Role of the guideline levels

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OWERVIEW about limits and levels

Limit: *the term should only be used for a criterion that must not be exceeded, e.g. where exceeding the limit would cause some form of legal sanction to be invoked.*

primary limit: a limit on the dose or risk to an individual

derived limit: a limit on a measurable quantity set, on the basis of a model, such that compliance with the derived limit may be assumed to ensure compliance with a primary limit.

acceptable limit: a limit acceptable to the *regulatory body*, used to refer to a limit on the predicted radiological consequences of an accident or on potential exposures if they occur that is acceptable to the relevant regulatory body when the probability of occurrence of the accident or potential exposures has been taken into account usually on the basis that it is unlikely to occur.

authorized limit: a limit on a measurable quantity, established or formally accepted by a *regulatory body*. Authorized limit should be used in preference to prescribed limit, it has been more commonly used in radiation safety and waste safety, particularly in the context of limits on discharges

OWERVIEW about limits and levels

Action level: the level of dose rate or activity concentration above which remedial actions or protective actions should be carried out in chronic exposure or emergency exposure situations. An action level can also be expressed in terms of any other measurable quantity as a level above which intervention should be undertaken.

Emergency action level (EAL): A specific, predetermined, observable criterion used to detect, recognize and determine the emergency class.

Reference (intervention) **level.** The level of avertable dose at which a specific protective action is taken in an emergency or a situation of chronic exposure.

Operational intervention level (OIL): A calculated level, measured by instruments or determined by laboratory analysis, that corresponds to an intervention level or action level.

Investigation level: the value of a quantity such as effective dose, intake or contamination per unit area or volume at or above which an investigation should be conducted.

Recording level: a level of dose, exposure or intake specified by the regulatory body at or above which values of dose, exposure or intake received by workers are to be entered in their individual exposure records.

OWERVIEW about limits and levels

Exemption level is the activity concentration of all bulk amounts of solid material, it covers the removal from control of material containing very low levels of radioactivity originating from regulated practices, like nuclear installations, hospitals, research institutes, material from interventions, materials containing radionuclides of natural origin that need to be considered for exclusion.

Exclusion levels are the activity concentration values for radionuclides of natural origin, the intention is to exclude from regulation virtually all soils, but to not ores, mineral sands, industrial residues and wastes which are recognized as having significant activity.

The values of **clearance level** are established by Regulatory Authority and expressed in terms of activity concentration and/or total activity, at or below which sources of radiation may be released from regulatory control.

Exemption, exclusion and clearance level are derived activity concentrations, which are valid for all types of solid material containing radionuclides of artificial or natural origin except foodstuffs and drinking water.

Notification level related to inform the public by communicé, when discharge from nuclear installation reaches the observable level in the environment.

Reporting level defined in 2000/473/Euratom is used for the forming the common European database about the environmental level of radioactivity including foodstuff and drinking water.

Guideline level is a specified quantity above which appropriate actions should be considered.

Dangerous quantities usually used as D-values, the term cover the dangerous quantity of radioactive material, the source natural or artificial origin, which could, if not under control give rise to exposure sufficient to cause severe deterministic effect.

In March 2002, the IAEA's Board of Governors approved a Safety Requirements publication entitled "Preparedness and Response for a Nuclear or Radiological Emergency". The Requirements define a dangerous source as one "that could, if not under control, give rise to exposure sufficient to cause severe deterministic effects".

Define the antithesis of D-values

Introduction of S-values, ie. safe-values

S-values corresponds to any kind of material which even is ingested there is a small probability - trivial risk - of the stochastic effect, and no need of any kind of control.

S-value - for the solid substances, not possible to exclude the possibility of the ingestion by human

In case of more isotope simultaneous presence:

sum of measured activity-concentration normalised by S-value < 1

S-values

1. S-values:

Applicable in normal circumstances, normal everyday life with a usual life-style
Applicable for any kind of material surrounding the public, including the material used by babies (toy), even human food generally.

According to ICRP recommendations **0.1 mSv/year** additional dose is the dose consequence for public exposure for prolonged components from long lived radionuclides, “it would obviously prudent to impose additional restriction on the prolonged component of the annual individual dose”.

It corresponds to **trivial risk**

Determination of a trivial level of risk (Annals of the ICRP - Supporting Guidance 5 – Analysis of the Criteria Used by the International Commission on Radiological Protection to Justify the Setting of Numerical Protection Level Values, p15, 2005):
ICRP considers that: ‘The lowest risk category is of the order of one in a million and is in the region in which people are usually content to dismiss the risk as approaching the trivial. The corresponding dose region is less than 100 μSv which is the amount of dose delivered by natural background radiation in a few weeks.
It is considerably less than the variations in annual dose from natural background to persons living in different locations…’ (ICRP, 1992a, Para. 53).

Radionuclide	S-value, Bq/kg
C-14	**200**
P-32	10
S-35	200
Cl-36	30
Cr-51	900
Mn-54	60
Fe-55	40
Fe-59	8
Co-60	6
Ni-63	200
Zn-65	9
Sr-85	40
Sr-89	9
Sr-90	1
Y-90	10
Zr-93	100
Nb-94	20
Tc-99	30
Tc-99m	1000
Ru-103	40
Ru-106	4
Ag-ll0m	14

Radionuclide	S-value, Bq/kg
I-129	1
I-130	10
Cs-134	6
Cs-137	9
Ba-133	10
La-140	10
Ce-144	5
Sm-151	200
Sm-153	40
Eu-152	20
Eu-154	10
Pb-210	0.04
Pb-212	2
Po-210	0.01
Ra-226	0.07
Ra-228	0.009
Ac-228	40
Th-228	0.09
Th-230	0.08
Th-232	0.07
Th-234	8

Radionuclide	S-value, Bq/kg
U-234	0.9
U-235	0.9
U-238	0.9
Np-237	0.1
Np-239	30
Np-240	300
Pu-238	0.08
Pu-239	0.08
Pu-240	0.08
Pu-241	6
Am-241	0.09
Cm-242	0.5
Cm-243	0.1
Cm-244	0.1
Cm-245	0.09
Cm-246	0.09
Cm-247	0.09
Cm-248	0.02

Randomly selected from 290 isotopes

S-values

If any concentration exceed these values, recommended
- to designate or recall a decision-support system according to the need of the actual problem
- to make a risk assessment,
- to run a sufficient model,
- to analyse cost and benefit
- to make a decision about the action taken

In all situations the constraint is complemented by the requirement to optimise the level of protection achieved, because some probability of health effects even at small increments of exposure to radiation above the natural background can not be excluded. That is the main principle of radiation safety, is the need to ensure that all exposures are as low as reasonably achievable.

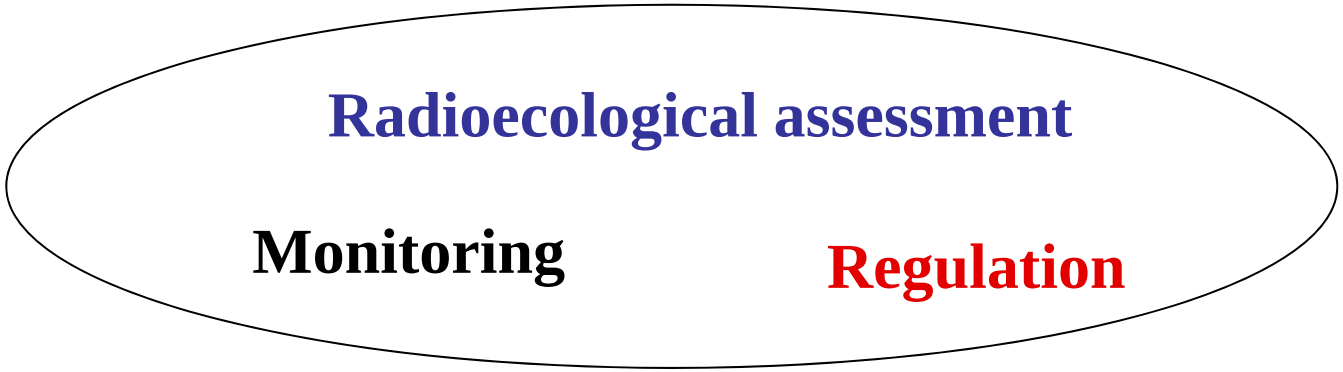
Below this dose regulatory provision will produce little or no improvement in dose reduction, because the radiation sources give rise to small individual dose and protection could be regarded as optimised.

Might be the final goal of the environmental modelling

NOT EMERGENCY SITUATION

The role of the guideline levels:

- they give the frame of the work
- they give the reliable frame of the needs
- they give the reliable frame of the requirements
- helps to keep the balance between the opinion of the public and the possibility of a government



Guidelines for the SAFETY

WATER
World Health Organisation
Guidelines for Drinking-water Quality – Third edition incorporating the first and second Agenda – Volume 1, Recommendations, Geneva, 2008
9. Radiological aspects

GASEOUS (ICRP 103: lower level at which to act For dwellings this range was a radon concentration of 200-600 Bq/m3, while the corresponding range for workplaces was 500-1500 Bq/m^3.)
Guidelines for indoor **Rn** – workplace 1000 Bq/m^3 IAEA BSS
US standard: 200 Bq/m^3,
Europe: 200 Bq/m^3 (Sweden, UK, Spain)
400Bq/m^3 (Finnland, Germany, Chech Rep., Austria, Switzerland, Slovenia, Greece)

SOLID
Missing: might be the S-values


Thank you for your attention!

The 2007 Recommendations of the International Commission on Radiological Protection, ICRP Publication 103, 2007

Regulatory authorities were expected to apply the optimisation of protection in a generic way to find a lower level at which to act, in the range from 3 to 10 mSv. The effective dose was converted by a dose conversion convention into a value of radon-222 concentration, which was different between homes and workplaces largely because of the different number of hours spent at each. For dwellings this range was a radon concentration of 200-600 Bq/m^3, while the corresponding range for workplaces was 500-1500 Bq/m^3. The result of the optimisation was to set action levels, i.e., levels above which action was required to reduce the dose.