

# Science and Values in Radiological Protection Decision-making

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## Background

- The CRPPH has studied national experience with the involvement of stakeholders in decision making processes since 1993
- While stakeholders do not MAKE decisions, stakeholder involvement is crucial to achieve acceptable, sustainable decisions in complex radiological protection situations
- The CRPPH has concluded that RP decisions are informed by science, but are generally driven by social values.
- To help to appropriately articulate both the science and values aspects of decisions, the CRPPH has arranged 5 workshops on this subject

## CRPPH Stakeholder Work

- Villigen Workshops (1998, 2001, 2003)
  - Integrate RP aspects into societal decisions, rather than integrating societal values into RP decisions
- Chernobyl Work (1987 – 2011)
  - The RP expert should be at the service of stakeholders
- Science and Values Workshops (2008, 2009, 2012, 2015)
  - Decisions are informed by science, but are driven by social values

## Science and Values

- Based on studies and experience, the CRPPH undertook to better understand the elements that are considered when making radiological protection decisions
- The distinction was expressly made between “RP science” and “social values”
- To study these aspects the CRPPH organised workshops on “**Science and Values in Radiological Protection**”

## Science and Values in Radiological Protection

- Science and Values in Radiological Protection, Helsinki, Finland, 15-17 January 2008
- *2<sup>nd</sup> Science and Values in Radiological Protection* workshop, *Vaux de Cernay, France*, 30 November – 2 December 2009
- The 3<sup>rd</sup> Workshop on Science and Values in Radiological Protection Decision Making, Tokyo University, 6-8 November 2012
- The 4<sup>th</sup> Workshop on Science and Values in Radiological Protection Decision Making, Moscow, 9-11 June 2015
- The 5<sup>th</sup> Workshop on Science and Values in Radiological Protection Decision Making, Milan, 19-21 September 2018

## Science & Values Workshops

Workshop	Location	Date	Breakout Topics	Focus
S&V 1	Helsinki	January 2008	<ul style="list-style-type: none"> <li>• Non-targeted effects</li> <li>• Individual sensitivity</li> <li>• Circulatory disease</li> </ul>	What if?
S&V 2	Vaulx-de-Cernay	December 2009	<ul style="list-style-type: none"> <li>• Radon</li> <li>• Medical exposures</li> <li>• Vascular effects</li> </ul>	What now?
S&V 3	Tokyo	November 2012	<ul style="list-style-type: none"> <li>• Low dose</li> <li>• Children, self-help</li> <li>• Non-cancer effects</li> </ul>	Where do we go from here?
S&V 4	Moscow	June 2015	<ul style="list-style-type: none"> <li>• Medical surveillance</li> <li>• Effective dose</li> <li>• Safety concerns</li> </ul>	Values in RP decision-making
S&V 5	Milan	September 2018	<ul style="list-style-type: none"> <li>• Low-dose uncertainty</li> <li>• Medical screening</li> <li>• Ethics</li> </ul>	uncertainty nuances, ethical aspects

## S&V Results

- The results of these workshops have helped the CRPPH to advance its understanding of the nature of decision making, and of the most important aspects influencing such decisions
- This has been important to the Committee's focus on post-accident recovery management, particularly with regard to stakeholder engagement and trust building

## 1<sup>st</sup> S&V, Helsinki

Dialogue among the attending regulators, scientists and NGOs improved mutual understanding of the choices underlying radiological protection, and began to shape a process and framework for the better integration of its social and scientific dimensions.

- Non-targeted effects
- Individual sensitivity
- Radiation-induced circulatory diseases



## 2<sup>nd</sup> S&V, Vaulx-de-Cernay

Participants reviewed stakeholder experience, rationale and justification for adopting new approaches, practical actions, research needs, and process and framework elements that could enhance radiological protection by better integration of scientific and social aspects

- Domestic exposure to radon
- Growing medical exposures in diagnostic and screening procedures
- Radiation-induced vascular effects.



## 3<sup>rd</sup> S&V Tokyo

Participants addressed the values issues of these three topics in great depth, to assist radiological protection to move forward in an accepted and sustainable direction

### Assessment & Management of Low-Dose Exposures

- “Risk” is a poorly understood concept; “Safe” is a situation and circumstance specific judgment
- Proactive initiatives for open and transparent dialogue

### Protection of Children, Self Help

- Duty and ALARA priority are children, resources here first
- Letting the children speak and remember
- Self-help actions compliment and are supported by authority actions

### Non-Cancer Effects

- Epidemiology suggests risk, mechanisms unclear
- Science still unclear, not yet ready for system change





## 4<sup>th</sup> S&V, Moscow

Participants addressed how the values aspects of these topics are used in practice in making radiological protection decisions

### Medical Surveillance: Support Well Being

- Need framework for surveillance of workers & the public
- Need depends on prevailing circumstances

### Use of Effective Dose

- Complex quantity, need clear explanation
- Not individual risk

### Safe

- Driven by prevailing circumstances and stakeholder views
- A concept rather than a criteria



To continue advancing the integration of new radiological protection scientific and technological developments, and **evolving understanding of social considerations into decision-making in circumstances involving radiological aspects**, the NEA Committee on Radiological Protection and Public Health (CRPPH) was prompted to organise the

## **5<sup>th</sup> Workshop on Science & Values in Radiological Protection Decision-making**

**Milan, Italy  
19-21 September 2018**

## 5<sup>th</sup> Workshop on Science & Values

The 5<sup>th</sup> Science and Values in Radiological Protection Workshop addressed **the complexity and multi-faceted nature of radiological protection situations** (*e.g. uncertainty and variability of scientific-social-ethical aspects, etc.*) as inputs to **radiological protection decision-making**, and approaches to decision implementation.



## 5<sup>th</sup> Workshop on Science & Values

This workshop addressed issues that have been particularly evident in a post-accident context, but that are also commonly seen as aspects of importance in other radiological protection circumstances.

**The workshop focused on ethics and uncertainty in the context of the following three key topics:**

Topic A	Topic B	Topic C
Challenges of managing uncertainty of low-dose effects in chronic public exposure situations	Medical screening: RP ethics and uncertainties in justification and implementation	Ethics of Radiological Protection in Occupational Exposure Situations

# 5<sup>th</sup> Workshop on Science & Values

## Workshop Objectives

The workshop aims at understanding **how the science and values aspects of the key three topics might influence the evolution of the system of radiological protection**, and how these aspects should be included and transparently articulated in radiological protection decision-making.

**The workshop was built around parallel breakout session discussions**, and focused more on the “values” aspects of radiological protection decision-making than on the “science” aspects.







## Milano 2018



## PIAZZA DUOMO

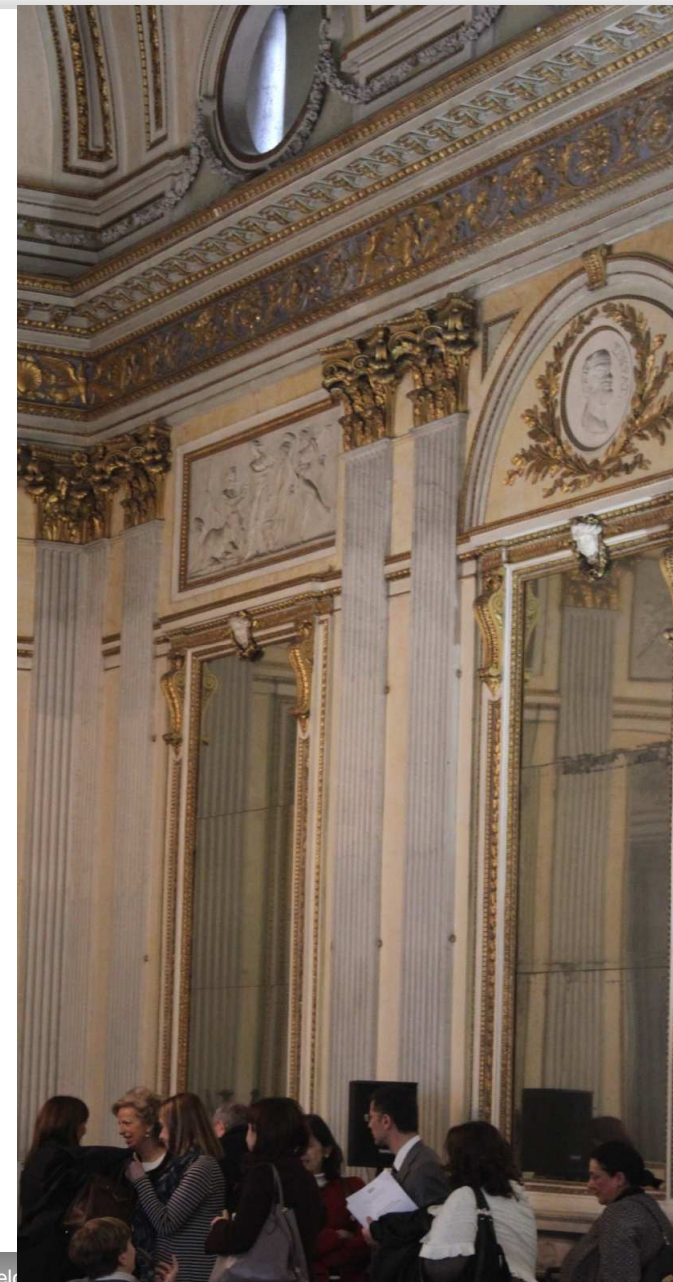




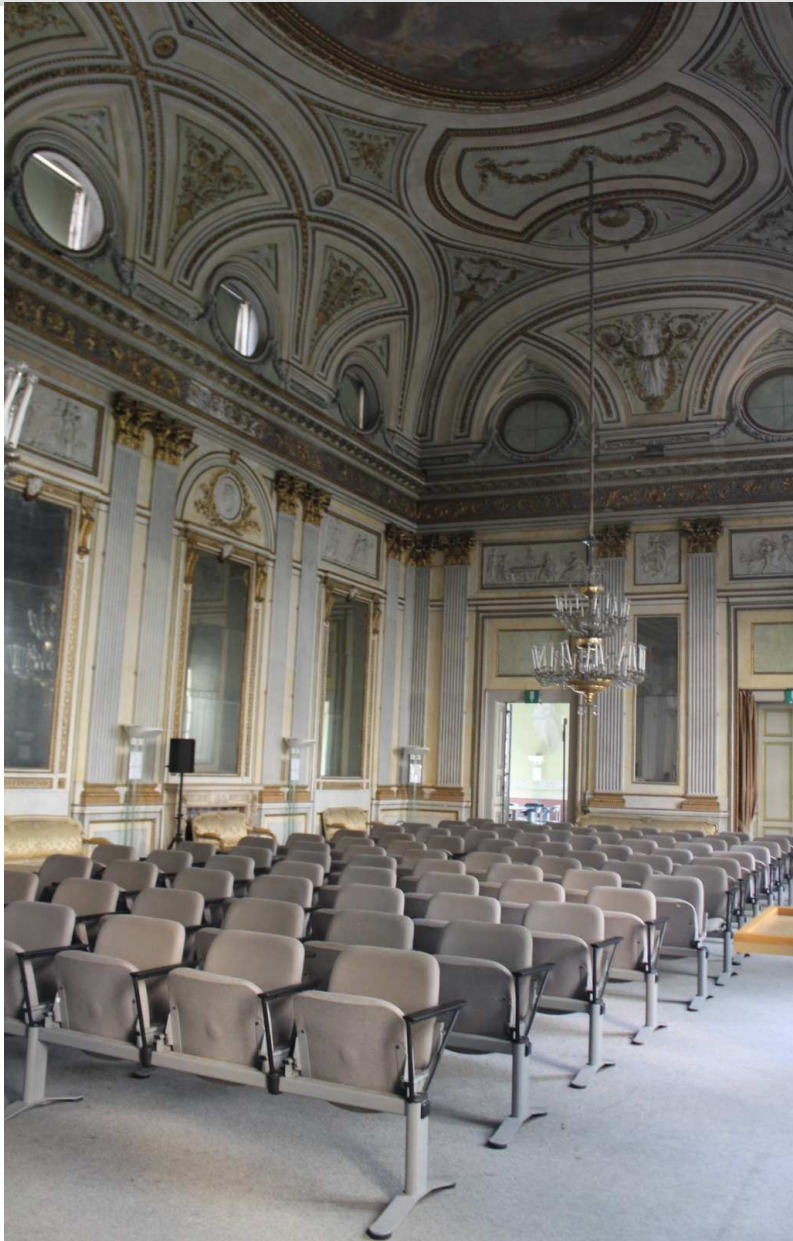


## SALA NAPOLEONICA

*part of Palazzo Greppi designed by  
Giuseppe Piermarini, the architect  
of La Scala Theatre*







Sala Napoleonica  
and nearby rooms









# **Topic A**

## **Challenges of managing uncertainty of low-dose effects in chronic public exposure situations**

## Managing uncertainty of low dose effects in chronic public exposure situations

Starting point for discussion

- Allow people to be angry, acknowledge their anger
- Acknowledge that radiation science and situations are complex
- The objective of discussions is to achieve informed decisions
- Individual autonomy
- Acknowledge individual uniqueness

Public dialogues

- Anticipate questions, prepare answers
- Public-interaction training to RP experts
- Add radiological risks to the education system at several levels
- Can/should science speak with one voice?

## Topic B

# Medical screening: RP ethics and uncertainties in justification and implementation

## Medical screening: RP ethics and uncertainties in justification and implementation

### Summarizing: aspects for discussion

- General problem of screening:
  - To what extent do screening programmes have an positive effect?
  - To what extent does IHA have an positive effect?
- Relevance of prevailing circumstances
  - Allocation of resources in healthcare
  - Structure of health care system
  - incentives resulting from reimbursement system
- Solidarity as part of personal decision?

What ethical principles would be relevant in deciding whether it is just, or not, to use personal data from patients for scientific studies of little direct value to patients?

## Medical screening: RP ethics and uncertainties in justification and implementation

### Some food for discussion

Personal data:

- ok if you ask
- Big problem, concerns outcome of screening programmes
- Big data management
- Solidarity?

## Topic C

# Ethics of Radiological Protection in Occupational Exposure Situations

## Uncertainties and value judgements

- Uncertainties in biological effects:
  - ✓ Move in society to towards protection of the individual
  - ✓ If combined with evidence of individual sensitivity, puts strain on the RP System
- New exposure situations (NORM, radon)
  - ✓ Experts trained in RP often have little knowledge of these situations
  - ✓ In NORM industries, radiation is not the main concern, how then to apply ALARA?
- Concept of occupational exposure
  - ✓ Broad definition: exposure at work
  - ✓ Potentially very large number of workers
  - ✓ Need distinguish “exposed worker” and “radiation worker”
  - ✓ Responsibility of employer/undertaking
  - ✓ Radiation worker: specific training, responsibility for own protection, and for safety of other workers, members of the public or patients
  - ✓ Occupational health service with specific responsibilities



## Uncertainties and value judgements

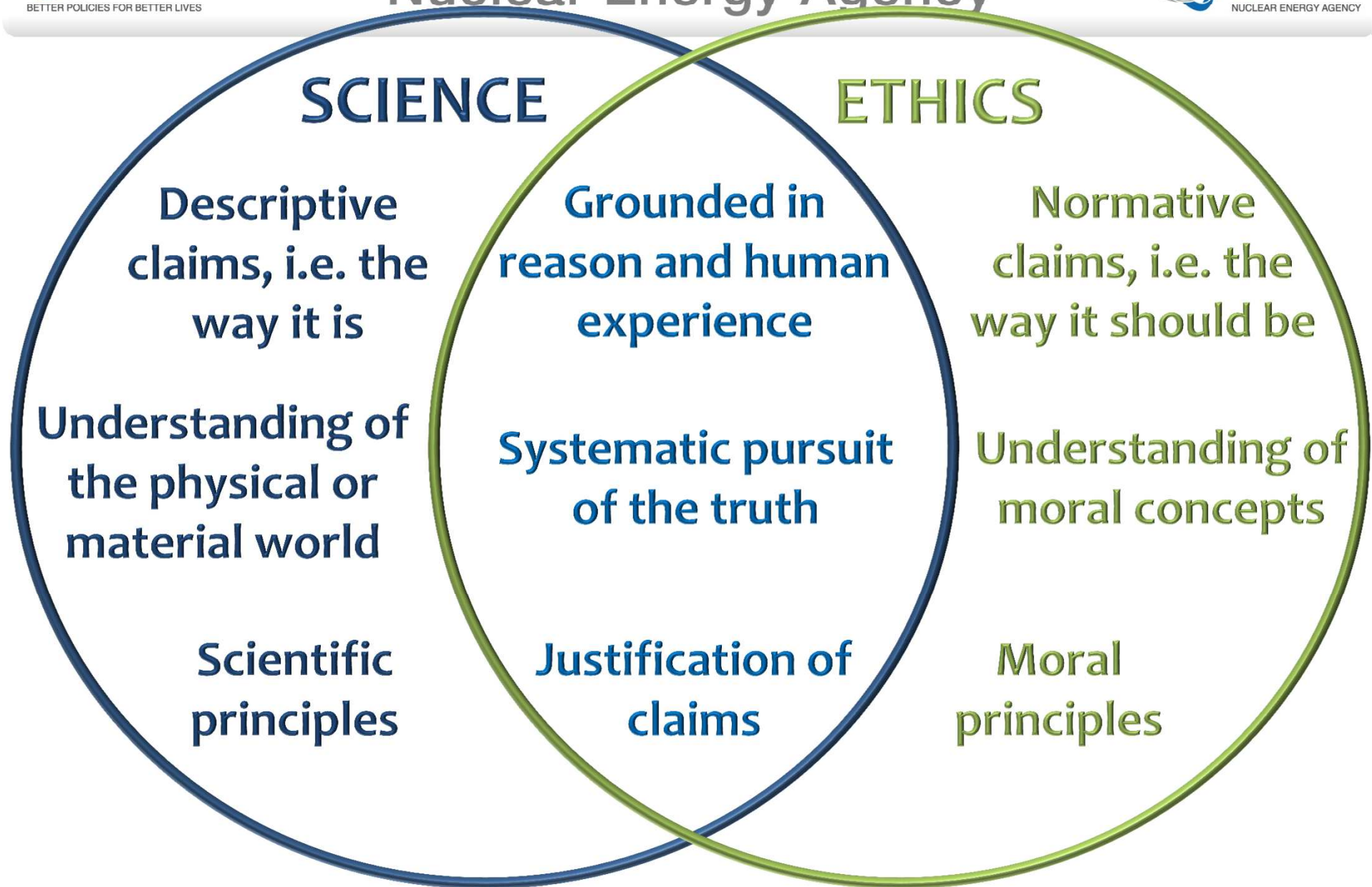
- Conservatism in dose assessment
  - ✓ Difficult to anticipate actual exposures by design
  - ✓ Conservatism not compatible with ALARA
  - ✓ Importance of worker's own attitude (benefit of monitoring)
  - ✓ Monitoring in NORM industries: individual exposures or workplace assessment
- Broader all-hazards approach:
  - ✓ Judgment of the radiation protection expert
  - ✓ Bias about importance of radiation effects
  - ✓ Lack of knowledge about other aspects
- Post-accidental situations
  - ✓ Steel works and scrap metal dealers: orphan sources are a known risk
  - ✓ Post-accidental contamination, need for guidelines?
  - ✓ Need for an approach to be implemented promptly in case of an accident?
  - ✓ Values are the key parameters!
- Probability of causation
  - ✓ Uncertainties in cancer causation
  - ✓ Non-cancer effects
  - ✓ Different approaches for compensation

## Values underlying the RP system

- Biological science
  - ✓ Importance of continued fundamental research
  - ✓ For occupational protection: current knowledge is a sufficient basis
  - ✓ Be open of unexpected scientific results
  - ✓ Prudence and accountability require emerging issues to be flagged
  - ✓ If biomarkers would be found, their existence should not be hidden
- RP System has developed its own paradigms
  - ✓ Historical: Euratom Treaty, international BSS
  - ✓ Initial focus on nuclear energy, industry
  - ✓ Expertise within the radiation protection community, RP authorities, not elsewhere
  - ✓ Comprehensive RP System, needs to be fine-tuned to the new situations
  - ✓ Differences ICRP and international standards
  - ✓ Build framework for occupational radiation protection on the basis of the science and of the values at stake

# **ETHICS of RADIOLOGICAL PROTECTION**

Slides from Dr Nicole Martinez



## Foundational Ethical Theories

### Consequentialism

Emphasis on consequences of actions

Utilitarian ethics:  
Greatest good for greatest number of people



What are potential consequences, both short and long term?  
Are the consequences positive or negative?

### Deontology

Emphasis on the nature of the act and intent

Kantian ethics:  
responsibility to treat others with respect as they have inherent value



Does the action respect the rights of persons?  
Consider the various stakeholders

### Virtue ethics

Emphasis on being a responsible human being

Ethics of aspiration:  
striving for excellence of character in life

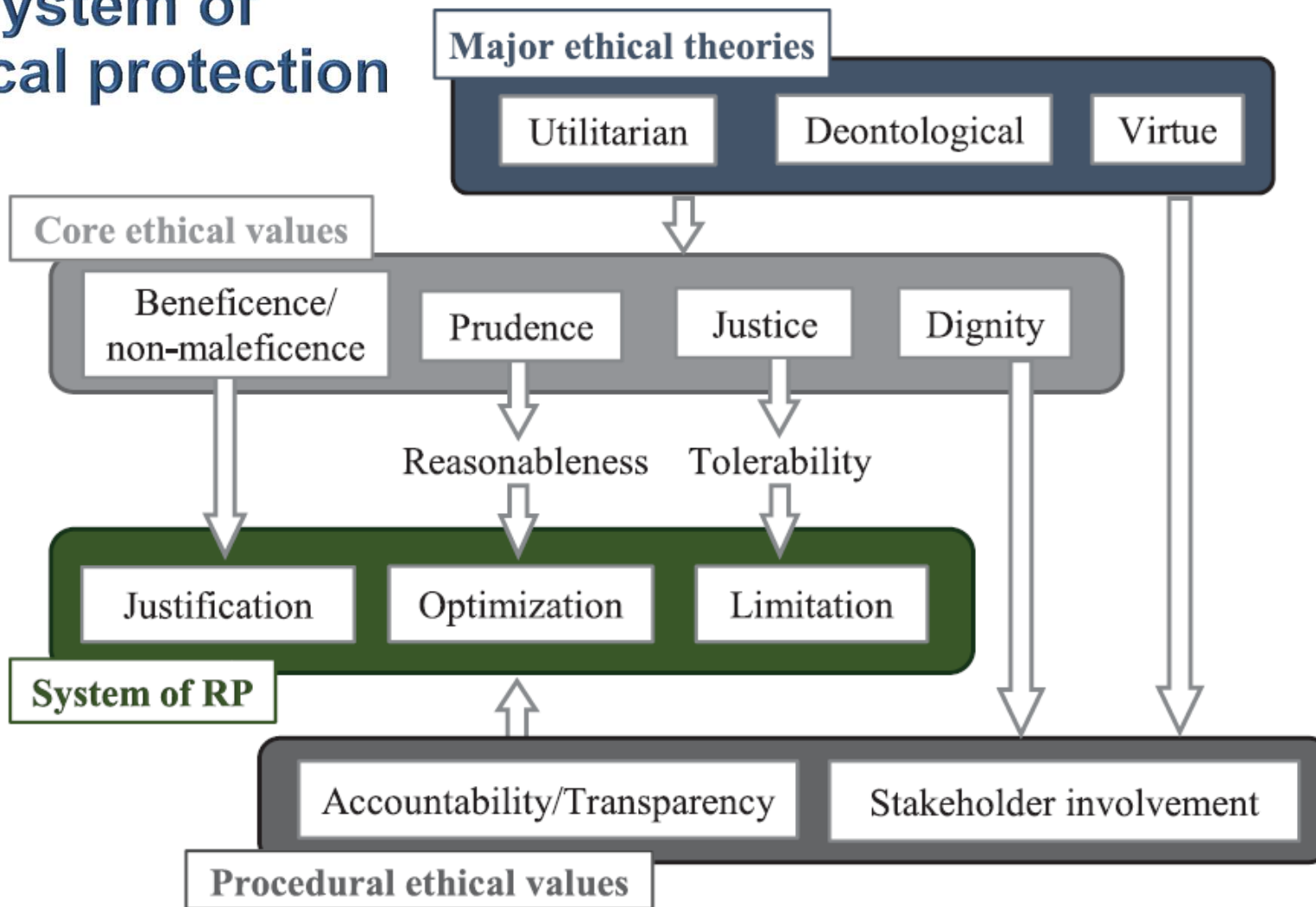


How does this effect (or what does the action say about) the character of a person?  
Consider various roles and responsibilities

# Values Underpinning the System

- **Four core ethical values**
  - Beneficence/non-maleficence
  - Prudence
  - Justice
  - Dignity
- **Three procedural values**
  - Accountability
  - Transparency
  - Inclusiveness

## Ethical foundations of the system of radiological protection





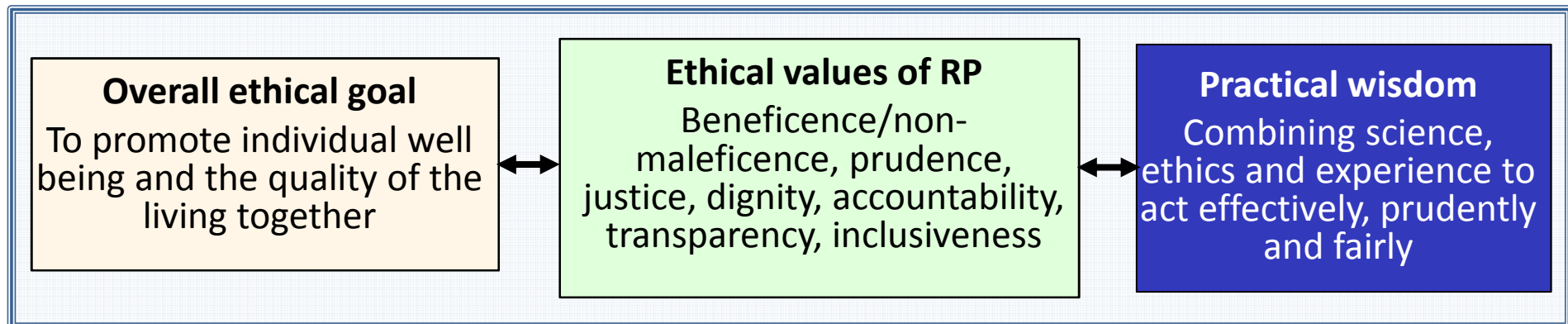
## Summary

In practice, the search for

- **appropriate** exposure situations (**justification**)
- **reasonable** levels of protection (**optimization**)
- and **tolerable** exposure levels (**dose limitation**)

is a permanent questioning which depends on the prevailing circumstances with a desire to

- do more good than harm (**beneficence/ non-maleficence**)
- avoid unnecessary risk (**prudence**)
- seek fair distribution of exposures (**justice**) and
- treat people with respect (**dignity**)





Justification of protection strategies goes **far beyond the scope of radiological protection** as they may also have various economic, political, environmental, social, and psychological consequences

Optimization of protection is **not** minimization of dose. Optimization of protection is the result of an evaluation which **carefully balances** the detriment from the exposure with the relevant economic and social factors.

The value of the reference level should result from a **careful balance** of many inter-related factors, including the sustainability of social, economic, and environmental life, and the overall health of the affected populations... appropriately including stakeholder views

## Moving forward

How can ethical theory be made more accessible?

*Goal: engage interested parties in ethical decision making*

How can ethical theories be applied in a practical way?

*Goal: provide a framework for dealing with real problems*

Currently Task Group 109: Ethics in Radiological Protection for Medical Diagnosis and Treatment

Inclusion of the ethical considerations in future ICRP publications