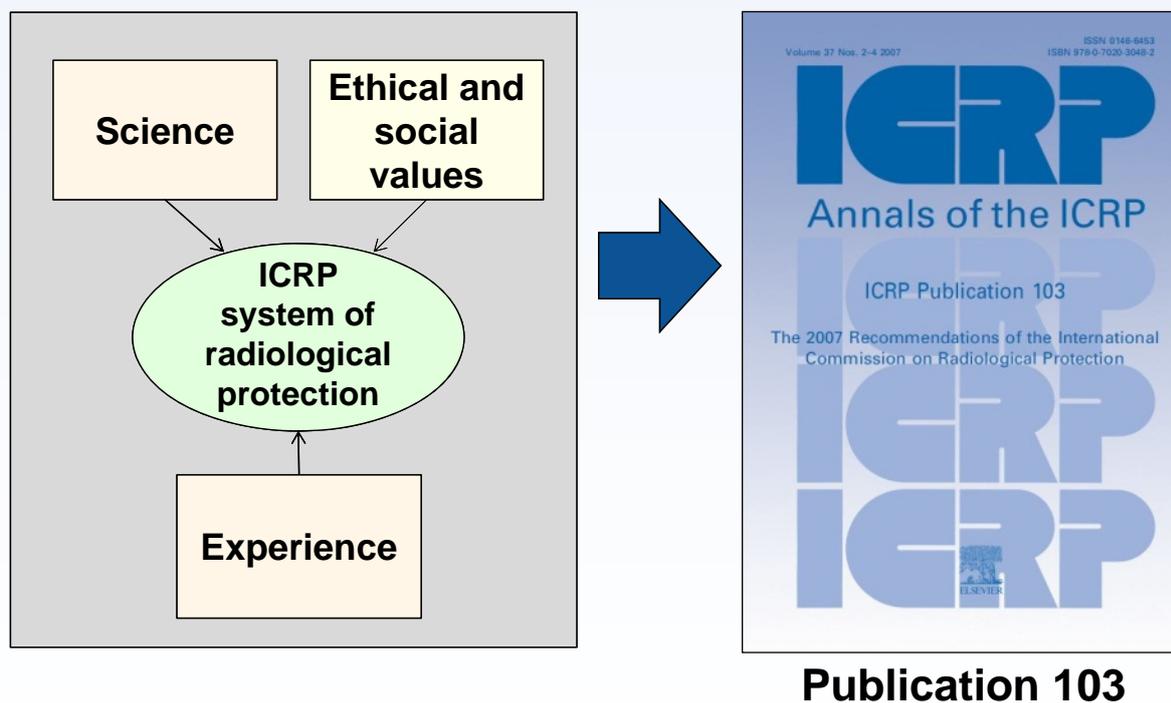
## A brief historical perspective about the evolution of the ICRP system of radiological protection (2)

- The **Chernobyl** nuclear accident followed by the raising concerns on exposure situations inherited from the past in the nineties, then the threat of “malevolent events” following the **September 11** attacks profoundly questioned the ICRP 60 recommendations
- Although not explicit, this questioning has played an important role in the development of the new recommendations in **Publication 103** published in 2007
- The system of Publication 103 has often been presented as a **simple update** of the previous system (ICRP 60), but in fact it represents **a major evolution**

## A brief historical perspective about the evolution of the ICRP system of radiological protection (3)

- The three main evolutions of the system of protection in Pub. 103 are:
  - The introduction of **3 types of exposure situations** with the **generalization of the optimisation principle** in connection with **individual dose restrictions** to all controllable exposure situations
  - The introduction for the first time in general recommendations of “**the need to account for the views and concerns of stakeholders when optimising protection**”
  - The **protection of the environment** (fauna and flora)

## The three pillars of the ICRP system of radiological protection



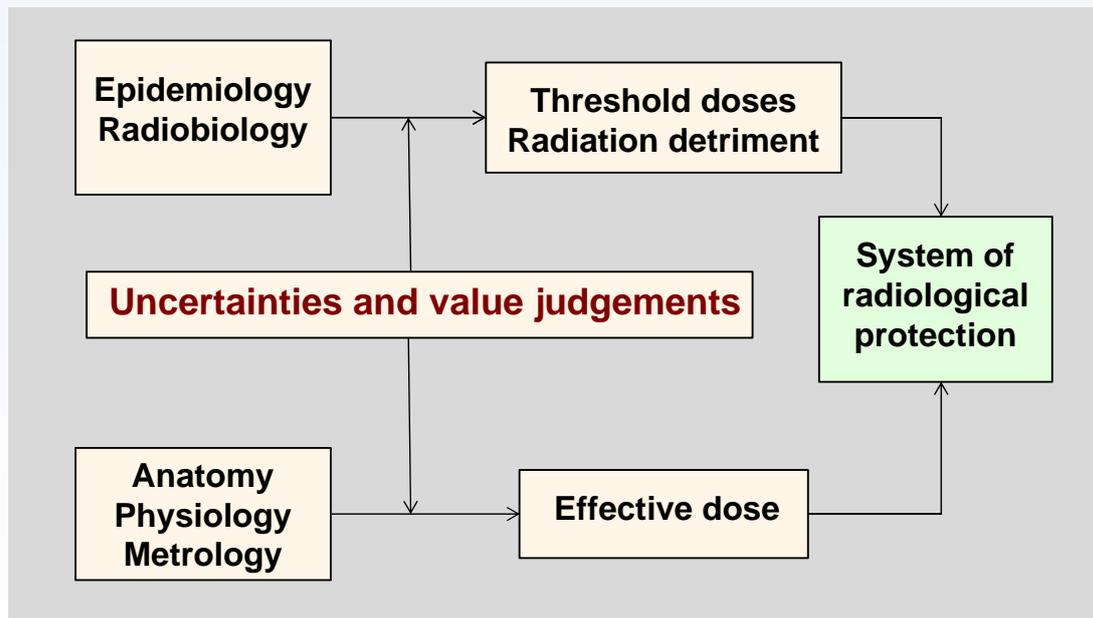
7

## The aims of the ICRP system of radiological protection

- “... to contribute to an appropriate level of protection against the **detrimental effects** of ionising radiation exposure without unduly limiting the **benefits** associated with the use of radiation.” ICRP 103, § 26
- “... to manage and control exposures to ionizing radiation so that **deterministic effects** are **prevented**, and the risks of **stochastic effects** are **reduced** to the extent **reasonably achievable**.” ICRP 103, § 29
- Estimating and comparing benefits and risk of different options before acting is one of the **most common ethical dilemmas** in daily life

8

## The scientific basis of the system of radiological protection



## Uncertainties and prudence

- « It is **prudent** to take uncertainties in the current estimates of thresholds for **deterministic effects** into account... Consequently, annual doses rising towards 100 mSv will almost always justify the introduction of protective actions ». ICRP 103, § 35
- « At radiation doses below around 100 mSv in a year, the increase in the incidence of **stochastic effects** is assumed by the Commission to occur with a small probability and in proportion to the increase in radiation dose... The Commission considers that the LNT model remains a **prudent** basis for radiological protection at low doses and low dose rates. » ICRP 103, § 36
- « There continues to be no direct evidence that exposure of parents to radiation leads to excess heritable disease in offspring. However, the Commission judges that there is compelling evidence that radiation causes **heritable effects** in experimental animals. Therefore, the Commission **prudently** continues to include the risk of heritable effects in its system of radiological protection. » ICRP 103, § 74

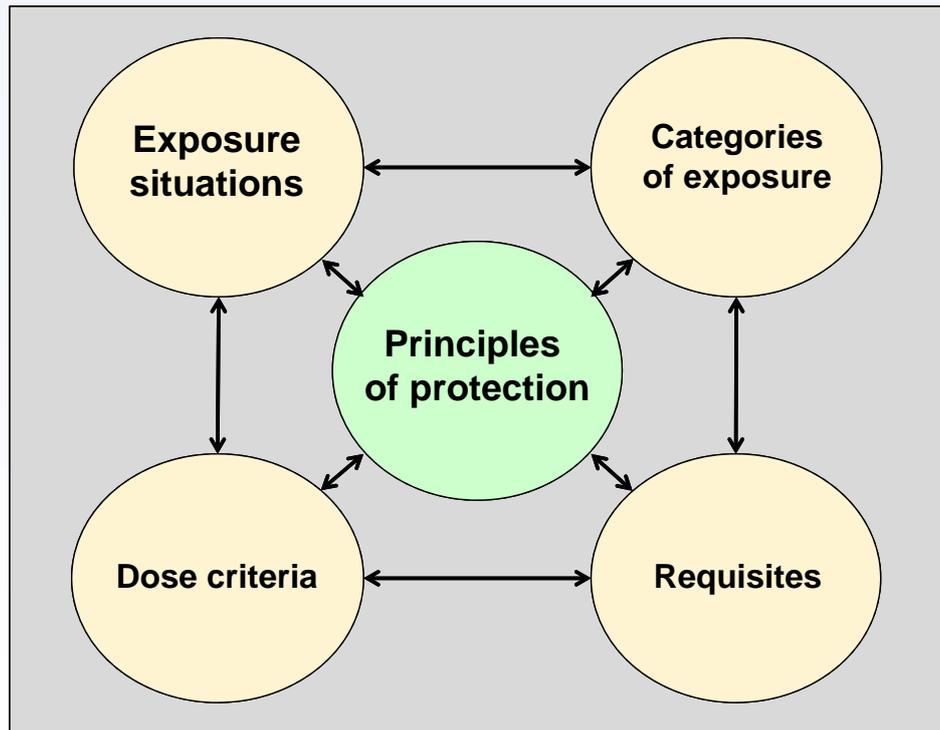
## About prudence

- Prudence is one of the fundamental ethical values that structures the system. It allows to take into account the uncertainties of the radiation risk, particularly at low doses of radiation, and to **act judiciously and reasonably**
- **Prudence** concerns the contingent, that is what can happen or not happen, which is occasional, incidental or uncertain. Prudence guides the actions of humans towards what is useful and good for them. Prudence varies according to individuals and circumstances
- Prudence implies a **duty of vigilance** regarding the effects of radiation: the requirement of radiation and health monitoring of exposed populations and the duty to relentlessly pursue **research in the fields of epidemiology and radiobiology** to try to reduce uncertainty

## The implications of prudence for stochastic effects

- Risk taking is justified only if there is a benefit in return
  - ➔ **Justification of decisions**
- Once an activity is justified:
  - How far to reduce the risk?
  - How not to jeopardize the activities?
  - What rationale/criteria to use to base decisions on the right level of protection?
  - ➔ **The quest for reasonableness**
- Maintaining exposures below a threshold is not a guarantee of no risk
  - ➔ **Restricting individual exposure is an issue of tolerability of risk**

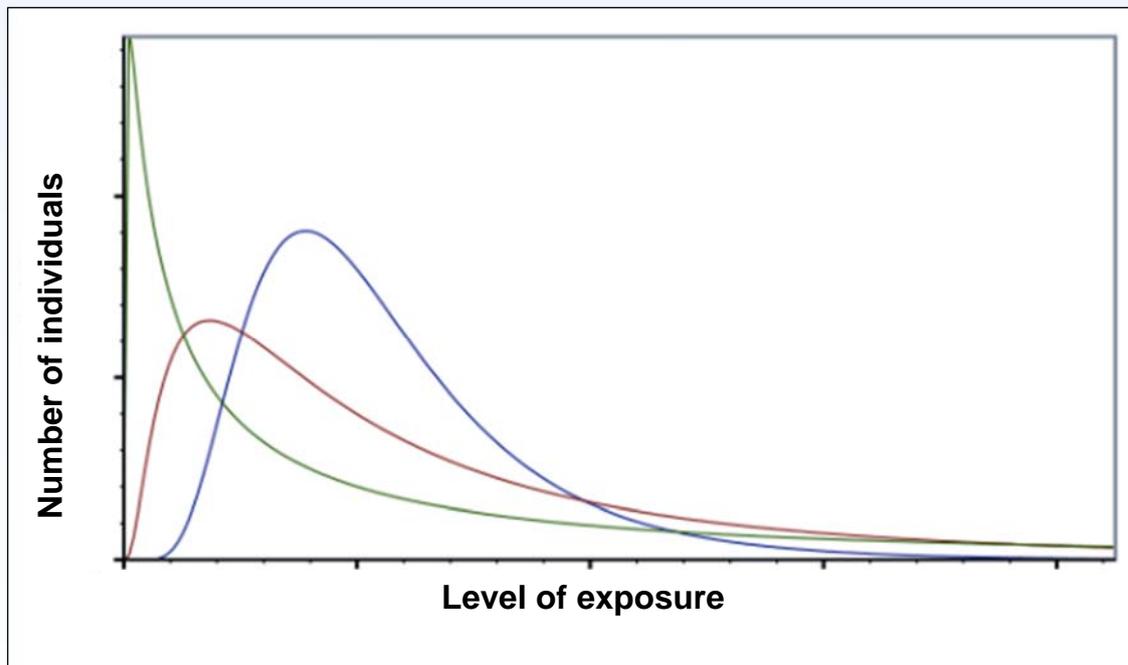
## The basic components of the ICRP system of radiological protection for humans



## Exposure situations

- **Existing exposure situations:** exposures resulting from natural and man-made **sources that already exist when decisions to control them are taken.** Characterization of exposures is a prerequisite to their control
- **Planned exposure situations:** exposures resulting from the **deliberate introduction and operation of sources used for their radioactive and radiation properties.** Exposures can be anticipated and fully controlled but may be significantly higher than expected in case of incidents and accidents.
- **Emergency exposure situations:** when exposures result from the **loss of control of a source** or from any **unexpected situation.** These situations require urgent and timely actions in order to mitigate exposures

## Individual dose distributions associated with exposure situations



## The categories of exposure

- **Medical exposure:** radiation exposures received by patients in the course of diagnostic, interventional, and therapeutic procedures
- **Occupational exposure:** radiation exposures incurred at work as a result of exposure situations that can **reasonably** be regarded as being the responsibility of the operating management
- **Public exposure:** encompasses all radiation exposures of the public other than occupational and medical exposure

Although individuals may fall into the 3 categories respectively as workers, patients or members of the public, ICRP considers the management of each category **separately**

## The principles of radiological protection

- **The principle of justification:** Any decision that alters the radiation exposure situation **should do more good than harm**
  - ➔ This refers to the ethical value of **beneficence/non-maleficence**
- **The principle of optimisation of protection:** All exposures should be **kept as low as reasonably achievable**
  - ➔ From an ethical point of view, this principle refers to the virtue of **prudence**
- **The principle of limitation of individual exposure:** All individual exposures should **not exceed the dose criteria** recommended by the Commission
  - ➔ This refers to the ethical values of **justice** and **equity**

## The quest for reasonableness

- Recognizing that there may be no threshold for stochastic effects and taking into account the irreversibility of these effects, the Commission adopts a **prudent attitude** and recommends **to reduce exposures to the lowest possible level** (ICRP-1950)
- The reduction of risk must be compared with the effort to achieve it. Recommendation **to keep exposures as low as readily achievable, economic and social considerations being taken into account** (ICRP 9 -1965)
- The adverb 'readily' is replaced by '**reasonably**' (ICRP 22 -1973). Attempt to found the reasonable on economic theory with the introduction of the **cost-benefit model** as an attempt
- Adoption of a more **pragmatic approach** with the optimisation process (ICRP 55 -1988) taking into account equity (ICRP 60 – 1990) and the involvement of relevant stakeholders (ICRP 103 - 2007)

## Dose criteria

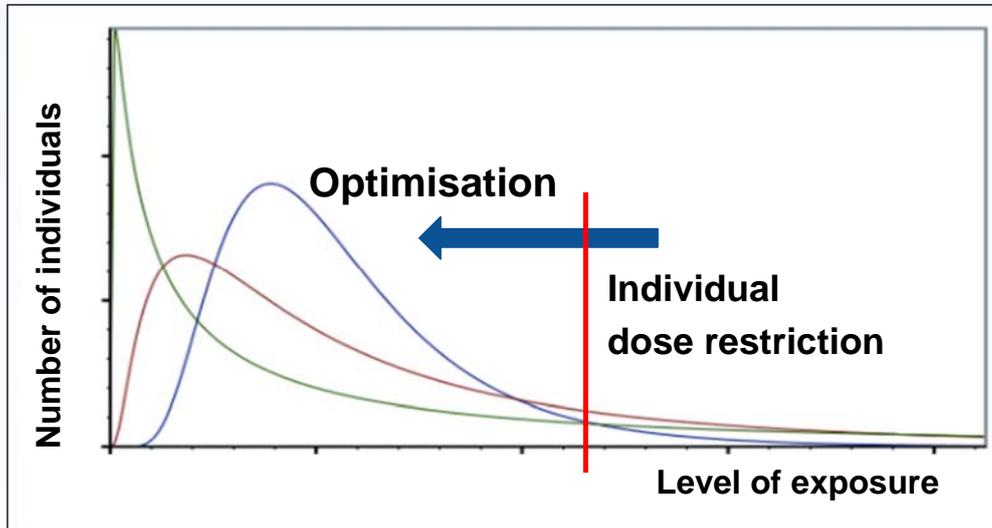
- For preventing deterministic effects
  - **Dose limits** to organs
- For mitigating the risk of stochastic effects to **tolerable levels**
  - Source related restrictions associated with the optimisation principle:
    - **Reference levels** for existing and emergency exposure situations
    - **Dose constraints** for planned exposure situations
  - Individual related restrictions:
    - **Dose limits** applying only to planned situations other than medical exposure

## Individual dose restrictions

- For the selection of an appropriate value for the dose restrictions one should consider the **relevant exposure situation** in terms of the nature of the exposure, the **benefits from the exposure situation to individuals and society**,..., and the **practicability** of reducing or preventing the exposures (ICRP 103, § 242)
- *“At doses higher than 100 mSv, there is an increased likelihood of deterministic effects and a significant risk of cancer. For this reason the Commission considers that the **maximum value for a reference value is 100 mSv** incurred either acutely or in a year.” (ICRP 103, § 236)*
- This statement needs some clarification about how to interpret the **“acutely or in a year”** in the context of emergency exposure situations

## Individual dose restrictions and optimisation

- **Dose constraints** in planned exposure situations and **reference levels** in emergency and existing exposure situations allow to restrict **inequity** in individual dose distributions



## The quest for tolerability

- **Publication 26 (1977)** : the risk associated with dose limits compared with safe occupation for occupational exposures and risk regularly accepted in everyday life (e.g. public transport) for public exposures
- **Publication 60 (1990)**: introduction of the tolerability of risk model: difference between unacceptable, tolerable and acceptable levels of risk. Use of a multi-criteria approach for the occupational dose limit and reference to the natural background for the public dose limit
- It is interesting to note that there are no considerations about the tolerability of risk in **Publication 103**

## The requisites

- The basic requisites that apply to all exposure situations and categories of exposure
  - **Evaluation of exposure**
  - **Information of exposed individuals**
  - **Involvement of stakeholders** (Introduced in Pub. 103)
- These basic requisites are declined differently depending of the exposure situation and the category of exposure e.g. **informed consent** in the medical field, **training** and **individual monitoring** of occupationally exposed workers,...

## The vision of a pioneer

“Aside from our experienced scientists, trained in radiation protection, where do we look further for our supply of **wisdom**? Personally, I feel strongly that we must turn to the much larger group of citizens generally, most of whom have to be regarded **as well-meaning and sincere**, but rarely well-informed about the radiation problems that they have to deal with. **Nevertheless, collectively or as individuals, they can be of great value ... in developing our total radiation protection philosophy.**”

*Lauriston Taylor, Sievert Lecture, IRPA 5 Congress, Jerusalem, 1980*

## Stakeholder engagement

- Concretely stakeholder engagement in radiation protection emerged in the **late 80s and early 90s** in the context of the management of exposures in contaminated areas by the **Chernobyl accident** and contaminated sites by **past activities**
- Why to engage stakeholders?
  - To take into account their **concerns and expectations** as well as the **prevailing circumstances** of the exposure situations
  - To adopt more **effective** and **fairer** protection actions
  - To diffuse **radiation protection culture**
  - To favour their **empowerment** and **autonomy** i.e to promote their **dignity**

## About dignity

- **Dignity is an attribute of human condition** : idea that something is due to the human being because she/he is human. This means that every individual deserves unconditional respect, whatever her/his age, sex, health, social condition, ethnic origin and religion.
- Personal **autonomy** is the corollary of human dignity. Idea that individuals have the capacity to act freely and morally.
- Human dignity is not natural: it is a conquest over the inhuman. **Dignity is cultural**. This is an agreement between a culture and those who share it
- Dignity is enshrined in the Universal Declaration of Human Rights (1948): *“All human beings are born free and equal in **dignity** and **rights**” (Art. 1)*

## Concluding remarks

- Not only the ICRP system of radiological protection is based on well established scientific evidences but also on universally shared ethical values: **prudence, beneficence, justice and dignity**
- The system is globally well structured and coherent with the principle of **optimisation** being the **cornerstone** and reasonableness and tolerability the **core** elements
- Apart from scientists, experts and professionals, citizens are rarely informed about radiation and even less about the radiological protection system
- Lessons from engaging with stakeholders during the last 2 decades tell us that we, as professionals, must develop **a narrative about the ethical and social values** embodied into the radiological protection system

# Thank you



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