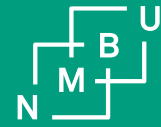


# The 2001 IUR Consensus Statement – Philosophical and Ethical Foundations of Environmental Protection



**Deborah Oughton**

Center for Environmental Radioactivity (CERAD), Norway  
UNSECO World Commission on Ethics in Science and Technology (COMEST)

*IUR Workshop, Miami Beach  
17 November, 2015*



# Oslo Consensus Conference, October 2001



**Radiation Protection in  
the 21st Century:  
Ethical, Philosophical and  
Environmental Issues**

**Consensus Conference on  
Protection of the Environment**

The Norwegian Academy of Science and Letters  
Oslo, October 22–25th, 2001



The Oslo consensus conference on protection  
of the environment

D.H. Oughton<sup>a,\*</sup>, P. Strand<sup>b</sup>

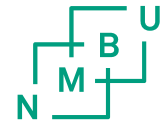
<sup>a</sup> University of Oslo's Ethics Programme, Gaustadalléen 21, Forskningsparken, 0379 Oslo, Norway

<sup>b</sup> Norwegian Radiation Protection Authority, Box 55, 1332 Osteras, Norway

**ORGANISORS: Norwegian Radiological Protection Authority  
(NRPA) and Agricultural University of Norway (AUN)**

**SUPPORTED BY: Nordic Nuclear Safety Research (NKS) and IUR**

# Oslo Consensus Conference, October 2001



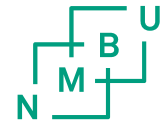
## AIMS

“... to provide a forum for discussion of current issues in radiation protection, to have an input to international developments related to protection of the environment, and to encourage wider participation in the debate. The purpose of the consensus procedure was to identify areas of agreement as an input to the ongoing regulatory developments. Some form of consent was a main goal, but not a requisite.”

## 46 PARTICIPANTS

Scientists/researchers, authorities/regulator, International organisations, industry  
NGOs

# Oslo Consensus Conference, October 2001



## GUIDING PRINCIPLES

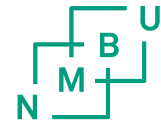
*“Humans are an integral part of the environment, and whilst it can be argued that it is ethically justified to regard human dignity and needs as privileged, it is also necessary to provide adequate protection to the environment.*

*In addition to science, policy making for environmental protection must include social, philosophical, ethical (including the fair distribution of harms/benefits), political and economic considerations. The development of such policy should be conducted in an open transparent, and participatory way.*

*The same general principles for protection of the environment should apply for all contaminants.”*

From Conference Consensus Statement, 2001

# Oslo Consensus Conference, October 2001



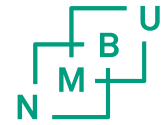
## STATEMENTS

“1. As part of the effort to revise and simplify the current system of radiological protection of humans, there is a need to address specifically radiological protection of the environment.

2. There are several reasons to protect the environment, including ethical values, sustainable development, conservation (of species and habitats) and biodiversity

From Conference Consensus Statement, 2001

# Oslo Consensus Conference, October 2001



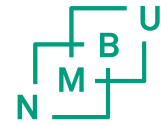
## STATEMENTS

“3. Our present level of knowledge should allow the development of a system that can be used to logically and transparently assess protection of the environment using appropriate endpoints. The development of the system ought to identify knowledge gaps and uncertainties that can be used to direct research to improve the system.

4. The best available technology, including consideration of economic costs and environmental benefits should be applied to control any release of radionuclides into the environment in a balanced manner with respect to other insults to the environment.

From Conference Consensus Statement, 2001

# Oslo Consensus Conference, October 2001

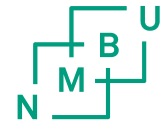


## STATEMENTS

“5. When a product or activity may cause serious harm to the human population or to the environment, and significant uncertainties exist about the probability of harm, precautionary measures to reduce the potential risk within reasonable cost constraints should be applied. In making such assessments and decisions, an improved mechanism for incorporating developing scientific knowledge needs to be established.

From Conference Consensus Statement, 2001

# Oslo Consensus Conference, October 2001



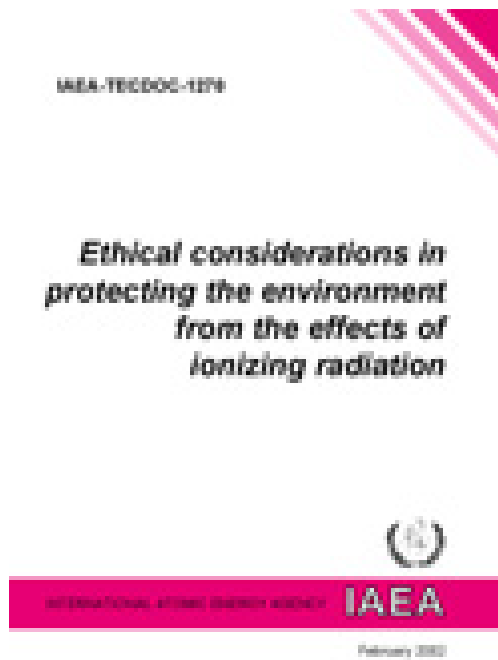
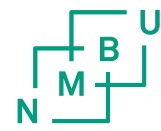
## STATEMENTS

“6. To assess the impact on the environment, there is a need to take into account *inter alia* radiation type, type of organism, and biological endpoints (impact-related). In order to improve the transparency of assessing environmental impacts, the authoritative bodies should give consequently give consideration to the development of quantities and units for biota, with the intent to avoid unnecessary complexity.”

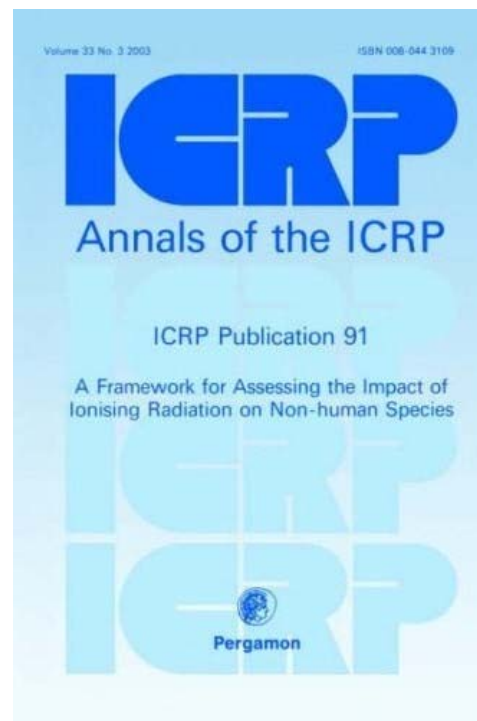
From Conference Consensus Statement, 2001



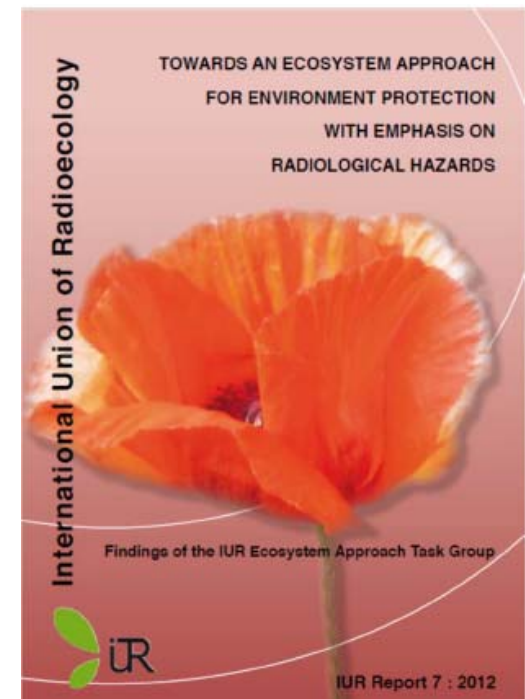
# Philosophical and Ethical Aspects were addressed by many organisations during Development of the System



2002

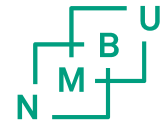


2003



2012

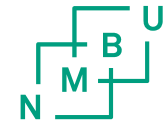
IAEA, ICRP, IUR, NEA/OECD, ...



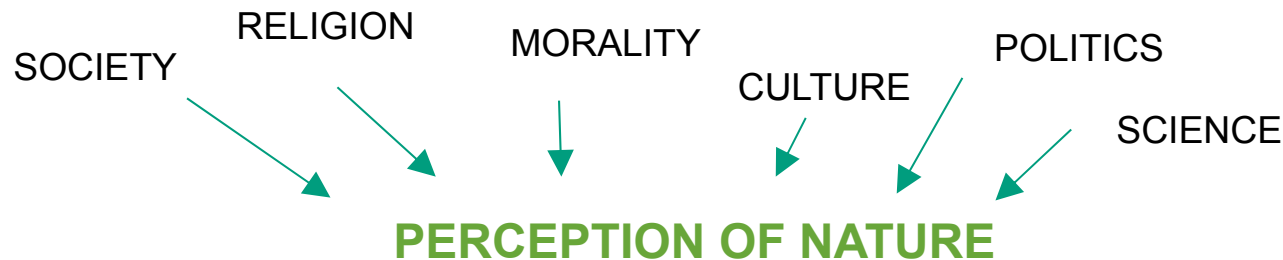
# How do we Value the Environment?

- ethically
- in the context of environmental radiation protection

# What has Moral Standing in the World and Why?



Charles Darwin, 1840 (Downe House, Downe, Kent, Great Britain/Art Resource, NY)



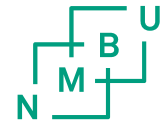
*Value-basis*

Conceptualised as:

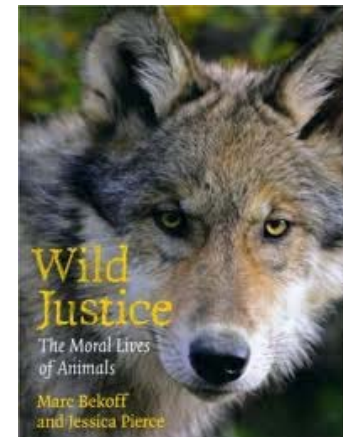


*Philosophical worldviews*

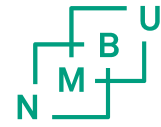
# Antropocentric



- Human beings are the entities that have moral standing
- Non-human species and the environment have value only in so much as they satisfy human interests – “extrinsic value” (Frankena, Bookchin)
- Environmental effects matter only to the extent that they affect human interests



# Antropocentrism and Valuing the Environment



Tourism?

Mineral Resources?

Hunting?

Food?

Ecosystem Services

Aesthetic beauty?

# Biocentric

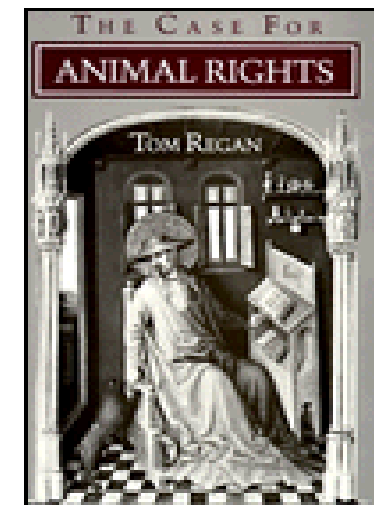
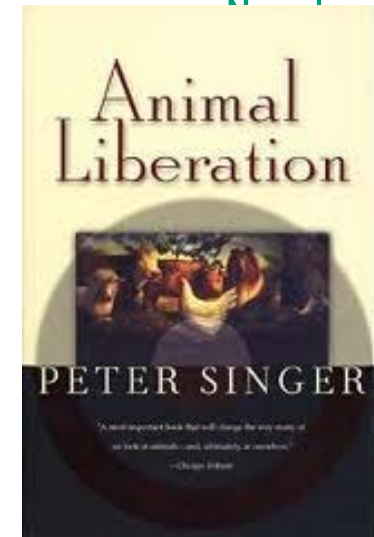
- Moral standing can be extended to individual members of other species, and thus obligations pertaining to such individuals arise as a consequence
- Different views about how we draw a moral distinction between humans and animals?
  - Rationality
  - Sentience
  - Inherent or instrumental worth
- Disagree on which organisms have moral standing



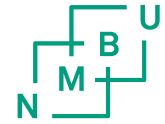
# Biocentrism (Animal Ethics)




- Utilitarian (Peter Singer)
  - Ethical realm concerns all sentient creatures “can they feel pain, do they suffer”
- Kantian/deontological (Tom Regan)
  - animal rights, duty based ethics. Animals are capable of experience, thus have similar claim to rights as humans



# Ecocentric



- Moral standing can be extended to virtually everything in the environment, including landscapes—rivers and mountains—but the focus lies more with the entirety and diversity of the ecosystem rather than the individual entities.



A thing is right when it tends to preserve the integrity, stability and beauty of the biotic community. It is wrong when it tends otherwise.

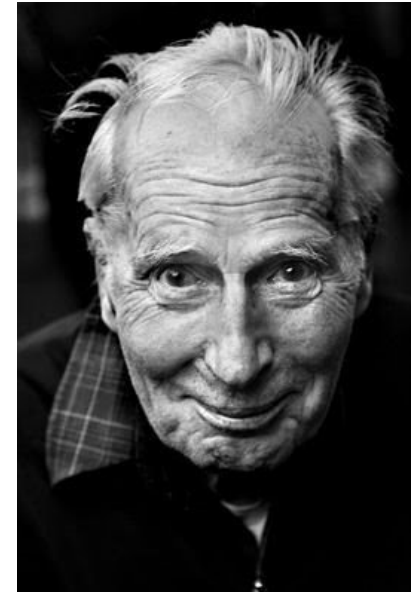
(Aldo Leopold)

izquotes.com



# Ecocentric

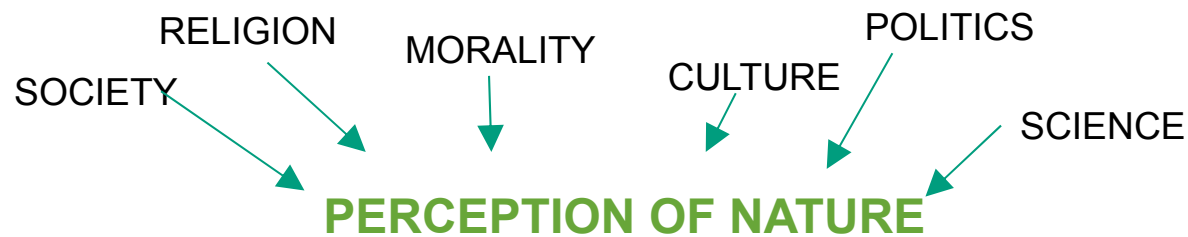
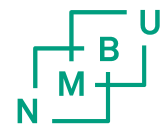
- A variety of views on the reasons for and solutions to environmental problems (human arrogance, male dominance, social and economic hierarchy)
- *“Humans have no right to interfere with the richness and diversity of the ecosystem except to satisfy vital needs (Næss)”*



Arne Næss



# Ethical Foundations for Environmental Radiological Protection



*Value-basis*

Conceptualised as:

ANTHROPOCENTRIC

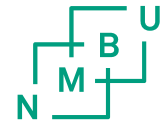
BIOCENTRIC

ECOCENTRIC

*Philosophical worldviews*

- All three theories can support the need to protect the environment
- Anthropocentrism can give powerful grounds for addressing the environmental impacts of ionising radiation
- Biocentric and ecocentric views are reflected in many religions and cultures

# Primary Principles of Environmental Radiological Protection



ANTHROPOCENTRIC

BIOCENTRIC

ECOCENTRIC

*Philosophical worldviews*

Broadly compatible with the principles of:

**Conservation**  
(of species and habitats)

**Sustainability** –  
economic, social  
and environmental

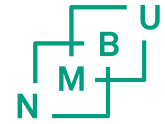
Protection of  
**Biodiversity**

*Primary Principles  
of Environmental  
Protection*

**Environmental justice**  
(distribution of risks and  
benefits; participation in  
decision making)

Respect for  
**Human dignity**

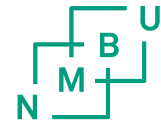
# Some Discussion Points



- What is Harm?
- Impacts of Remediation
- Sustainability and Ecosystem Approach

... and some comparisons with other environmental stressors

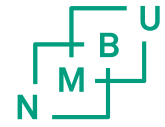
# What is Harm?



- When does change become damage?
- Impacts on biodiversity, conservation, «pristine» environments ... ?



# Impacts of Remediation



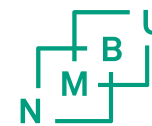
- Usually carried out on anthropocentric grounds
- Examples of biocentric or ecocentric driven remediation?



Fukushima Remediation



# Sustainable Development



Society

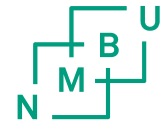
Economy

Sustainable  
Development

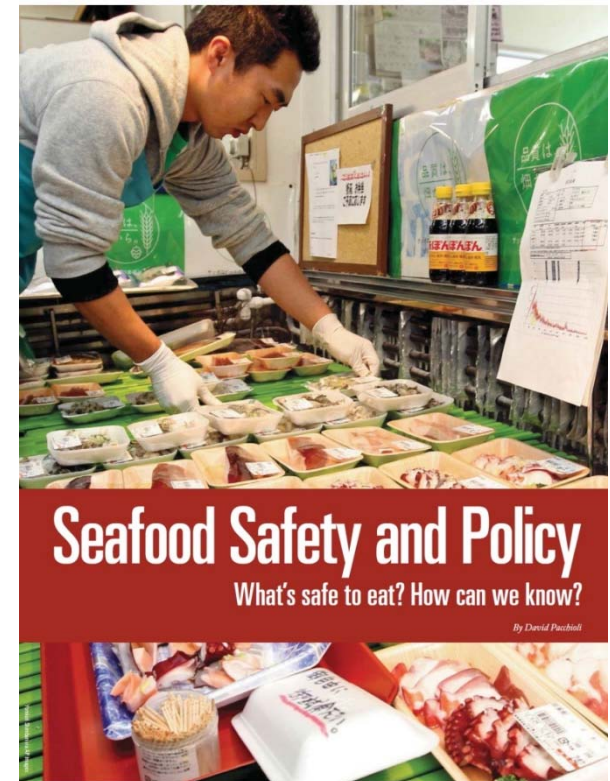
Environment

Worldpress.com

# What is the Cost of Marine Contamination after Fukushima?



- Direct loss from sales
- Ecological impacts of fishing bans
- Savings from government fishing subsidies

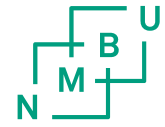


Oceanus, 2013

Inspired by Shunsuke Managi, Tokohu University  
<http://www.whoi.edu/website/fukushima-symposium/overview>



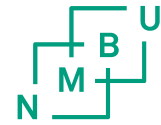
# What is the Cost of Marine Contamination after Fukushima?



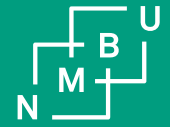
- Direct loss from sales
- Decrease in market value of marine products – even non-contaminated
- Ecological impacts of fishing bans
- Radiation effects in marine ecosystems
- Savings from government fishing subsidies
- Societal and demographic consequences from loss of livelihood for fishermen
- Loss of access to sites of cultural or community heritage



# Conclusions

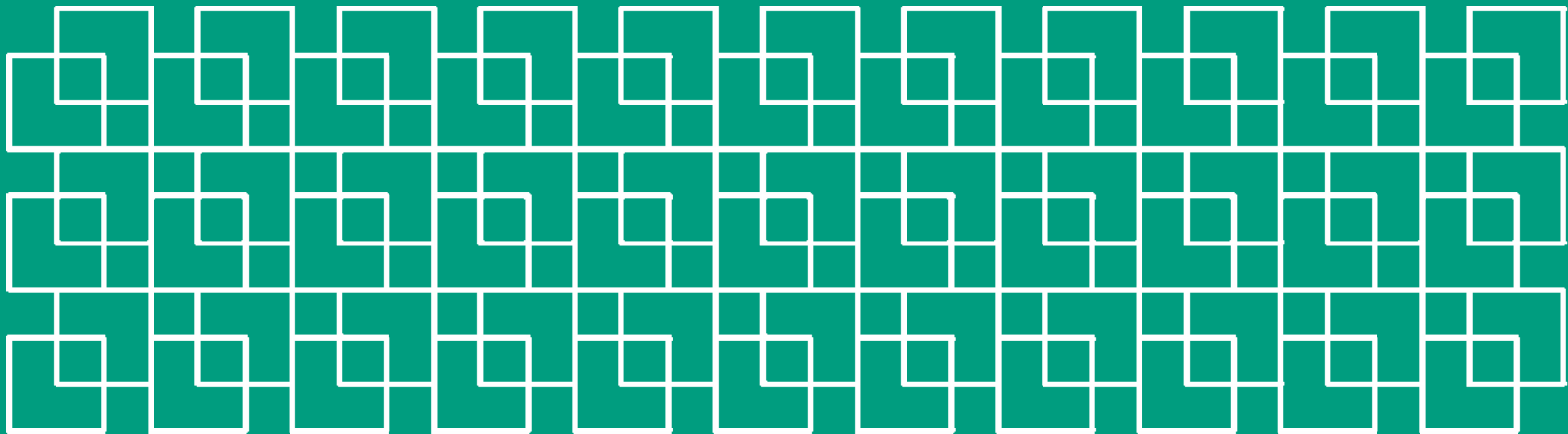


- The ethical foundation of Environmental Radiation Protection has been addressed by many international bodies (IAEA, IUR, IAEA)
- Found broad support for the primary environmental protection principles of conservation, sustainability, biodiversity, human dignity and environmental justice
- Environmental radiation protection can foster interaction between chemical, ecology and radiological disciplines  
... including improved comparison of radiation and other environmental hazards.



# Thank You!

[deborah.oughton@nmbu.no](mailto:deborah.oughton@nmbu.no)

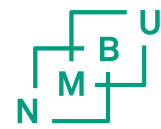




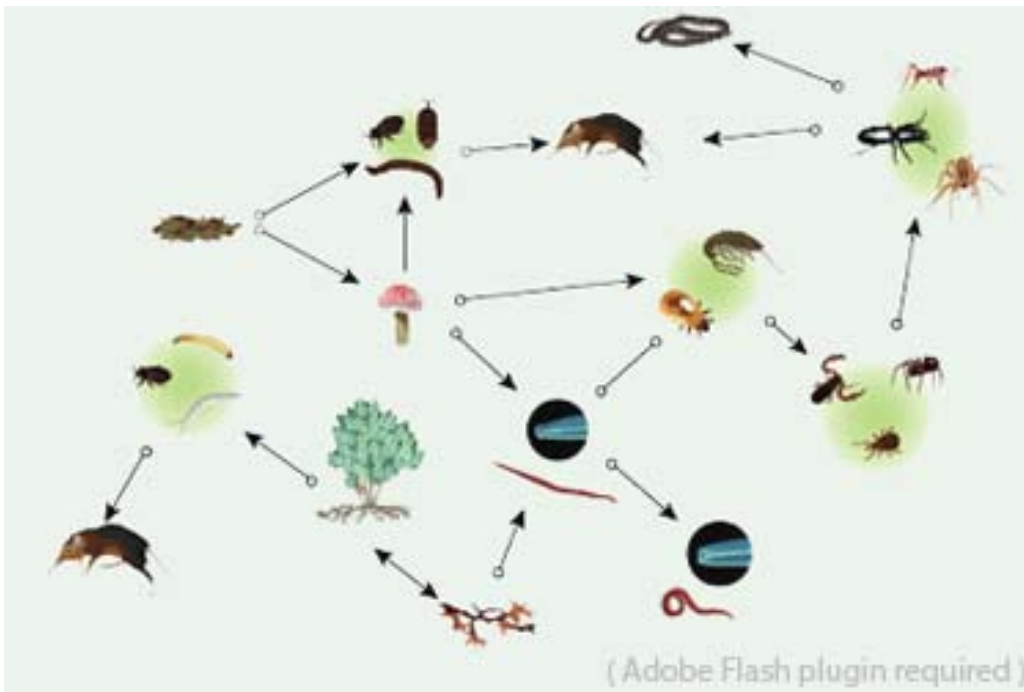
# Literature

- Oughton, D.H. 2003. Protection of the Environment, *J. Environ Radioact.*
- IAEA 2002. Ethical considerations in protecting the environment from the effects of ionizing radiation . IAEA-TECDOC-1270
- Singer, P. 1981. Animal liberation and animal rights
- Shunsuke Managi, The Economic Consequences of Fukushima. Fukushima Oceans Conference Tokyo Nov 2012. Presentation available from:  
[www.who.edu/website/fukushima-symposium/overview](http://www.who.edu/website/fukushima-symposium/overview)

# Embracing Ecological Complexity



- As for other environmental stressors, ionising radiation may cause indirect effects in populations through interactions and competition between species
- Which endpoints to monitor – diversity, functionality,...?



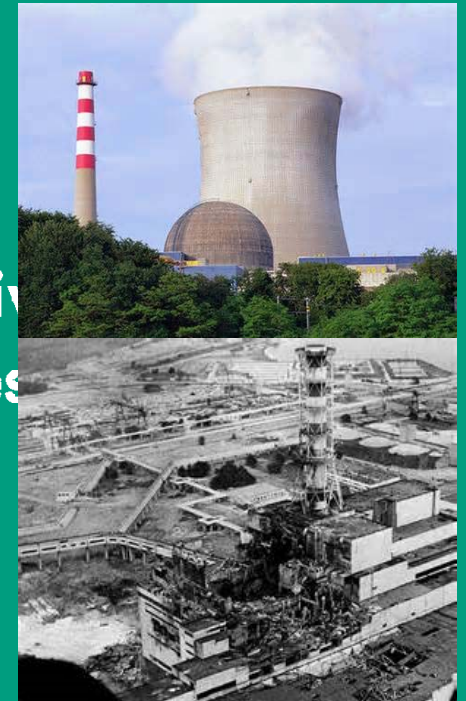
# Implementation in Environmental Legislation and Legal Requirements – some final thoughts....

National differences in addressing environmental radiation protection

Standards, benchmarks, guidance, ...

Applications in planned and existing situations

Integration of human and environmental protection



N M B U  
Norwegian University of Life Sciences

# ERICA – End-Users Group 2004-2006

U  
B  
M



# ERICA – End-Users Group 2004-2006

U  
B  
M



Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

 ScienceDirect

Journal of Environmental Radioactivity 99 (2008) 1503–1509

JOURNAL OF  
ENVIRONMENTAL  
RADIOACTIVITY

[www.elsevier.com/locate/jenvrad](http://www.elsevier.com/locate/jenvrad)

## Stakeholder interaction within the ERICA Integrated Approach

I. Zinger<sup>a,\*</sup>, D.H. Oughton<sup>b</sup>, S.R. Jones<sup>c</sup>

<sup>a</sup> Swedish Radiation Protection Authority, 171 16 Stockholm, Sweden

<sup>b</sup> Norwegian University of Life Sciences, Department of Plant and Environmental Sciences, PO Box 5003, 1432 Ås, Norway

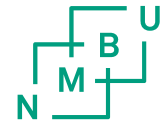
<sup>c</sup> Westlakes Scientific Consulting Ltd., Westlakes Research Institute/Westlakes Scientific Consulting, Westlakes Science Park Moor Row, Cumbria CA24 3LN, UK



INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION

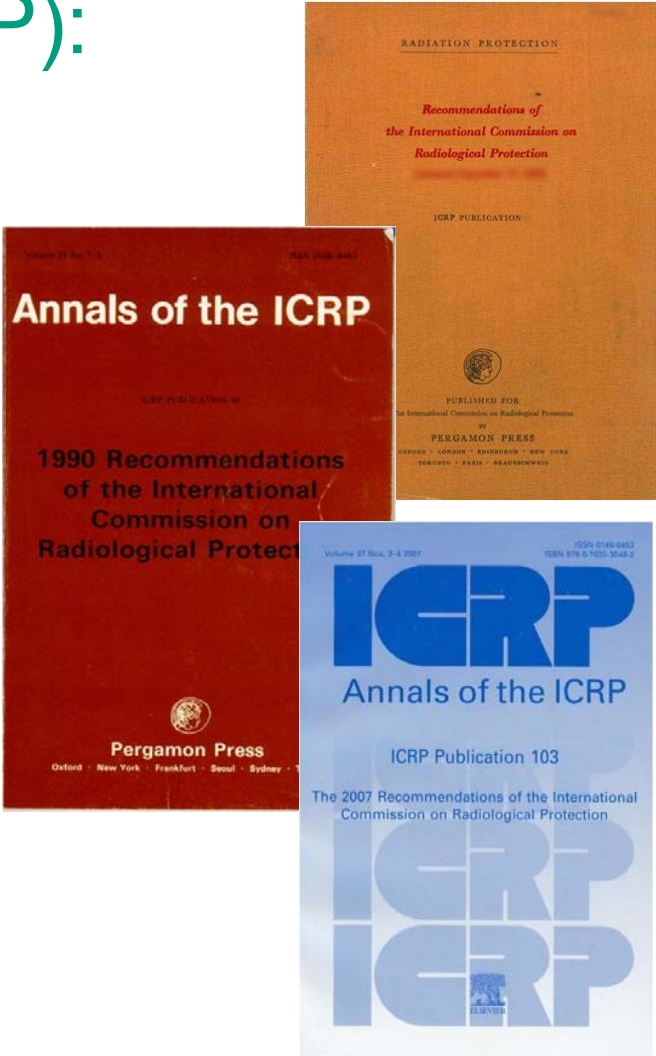


# International Commission for Radiological Protection (ICRP):



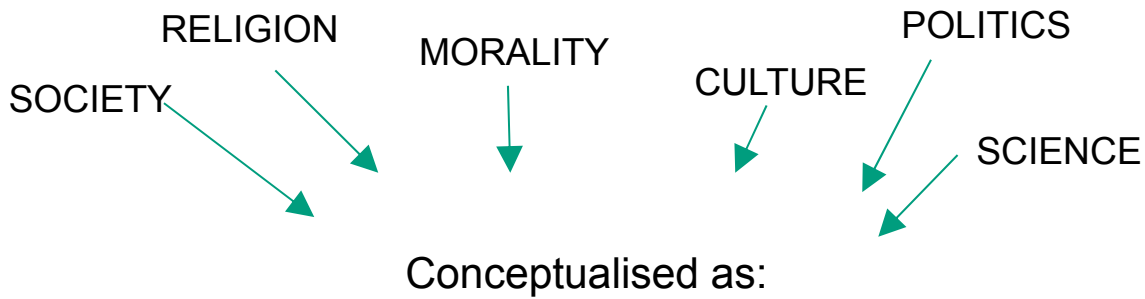
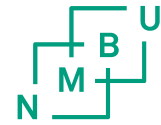
- Independent organisation in existence since 1927
- Initially provided guidance on medical uses of radiation
- Provides Recommendations and Advice on Radiological Protection, Emergency Preparedness and Nuclear safety

A long history compared to risk assessment and management of other stressors



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

# Theories, Values and Principles



*Value-basis*

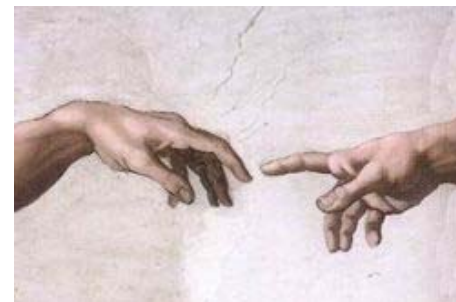
- UTILITARIANISM
- DEONTOLOGY
- VITRUE ETHICS

*Ethical Theories*

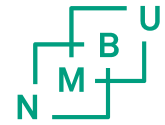
Broadly compatible with the principles of respect for:

- Autonomy
- Beneficence
- Non-Maleficence
- Justice

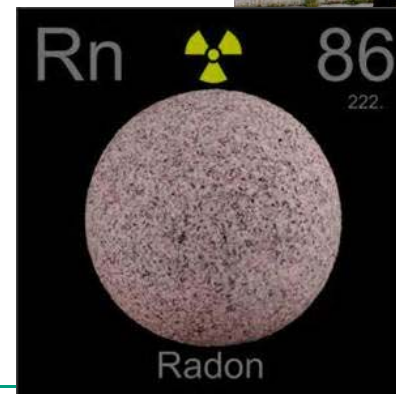
*Ethical Values*



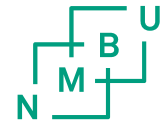
# Public perception of risk



- "Expert I" – the public is ignorant, misunderstands risks, is irrational in attitude towards risks (smoke and drive but rejects much smaller risks associated with GM foods, biotechnology, nuclear power)
- "Expert II" – the public's perception of risk is complex (psychological, societal, ethical, ...)



# Literature



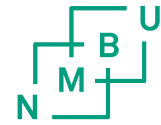
- Oughton and Howard 2012. The Social and Ethical Challenges of Radiation Risk Management, *Ethics, Policy and Environment*, **15**:71-76
- Oughton, D.H. and Hansson, S.O. (eds) 2013. *Societal and Ethical Aspects of Radiation Risk Management* (Elsevier: Amsterdam)
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- Oughton, D.H., Bay, I., Forsberg, E-M, Kaiser, M., Howard, B. (2004). An ethical dimension to sustainable restoration and long-term management of contaminated areas, *Journal of Environmental Radioactivity*, **74**: 171-183
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# From Human Centred to Environmental Protection

# Extending the Protection Aim

- Emerging consensus that radiation protection needs to address the effects of ionising radiation on non-human species (IUR, 2000, 2001)
- Oughton and Strand: Oslo Consensus Conference, 2001
- ICRP 208 (2007) Environmental Protection - the Concept and Use of Reference Animals and Plants [www.icrp.org](http://www.icrp.org)
- IAEA Safety Standards [www.iaea.org](http://www.iaea.org)



IAEA-TECDOC-1379

*Ethical considerations in protecting the environment from the effects of ionizing radiation*



International Atomic Energy Agency

IAEA

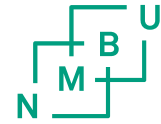
February 2002

## The Objective

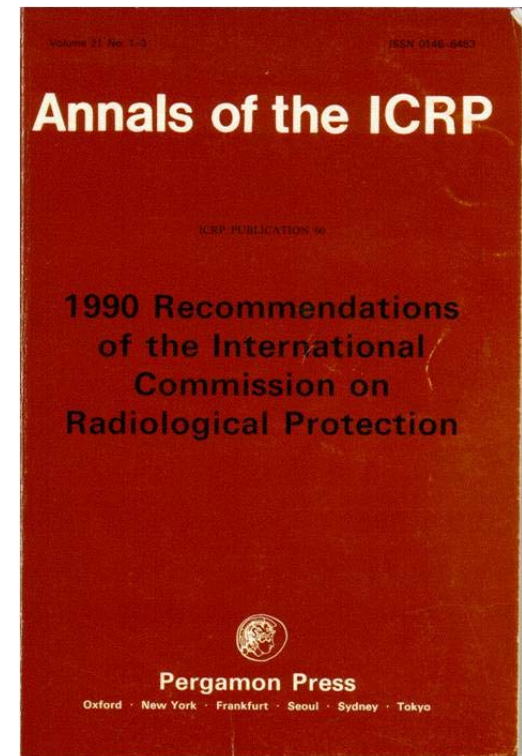
To protect people and the environment. Whether the cause is an unsafe act or a security breach, IAEA enhances efforts in both areas to avoid the same consequences.



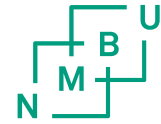
# ICRP, 1990



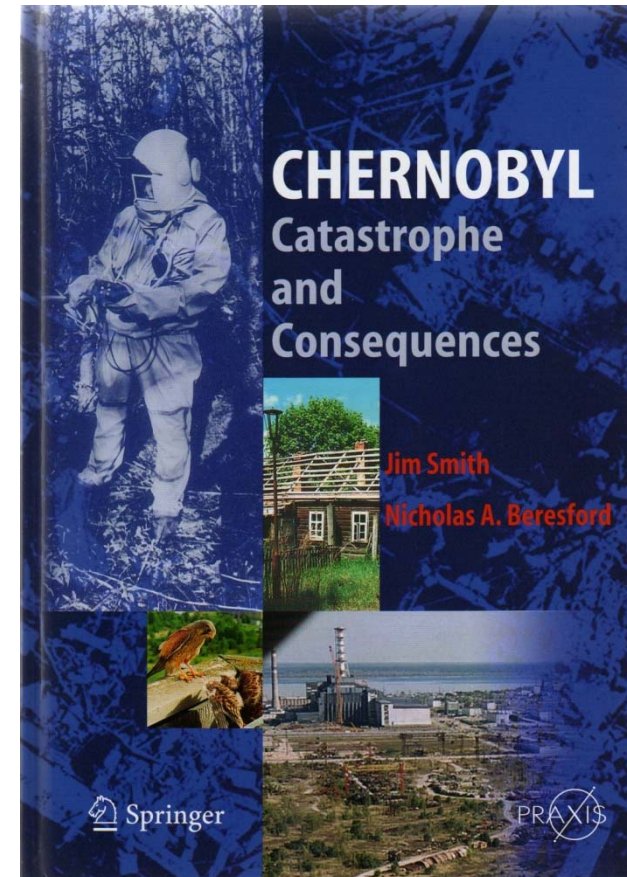
*“The Commission believes that the standard of environmental control needed to protect man to the degree currently though desirable will ensure that other species are not put at risk. Occasionally, individual members of non-human species might be harmed, but not to the extent of endangering whole species or creating imbalance between species. At the present time, the Commission concerns itself with mankind’s environment only....” [ICRP, 1991],*



# Overview



- Societal and ethical challenges in remediation – STRATEGY, and EURANOS projects
- Ethical tools
- Some implications for risk perception and remediation strategies

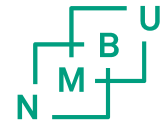


Oughton and Bay, 2005

STRATEGY ([www.strategy-ec.org](http://www.strategy-ec.org)) and EURANOS ([www.euranos.fzk.de](http://www.euranos.fzk.de))



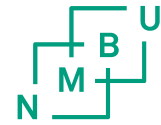
# Challenges in Remediation Evaluation



- The complexity of the issues (many countermeasures have both positive and negative social and ethical consequences);
- The various “trade-offs” that may be required when making choices;
- Lack of agreement within society on what is practical or acceptable, let alone on how to “put a price on” such non-monetary side-effects; and
- The lack of established procedures, and experience, in systematically incorporating these dimensions in decision-making.

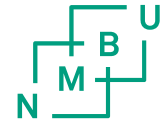


# Summary



- The divergence between assessment of radiation risks and chemicals is partly due to a historical separation
- We know a lot about radiation risks from large epidemiological studies ... but have difficulties communicating with the public
- The introduction of environmental risk assessment for radiation offers a chance for greater interaction between the chemical and radiological disciplines
- ... including improved comparison of radiation and other environmental hazards.

# Practical Implications: Summary



- Communication and dialogue
  - Honest information on doses and risks is paramount for public trust
  - Participation of public and laypersons in decision-making
  - Need for expertise in more than radiation protection
  - Different information for different people
- Increasing personal control
  - Access to local and personal monitoring
  - Dialogue with variety of experts
- Acceptance of risks comes down to more than probability of harm

# From ICRP Annex A



## b) Gender-specific detriments for ages 18-64 years at exposure

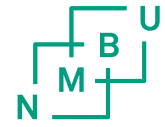
Tissue	Nominal Risk Coefficient (cases per 10,000 persons per Sv)	Lethality fraction	Lethality-adjusted nominal risk* (relating to column 1)	Relative cancer free life lost	Detriment (relating to column 1)	Relative detriment <sup>†</sup>
Male						
Oesophagus	14	0.93	14	0.91	12.8	0.035
Stomach	51	0.92	50	0.89	44.5	0.122
Small Intestine	170	0.92	168	0.91	150	0.078
Colon	219	0.92	216	0.91	198	0.051
Rectum	1009	0.92	1000	0.91	900	0.024
Bladder	1007	0.92	1000	0.91	900	0.024
Prostate	1000	0.92	1000	0.91	900	0.024
Other Organs	54	0.43	22	0.37	10.1	0.028
Gonads (Hereditary)	12	0.80	12	1.32	15.3	0.042
<b>Total</b>	<b>1103</b>		<b>368</b>		<b>365</b>	<b>1.00</b>

**Cancer risk co-efficients (ICRP, 2011)**

Risk of detriment = 0.057 per Sv  
*(Detriment = 0.055 cancer + 0.002 hereditary effects for populations\*)*

*EAR – excess absolute risk*  
*ERR – excess relative risk*

# Fukushima Challenges and Radiation Risk Perception and Communication

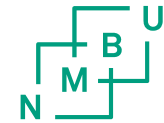


- Tens of thousands died in the Fukushima earthquake, nearly half a million were made homeless, yet since the accident most of the focus has been on nuclear incident
- Reports of iodine tablets selling out in Europe
- More than 25 embassies closed or relocated from Tokyo
- Bans on import of foods from Japan



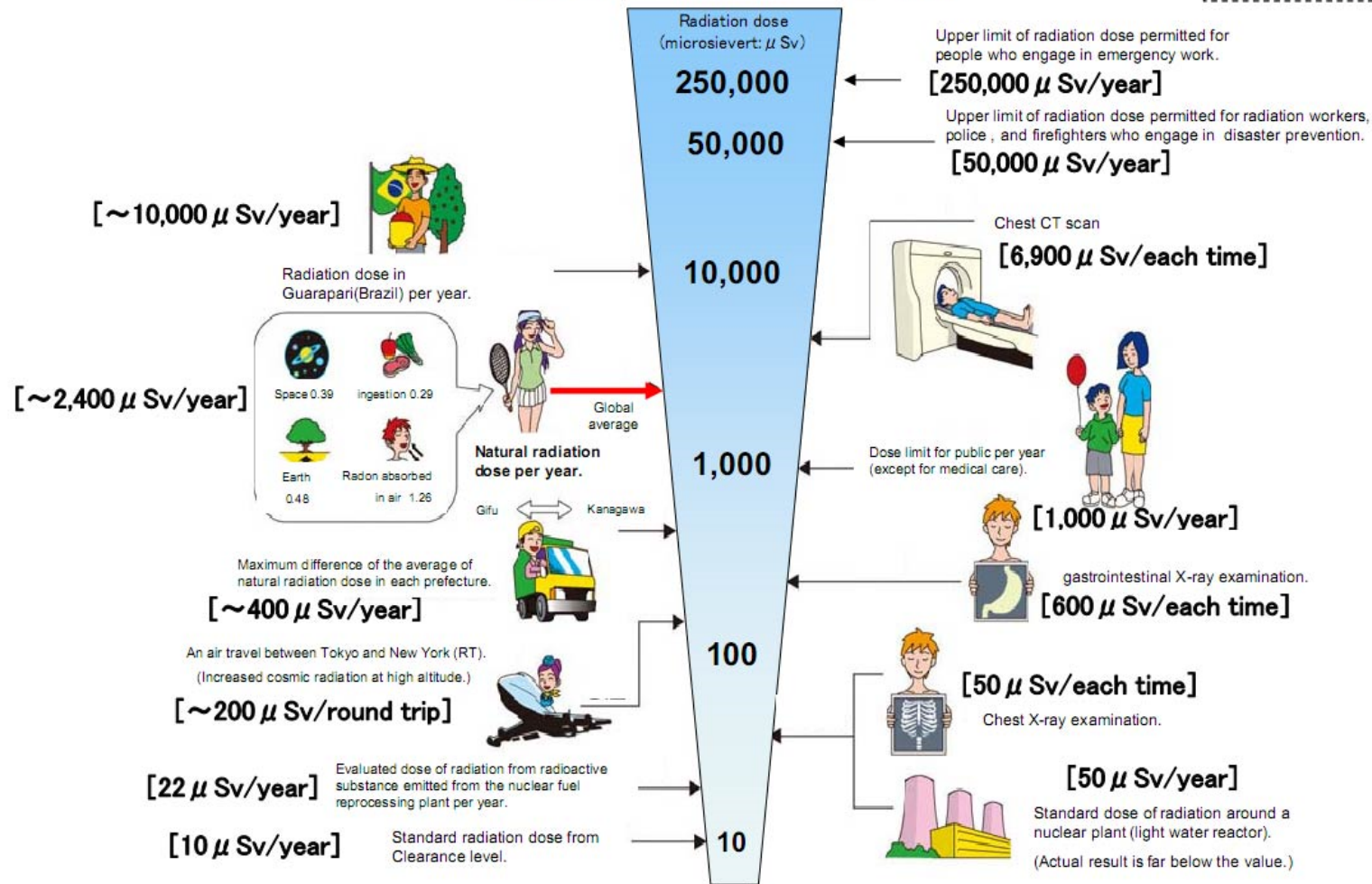
Social and Ethical Issues – Deborah Oughton

# Individual doses (EPA Japan)

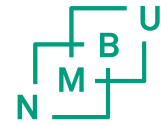


## Radiation in Daily-life

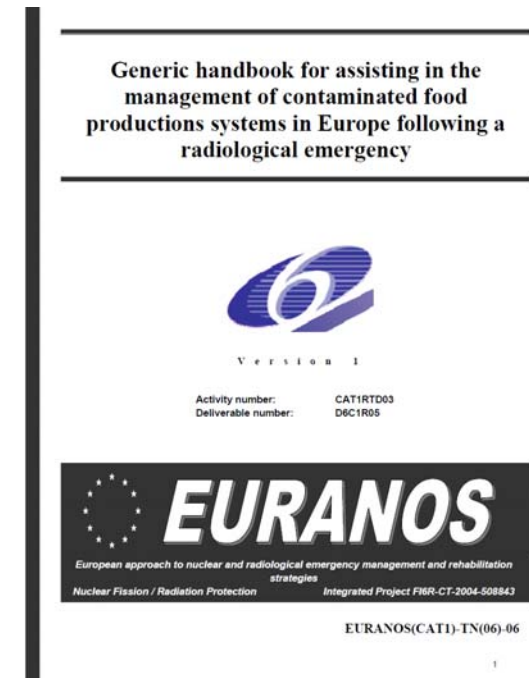
※Unit :  $\mu\text{Sv}$



# STRATEGY, EURANOS and NERIS EU Projects

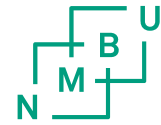


- STRATEGY project (Sustainable Restoration and Long-Term Management of Contaminated Rural, Urban and Industrial Ecosystems). 1999-2003.
- Multi-disciplinary project assessing radiation accident management strategies (Howard et al., 2002).
- Succeeded by EURANOS and NERIS projects
- **Outputs:** countermeasure templates, handbooks; stakeholder consultation, decision-tools, value matrix

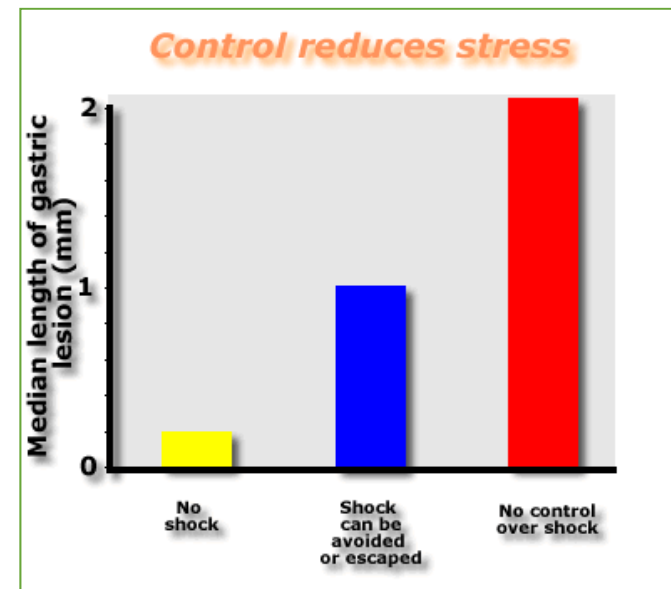


See [www.strategy-eu.org.uk](http://www.strategy-eu.org.uk) and [www.neris-eu.com](http://www.neris-eu.com)

# Factors Relevant for Risk Perception



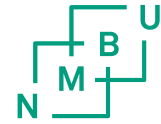
- Control, consent, choice
  - Ethical Principles: Autonomy, dignity
  - Practical implications: transparency, stakeholder engagement
- Distribution of risks and benefits
  - Ethical Principles: equity, fairness, responsibility
  - Practical Implications: time, age and spatial variation in risk and benefits



Weiss, J. 1972. "Psychological Factors in Stress and Disease." *Scientific American*, 226: 104.



# Importance of Measurements



- Personal dosimeters
- Whole-body monitoring
- Local monitoring stations



*Lavrans Skuterud, NRPA*

→ self help and personal control

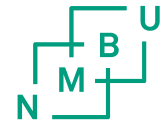


- Requests for health follow-up (and biomarker analysis)
  - Epidemiological and ethical challenges
  - Thyroid screening



*Babyscan, Hayano et al 2014*

# Ethical Theories: What is the Right Thing to Do?

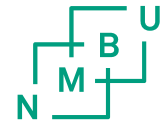


- Utilitarianism - Welfare?
- Deontology – Autonomy/Freedom?
- Virtue Ethics – The common good?
- Contractarianism – Distribution of risks and benefits?

... IN WESTERN PHILOSOPHY

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

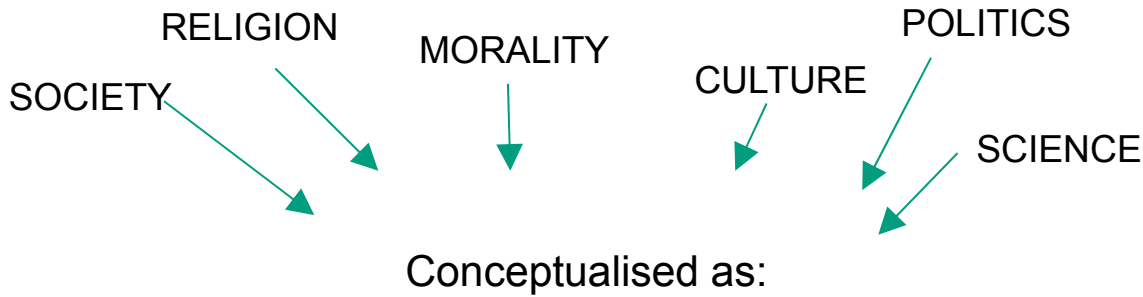
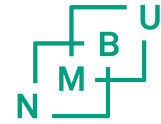
# Value and Ethical Matrixes



- Ethical Matrix: A tool developed for assessment of technology and policy, based on adaption of Beauchamp and Childress Biomedical Principles (Mepham, 1996).
- Similar adaptations of Beauchamp and Childress's principles had occurred in Public Health ethics (e.g, Seedhouse, 2004), where a stronger focus had been placed on community and ethics of care than the doctor – patient relationships in medical ethics

<b>Affected Party</b>	<b>Beneficence/ non-malificence</b>	<b>Autonomy</b>	<b>Justice</b>
<b>Society</b>			
<b>Industry</b>			
<b>Animals</b>			
<b>Etc.....</b>			

# Biomedical Ethics



*Value-basis*

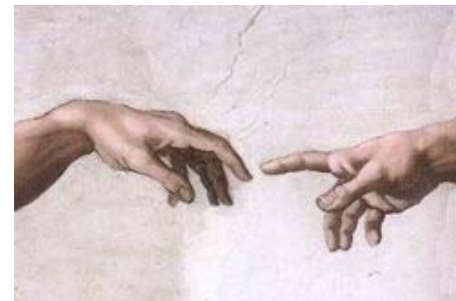
- UTILITARIANISM
- DEONTOLOGY
- VITRUE ETHICS

*Ethical Theories*

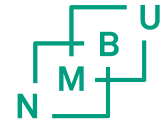
Broadly compatible with the principles of:

- Autonomy
- Beneficence
- Non-Maleficence
- Justice

*Biomedical Principles*



# Biomedical Ethical Principles

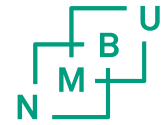


- **Respect for autonomy** (a norm of respecting the free-will and decision-making capacities of self-governing persons)
- **Nonmaleficence** (a norm of avoiding the causation of harm)
- **Beneficence** (a group of norms for providing benefits)
- **Justice** (a group of norms for distributing benefits, risks and costs fairly)

Beauchamps and Childress, 1979



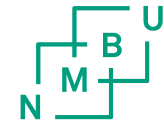
# Value and Ethical Matrixes



- Value Matrix:
- In STRATEGY, the values were modified into the principles of *well-being, dignity* and *justice*.
- Well-being refers to what is good for a person, for example health, economic welfare, security, etc.
- Dignity refers to the right to be treated with respect.
- Justice is the principle of treating everyone fairly, ensuring a equitable distribution of burdens and benefits.

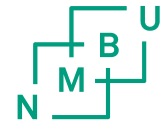
<b>Affected Party</b>	<b>Well-being</b>	<b>Dignity</b>	<b>Justice</b>
<b>Community</b>			
<b>Future generations</b>			
<b>Etc.....</b>			

# Excerpt from a Template Matrix for Management Evaluation



<b>Stakeholder</b>	<b>Example</b>	<b>Well-being</b>	<b>Dignity/ integrity</b>	<b>Justice/ equity</b>
<b>Owners/ employers</b>	Farmer House dweller Hotel owner Business proprietor	Doses to humans Loss/gain in income Damage to property	Self-help Consent Property rights	Possibility for conflict between different industries or projects
<b>Users/ community</b>	Tourists Public amenity user Local community	Access Aesthetics Empathy Community values Tourism	Respect for public heritage and footpaths Community sense	Potential inequity between age/sex/cultural minorities
<b>Animals Environment</b>	Farm animals Other biota	Animal welfare	Endangered species Habitat loss	Future generations Sustainability

# Value and Ethical Matrixes



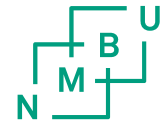
- Primarily a tool for gathering and mapping stakeholder concerns
- Useful as an aid to stakeholder dialogue and in identifying relevant stakeholders
- In radiation protection, tested as part of general emergency preparedness and specific countermeasure evaluation and selection/prioritisation

Crout et al., Radioprotection, 2004

<b>Affected Party</b>	<b>Well-being</b>	<b>Dignity</b>	<b>Justice</b>
<b>Community</b>			
<b>Future generations</b>			
<b>Etc.....</b>			



# Stakeholder evaluation of management strategies



## Contaminated Milk Disposal

- Discharge to Sea
- Land Spread
- Containment

## Acceptable

UK

Finland/  
Belgium

France



# Beneficence/Non-Malificence

## Definition in ethics

*Beneficence (and non maleficence)* – promoting or doing good as well as preventing, removing or avoiding evil or harm (Frankena, 1963)

## Relevance in RP

Beneficence – health benefits of radiotherapy, indirect benefits of other applications involving radiation exposure; benefits of reducing exposure

Non-Malificence – all exposures have an inherent risk of causing harm

Challenges – distribution of risks, harms and benefits; measurement of benefits and harms

WHO definition of health – well being

# Dignity

## Definition in ethics

*Respecting Autonomy* – the capacity to choose freely for oneself and be able to direct one's own life; to be treated as an end, and not only as a means

Recognition of human dignity a cornerstone of Human Rights (UN, 1948)

**Norwegian University  
of Life Sciences**

## Relevance in RP

Dose limits and constraints – individual rights

Consent – patients, workers (public)

Stakeholder engagement – empowerment

# Justice

## Definition in ethics

Fair distribution of resources, risks and benefits

Focus on the vulnerable/worst-off (Rawls)

Distributive Justice and Corrective/Reciprocal Justice

Equity – equal opportunity/equal treatment or equal status

## Relevance in RP

ALARA and constraints

Distribution of risks and benefits

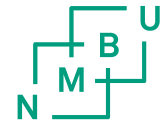
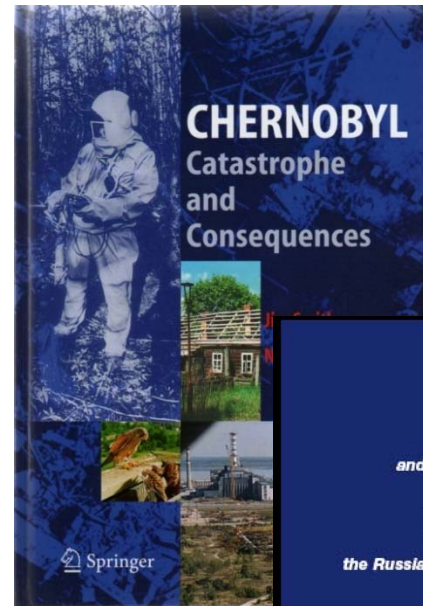
Differences across age, gender time and space

Future generations

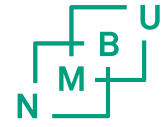
**Norwegian University  
of Life Sciences**

# Psychosocial Consequences

- *“The social and psychological consequences of Chernobyl far outweigh any direct health effects from radiation exposure” (IAEA, 1991, + +)*
- *“The most important health effect is on mental and social well-being, related to the enormous impact of the earthquake, tsunami and nuclear accident, and the fear and stigma related to the perceived risk of exposure to ionizing radiation” (UNSCEAR, 2013)*



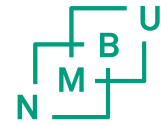
# Public perception: "Risk" is not synonymous with "probability of harm"



Rank according to "probability of death"	Rank according to "risk"
Smoking	Genetically modified organisms
Driving	Nuclear power
Alcohol	Alcohol

Survey of Oslo commuters, asked to rank the same list of hazards (Oughton, 1996)

# Societal and Ethical Consequences of Nuclear Accidents

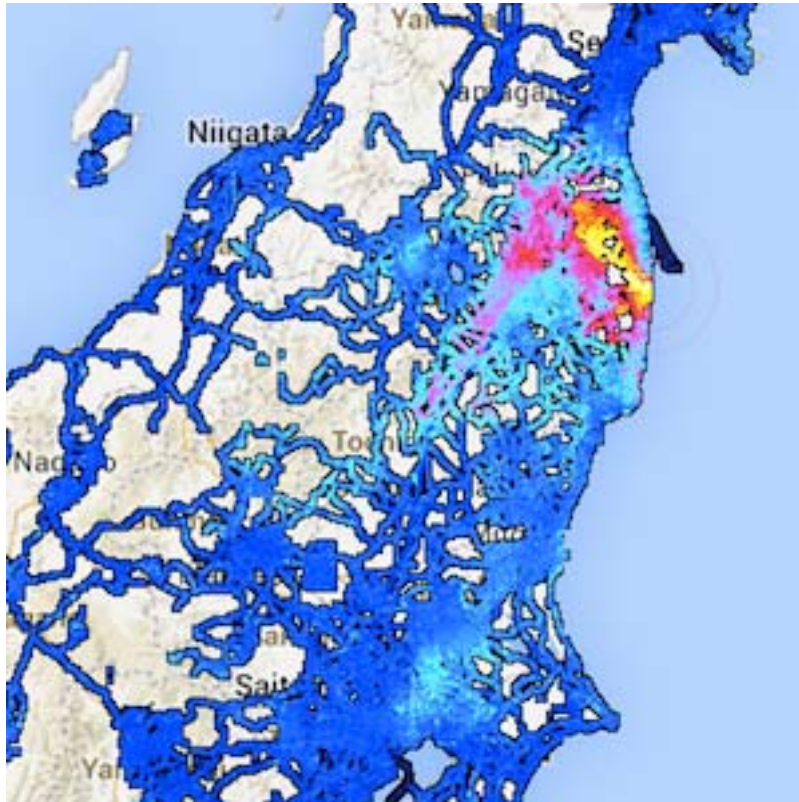
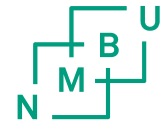


Misconception:

- 1) Aversion to radiation risk is (mostly/only) due to misunderstanding about the probabilities of harm
- 2) Educating people about risks will make those risks more acceptable

Reality: Probability of harm is only one dimension of risk acceptability

# Personal Dosimeters

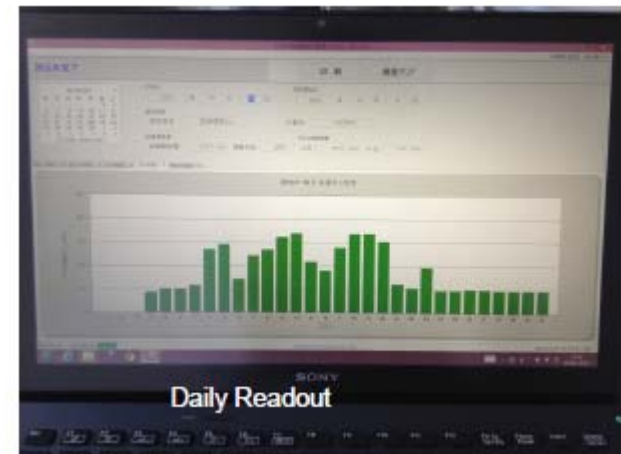


<http://blog.safecast.org/>



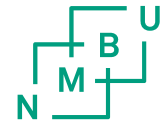
## D-Shuttle – AIST

Naito et al, Rad. Prot. Dosimetry 2014





# Remediation Strategy Evaluation: Social and Ethical Issues



- Disruption of everyday life and importance of “self-help”
- Free informed consent of workers (to risks of radiation exposure and/or chemical exposure) and consent of private owners for access to property
- Distribution of dose, costs and benefits
- Change in public perception or use of an amenity (e.g. access to graveyards or places of childhood memories)
- Concerns about discrimination and stigma
- Uncertainty
- Environmental risk from ecosystem changes, groundwater contamination, waste generation and treatment
- Animal welfare issues
- Liability and/or compensation for unforeseen health or property effects

Oughton et al., An Ethical Dimension... JER, 2004

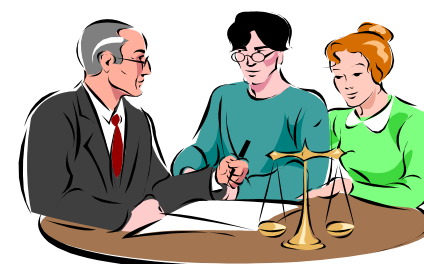
# “Social countermeasures”



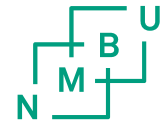
Actions where the primary aim or focus is not dose reduction

For example:

- Dietary advice
- Provision of counting/monitoring equipment
- Compensation scheme
- Change in food intervention levels
- Information/Advice bureau
- Education programme in schools
- Medical check up
- Stakeholder and public consultation methods



# Societal and Ethical Consequences of Nuclear Accidents



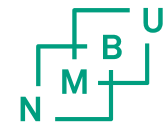
Misconception:

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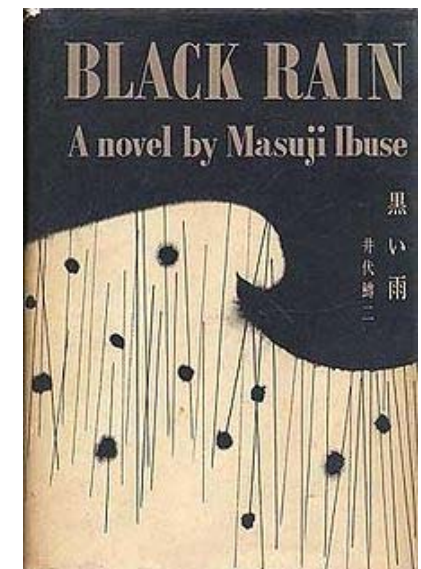
Reality:

- Probability of harm is only one dimension of risk acceptability
- Many factors influencing risk perception have strong ethical relevance

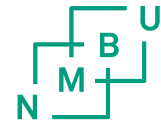
# Societal Consequences of Nuclear Accidents (and Protective Actions)



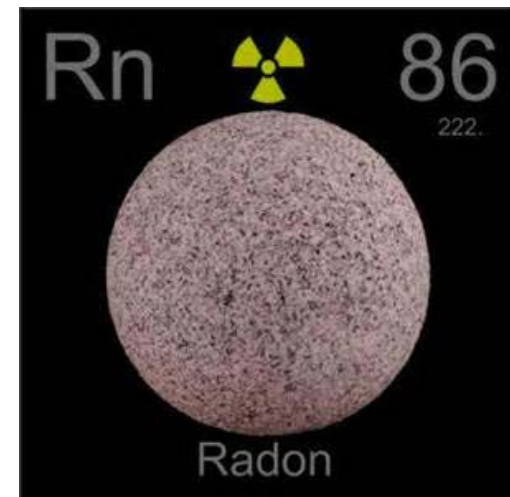
- Long-term evacuation and relocation
- Loss of livelihood (unemployment, agricultural land, tourism)
- Loss of consumer trust in products
- Loss of infrastructure (schools, hospitals, transport)
- Fears of stigma and discrimination
- Demographic changes (aging population)
- Loss of a «normal» way of life (cultural activities, children being able to walk to school, play outside, etc.)
- Perceived inequity of compensation schemes



# Other Factors Influencing Radiation Risk Perception

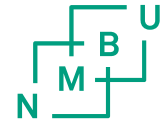


- Natural vs unnatural sources
- Internal vs external exposure
- Identifiable vs statistical deaths



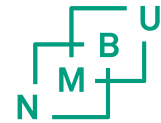
*Harder to ground in ethical relevance*

# Communication about Low-level Doses – Approaches following Fukushima



- Stressing Large Uncertainties at Low Doses
  - possible interpretation - 'anything could happen!'
- UNSCEAR – increases in cancer not measurable, not discernible
- Comparisons with bananas, medical exposures, ...
- Health Detriments:
  - generic, lifetime population based risks
  - public wants info on children
- Concerns that people are becoming averse to medical radiation

# World Health Organisation, 2013

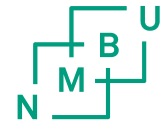


“In terms of specific cancers, for people in the most contaminated location, the estimated increased risks over what would normally be expected are:

- all solid cancers - around 4% in females exposed as infants;
- breast cancer - around 6% in females exposed as infants;
- leukaemia - around 7% in males exposed as infants;
- thyroid cancer - up to 70% in females exposed as infants (the normally expected risk of thyroid cancer in females over lifetime is 0.75% and the additional lifetime risk assessed for females exposed as infants in the most affected location is 0.50%).”



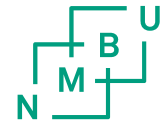
# Areas of Agreement – ICRP 91



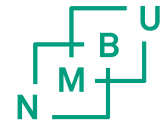
- Sustainable development. The UN 'Rio' Declaration of 1992 brought this concept into prominence (UN, 1992). Sustainable development relates to the need to recognise the interdependence of economic development, environmental protection, and social equity, and thus the obligation also to protect and provide for both the human and environmental needs of present and future generations...
- Environmental justice. Another feature of the Rio Declaration is the explicit responsibility to ensure that activities within national jurisdiction or control do not cause damage to the environment of other states. This, in turn, reflects the general principle of environmental justice: the need to take account of the fact that inequity can and does arise between the distribution of what might be termed 'environmental benefits and harm'...
- Human dignity. This, too, is a concept upon which there is international agreement. It is the cornerstone of the Charter of the UN (UN, 1945). It also has relevance to the concept of environmental protection and how it can be achieved. It recognises the need for the respect of individual human rights, and for the consequent range of human views...



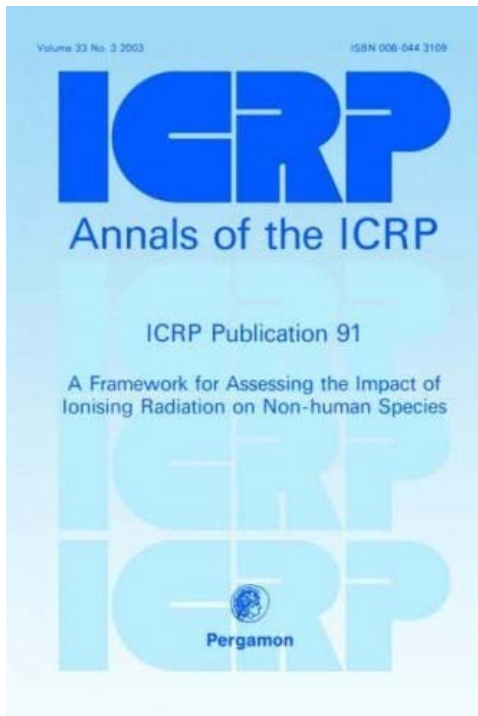
# Areas of Agreement – ICRP 91



- Conservation. There are many international agreements relating to the conservation of both species and habitats. They essentially relate to the 'importance' or 'vulnerability' attached to individual species, or areas where many species live, particularly with regard to the need for agreement at an international level in order to protect them; ...
- Preservation. Preservation recognises the worth of nature as pristine, as independent of human needs. Preservationists also argue for the value of wilderness, land untouched by human degradation or resource use; they recognise that wilderness is an important cultural value, not only in itself but also with respect to promoting character, spirituality, and natural systems (NRC, 1993)...
- Maintenance of biodiversity. This obligation also stems from Rio (UN, 1992), and recognises the need to maintain the biological diversity inherent within each species, amongst different species, and amongst different types of habitats and ecosystems.



# ICRP Publication 91, 2003



A Framework for  
Assessing the Impact of  
Ionising Radiation on  
Non-Human Species

## Case: GloFish®

### Research Ethics Class Discussion:

- GloFish are genetically modified fish that glow under ultraviolet light
- They were originally created for use in ecotoxicological studies, but are now marketed commercially in a number of countries.
- Should they be permitted to be sold in the EU?

