The ICRP’s approach to protection of the living environment under different exposure situations

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Questions that arise are:

- What are the protection objectives?
- Which exposure situation?
- What animals and plants are of interest?
- What biological effects of radiation are of relevance?
- What dose do they receive?
- What is the relationship between dose and effect on these animals and plants;
- How do we know that the original protection objectives have been met?
ICRP103 (2007)

(30) ....aim is...preventing and reducing the frequency of deleterious radiation effects to a level where they would have negligible impact on the maintenance of biological diversity, the conservation of species, or the health and status of natural habitats, communities and ecosystems.
Biological effects of relevance

- Early mortality;
- Some forms of morbidity;
- Impairment of reproductive capacity by either reduced fertility or fecundity; and
- Induction of chromosomal damage
So how do we apply this...
Planned, emergency, and existing exposure situations

Environmental radionuclide concentrations

Reference Male & Female, and Reference Person

Reference Animals and Plants

Dose limits, constraints and reference levels

Derived Consideration Reference Levels

Decision-making regarding public health and environmental protection for the same environmental exposure situation by way of representative individuals and representative organisms
<table>
<thead>
<tr>
<th>WILDLIFE GROUP</th>
<th>RAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large terrestrial mammals</td>
<td>Deer</td>
</tr>
<tr>
<td>Small terrestrial mammals</td>
<td>Rat</td>
</tr>
<tr>
<td>Aquatic birds</td>
<td>Duck</td>
</tr>
<tr>
<td>Amphibians</td>
<td>Frog</td>
</tr>
<tr>
<td>Freshwater pelagic fish</td>
<td>Trout</td>
</tr>
<tr>
<td>Marine fish</td>
<td>Flatfish</td>
</tr>
<tr>
<td>Terrestrial insects</td>
<td>Bee</td>
</tr>
<tr>
<td>Marine crustaceans</td>
<td>Crab</td>
</tr>
<tr>
<td>Terrestrial annelids</td>
<td>Earthworm</td>
</tr>
<tr>
<td>Large terrestrial plants</td>
<td>Pine tree</td>
</tr>
<tr>
<td>Small terrestrial plants</td>
<td>Wild grass</td>
</tr>
<tr>
<td>Seaweeds</td>
<td>Brown seaweed</td>
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</table>
ICRP 108 (2008)
Derived Consideration Reference Levels, DCRLs

![Graph showing benchmarks for various species and background levels](image)

- Deer
- Rat
- Duck
- Pine tree
- Frog
- Trout
- Flatfish
- Grass
- Seaweed
- Bee
- Crab
- Earthworm

**Benchmarks** from other studies/systems:
- Invertebrate benchmark
- Plant benchmark
- Generic benchmark
- Vertebrate benchmark

Background level
### Selection of DCRLs

<table>
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<th>Dose rate (mGy d⁻¹)</th>
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<th>Reference Flatfish</th>
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<td>100 - 1000</td>
<td>Reduction in lifespan due to various causes.</td>
<td>Some mortality expected in larvae and hatchlings</td>
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<tr>
<td>10 - 100</td>
<td>Increased morbidity. Possible reduced lifespan. Reduced reproductive success.</td>
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</tr>
<tr>
<td>1 - 10</td>
<td>Potential for reduced reproductive success</td>
<td>Possible reduced reproductive success due to reduced fertility</td>
</tr>
<tr>
<td>0.1 - 1</td>
<td>Very low probability of various effects</td>
<td>No information</td>
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<td>0.01 – 0.1</td>
<td>No observed effects.</td>
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**Notes:**
- Natural background
- Increased morbidity.
- Reduced reproductive success
- Reduced reproductive success due to reduced fertility
- Potential for reduced reproductive success
- Very low probability of various effects
- No observed effects.
- No information
ICRP 124 (in press)

Application in planned exposure situations

Increasing dose rate

DCRL

DCRL for relevant RAP

Reference point for the sum of all sources
ICRP 124 (in press)

Application in existing exposure situations

Increasing dose rate

Potential for dose rate reduction

Minimum level of ambition

DCRL

DCRL for relevant RAP
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Accidents and emergencies
ICRP 124 (in press)

Application in emergency exposure situations
Looking ahead
Application

Reference Animals and Plants

‘Derived Consideration Reference Levels’

Representative organisms

Radionuclide intake and external exposure

Planned, existing & emergency exposure situations
Representative Organisms (ROs) need to be identified to serve as representatives of a particular species, or a group of organisms, in relation to a site-specific assessment, taking account of their assumed location with respect to the source.
Max. concentrations of radionuclides in air, water and ‘soil’

Authorised Release Rates

Representative Persons

Dose constraints

Representative organisms

DCRLs

Planned situations
Task Group Participants

- Task Group Members
  - R J Pentreath
  - J Lochard
  - D Cool
  - D Copplestone
  - P Strand
  - M Watanabe
  - C-M Larsson
  - J Simmonds

- Corresponding Members
  - A Janssens
  - D Oughton
  - E Lazo
  - I Outola
  - G Pröhl