ARN’s perspectives on the regulation of the radiological protection of the environment

Abel J. González (*)
Senior Adviser of the Argentine Nuclear Regulatory Authority (ARN)
Av. del Libertador 8250, (1429) Buenos Aires, Argentina; +54 11 6323 1306; agonzalez@arn.gob.ar

(*) Vice-President of the International Commission on Radiological Protection (ICRP)
Representative to the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR)
Member of the Commission on Safety Standards of the International Atomic Energy Agency
• What is the problem?
  – Environment?
    (from OFr. environer, from environ ‘surroundings’, from en ‘in’+ viron ‘circuit’)
    ➢ the natural world?
    ➢ the surroundings in which a person lives?
  – Non human biota on the biosphere?
  – Species in the human habitat?

• What are the applicable ethical values?
Content

1. Ethics
2. Standards
3. Hesitation
4. Response
5. Outlook
(1) Ethics
The ethical basis of the system of radiation protection for humans are well established.

The ethical basis for the protection of the environment are still being developed.
Teleological
Mind the ends, which justify the means

Utilitarian
Do the greatest good for the greatest number of people

Deontological
Not do unto others what they should not do unto you

Aretaic
be virtuous, wise and prudent, aim at humanity

Ethical Aphorisms
Human Protection Principles

- Justification of Actions
- Optimization of Protection
- Individual Restrictions
- Precaution (commitment)
<table>
<thead>
<tr>
<th>Justification</th>
<th>Teleologism</th>
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<tbody>
<tr>
<td>Any decision that alters the radiation exposure situation should do more good than harm</td>
<td>The ends or consequences of a protective action should determine its morality, namely whether such action is good or evil</td>
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<tr>
<td>Optimization</td>
<td>Utilitarianism</td>
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<td>The level of radiation protection should be the best under the prevailing circumstances, maximizing the margin of benefit over harm.</td>
<td>The morality of protective actions should be judged against the contribution to the overall utility, namely to the best welfare summed among all sentient beings.</td>
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<tr>
<td>Individual Limitation</td>
<td>Deontologism</td>
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<td>Inequitable protection options should be prevented by restricting individual doses (dose limits, constraints and reference levels)</td>
<td>The morality of protection should be judged by the duty of goodness or rightness from the protective actions on specific individuals, rather than by the overall consequences or utility.</td>
</tr>
<tr>
<td><strong>Precaution</strong></td>
<td><strong>Aretaicisn</strong></td>
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<tr>
<td>Protection should be provided to present and future generations, and their habitat, against scientifically plausible commitments of radiation harm even if they are uncertain.</td>
<td>The focal point for judging the moral of protective actions should be their virtuosity rather than their consequences, utility or duty.</td>
</tr>
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</table>
What are the ethical principles of environmental protection?
1999 – IAEA report on the protection of the environment from the effects of ionizing radiation
2002 – IAEA issues first international report on ethical considerations for protecting the environment from the effects of ionizing radiation.
### Ethical Matrix

<table>
<thead>
<tr>
<th>Anthropocentric</th>
<th>Teleology (purpose)</th>
<th>Utilitarian (utility)</th>
<th>Deontology (duty)</th>
<th>Aretaic (virtue)</th>
</tr>
</thead>
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</table>

- **Done**
- **Being done**
- **?????**
(2) Standards
BSS Approach

• Radiation and radioactive substances are natural and permanent features of the environment, and thus the risks associated with radiation exposure can only be restricted, not eliminated entirely.

• The scope of the Standards is limited to the protection of human beings only; it is considered that standards of protection that are adequate for this purpose will also ensure that no other species is threatened as a population, even if individuals of the species may be harmed.
(3) Hesitation
Are the adequate standards for the protection of humans, inadequate for protecting other species?
RADIOLOGICAL CONDITIONS OF THE WESTERN KARA SEA:
Assessment of the radiological impact of the dumping of radioactive waste in the Arctic Seas

INTERNATIONAL ATOMIC ENERGY AGENCY

REPORT ON THE INTERNATIONAL ARCTIC SEAS ASSESSMENT PROJECT (IASAP)
Dumping in the Kara Sea

- Radioactive materials were dumped in the Kara Sea. Their radioactivity was around $90 \text{ PBq} \ (90 \times 10^{15} \text{ Bq})$.
- The dumped items included:
  - six nuclear submarine reactors with spent fuel;
  - icebreaker reactor with spent fuel;
  - ten nuclear reactors without fuel; and
  - solid and liquid low level waste.
### Maximum Total Annual Individual Doses for Selected Population Groups

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Annual doses&lt;sup&gt;a&lt;/sup&gt; to seafood consumers (Groups 1 &amp; 3) (µSv)</th>
<th>Annual doses to military personnel (Group 2) (µSv)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Best estimate scenario</td>
<td>&lt; 0.1</td>
<td>700</td>
</tr>
<tr>
<td>Plausible worst case scenario</td>
<td>&lt; 1</td>
<td>4000</td>
</tr>
<tr>
<td>Climate change scenario</td>
<td>0.3</td>
<td>3000</td>
</tr>
</tbody>
</table>

<sup>a</sup> For perspective, the annual doses to the critical groups 1 and 3 from naturally occurring polonium-210 in seafood are 500 and 100 µSv, respectively. In addition, the worldwide average total annual dose from natural background radiation is 2400 µSv.
(4) Response
Protection of the Environment from Ionising Radiation

The Development and Application of a System of Radiation Protection for the Environment
PROTECTION OF THE ENVIRONMENT FROM THE EFFECTS OF IONIZING RADIATION

Proceedings of an International Conference
Stockholm, 6–10 October 2003

IAEA
International Atomic Energy Agency
The Conference’s Outcome

The Conference

‘strongly supported the development of a framework for environmental radiation protection’

and also found that the time was ripe for launching a number of ‘international initiatives to consolidate the present approach to controlling radioactive discharges to the environment’
The 48th IAEA General Conference resolved that (Resolution GC(48)/RES/10; September 2004) an *International Action Plan on the Radiological Protection of the Environment* should be submitted to the Board of Governors for approval in 2005.

ICRP Structure

ICRP Main Commission

Committee 1  Effects
Committee 2  Doses
Committee 3  Medicine
Committee 4  Application
Committee 5  Environment

Task Groups
Working Parties

Scientific Secretariat
ICRP Publication 91

A Framework for Assessing the Impact of Ionising Radiation on Non-human Species
Transfer Parameters for Reference Animals and Plants

• Draft report now undergoing public consultation

• Comments must be submitted through the ICRP web site no later than October 1, 2010
The Individual Reference Animals and Plants

- A large terrestrial mammal – the *Reference Deer*
- A small terrestrial mammal – the *Reference Rat*
- An aquatic bird – the *Reference Duck*
- An amphibian - the *Reference Frog*
- A freshwater fish - the *Reference Trout*
- A marine fish – the *Reference Flatfish*
- A terrestrial insect - the *Reference Bee*
- A marine crustacean - the *Reference Crab*
- A terrestrial annelid - the *Reference Earthworm*
- A large terrestrial plant – the *Reference Pine Tree*
- A small terrestrial plant - the *Reference Wild Grass*
- A seaweed - the *Reference Brown Seaweed*
(5) Outlook:
ARN’s perspective
ARN’s early views (at Stockholm Conference)

“Regulatory Control of Discharges Of Radioactive Material to the Environment”

• suggested a framework for the protection of non-human species in the context of existing procedures for controlling radionuclide releases to the environment;
• outlined the rigorous procedures already in place for regulating the discharge of radionuclides to the environment;
• cautioned against an overreaction to the apparent conceptual gap in the present system; and
• stated that, if applied properly, the present system was protective of the environment.
ARN’s current views

- The epistemology is basically complete.
- Simple operational standards are now needed.
- They need not be based on dose but may be based on environmental activity or environmental integral over time of activity times energy).
- Thus, discharge limits could continue to be based on the system of dose limitation for humans, but the resulting activity in the environment might be checked against the operational environmental standards.
ARN’s objectives

- to maintain biological diversity,
- to ensure the conservation of species, and
- to protect the health and status of natural habitats, communities, and ecosystems
ARN’s long-term strategy

• Promote consensus on a comprehensive ethical approach for the protection of the environment

“Not everything that is technically feasible is morally acceptable”

The Bilateral Commission of the Holy See and the Chief Rabbinate of Israel
ARN’s immediate suggestions

- Revitalize the Action Plan
- Invite UNEP to co-sponsor it
- Nominate a Steering Committee
- Re-submit it to the GC and the Board
Thank you!

agonzalez@arn.gob.ar

Av. del Libertador 8250
Buenos Aires, Argentina

+541163231758