

About the Tolerability of Radiological Risk

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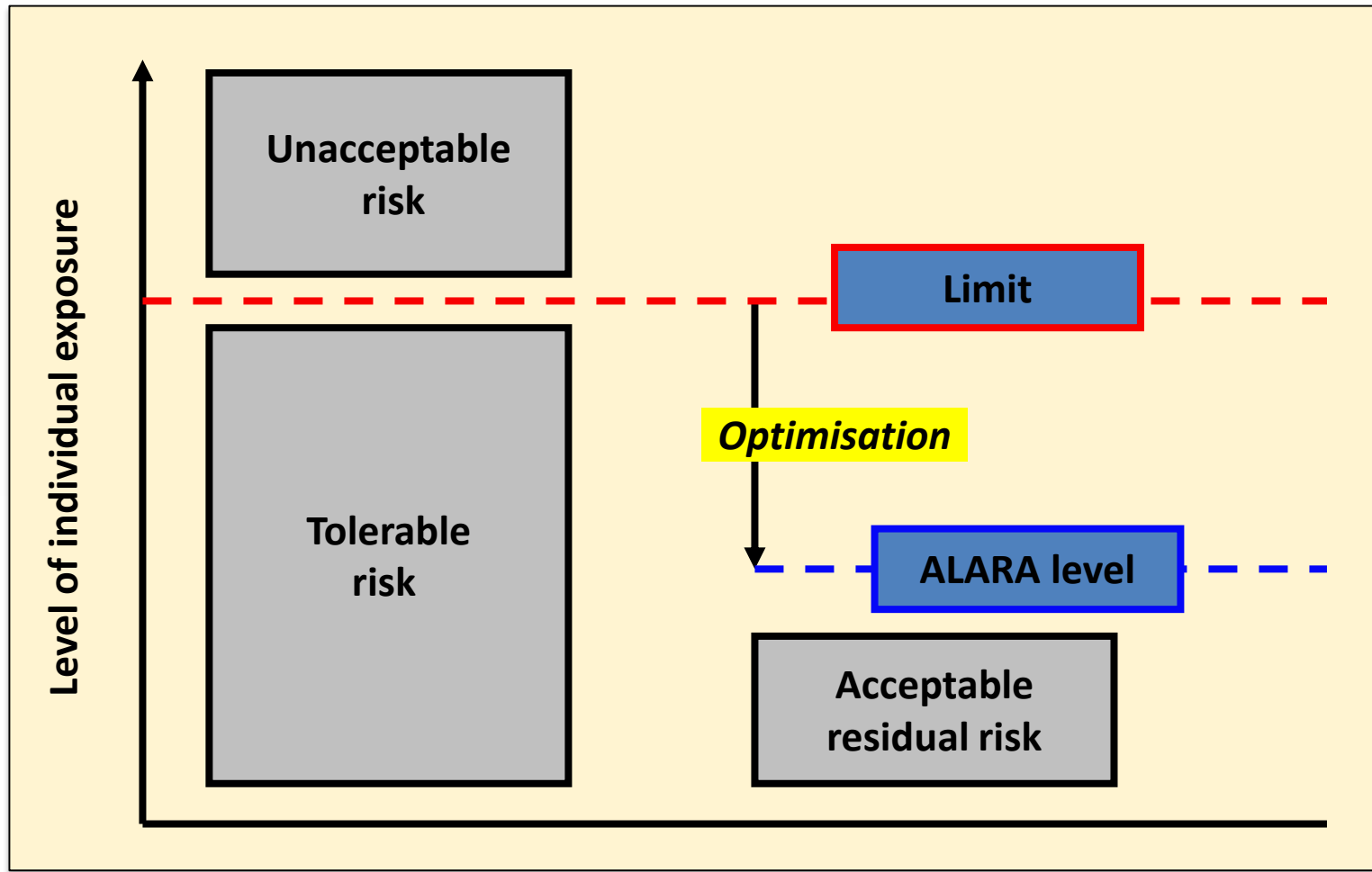
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The emergence of the tolerability of risk in the ICRP recommendations

- **Publication 26 (1977)**: Radiation detriment compared with the risk associated with safe occupation for occupational exposures and risk regularly accepted in everyday life (e.g. public transport) for public exposures
- **Publication 60 (1990)**: Introduction of the tolerability of risk model with the distinction between unacceptable, tolerable and acceptable levels of the radiation risk
- These developments have been made bearing in mind primarily the protection of workers and the members of the public associated with the development of the nuclear industry i.e. in **the context of what is called now planned exposure situations**



The tolerability of risk model adopted in ICRP Publication 60

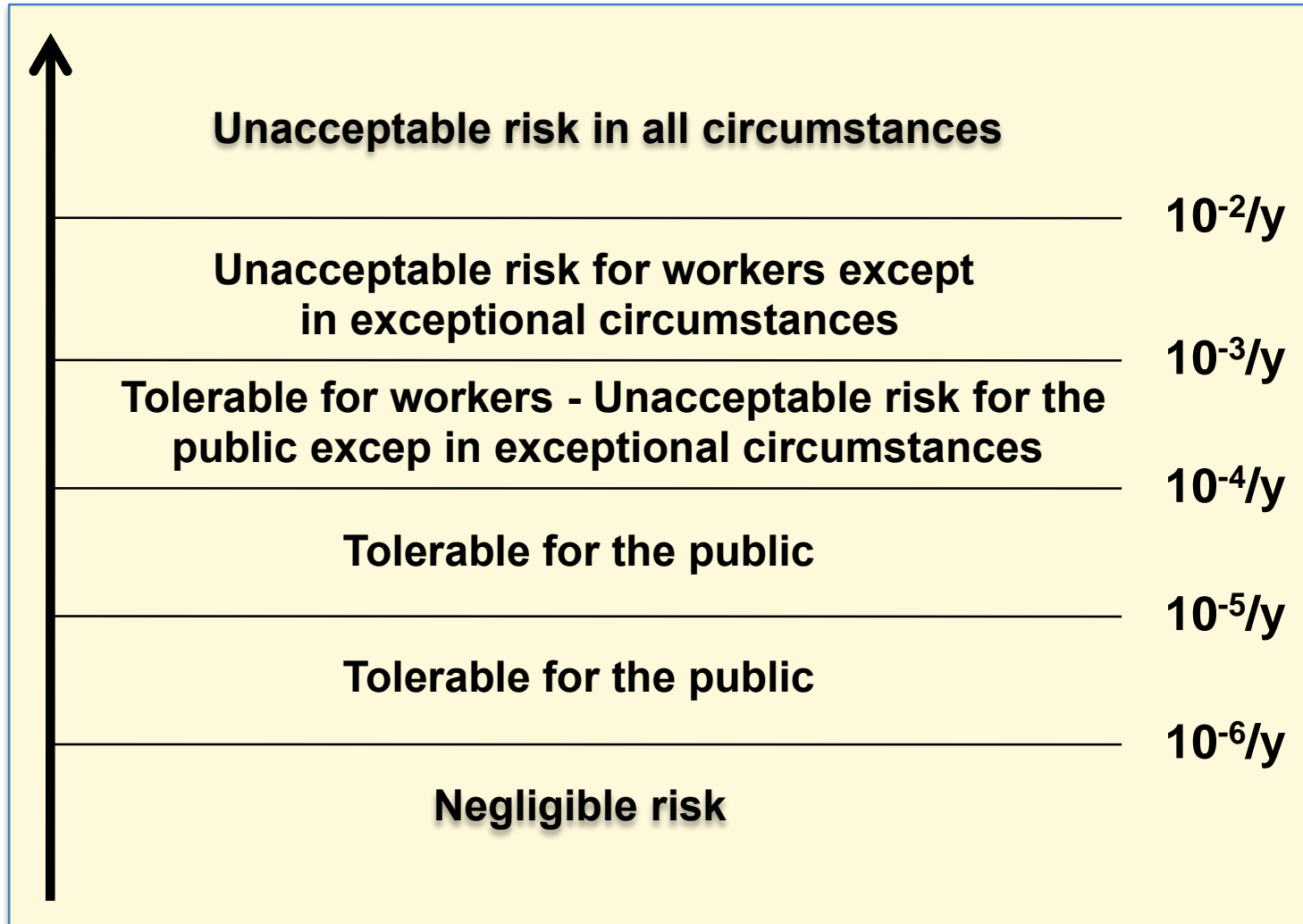


The foundations of the tolerability of risk model

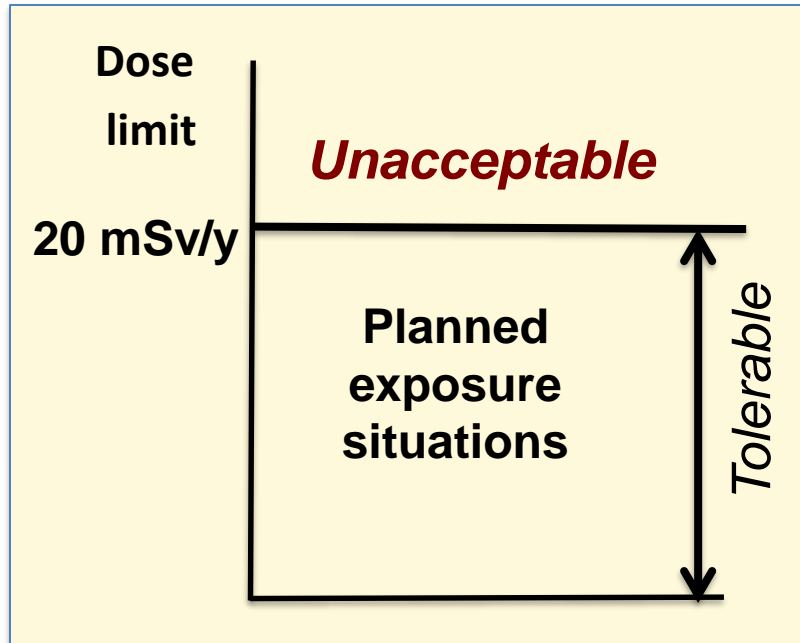
- The model was proposed in the 1980s, a period during which the **quantification of risks** (in terms of the probability of occurrence of an event x by its consequences) **and risk comparisons** were considered as the most appropriate scientific method for setting regulatory options
- **Two references** played an important role in the development of the model:
 - Risk Assessment: A Report of a Royal Society Study Group, 1983
 - The Tolerability of Risk from Nuclear Power Stations, HSE, 1988 (Revised 1992)



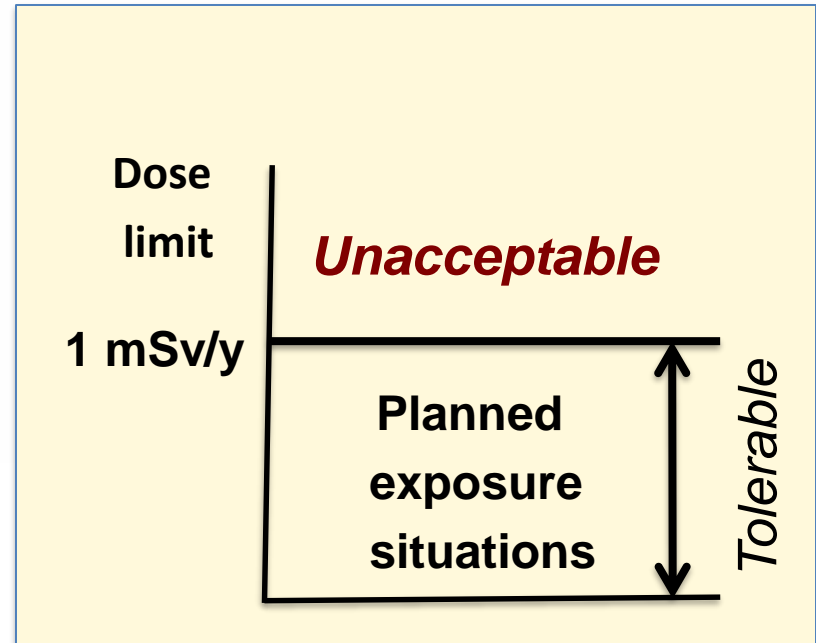
The risk scale built from the references - Probability of death-



The tolerability of risk model applied to the protection of workers and members of the public in Pub 60



Protection of workers



Protection of members of the public

The main changes in ICRP Publication 103

- Introduction of the **3 types of exposure situations: existing, planned and emergency**
- **Generalisation of the optimisation principle with restrictions on individual doses** in all exposure situations (dose constraints and reference levels)
- Introduction of **stakeholder involvement** in the optimisation process
- Introduction of a **dose scale** for selecting the values of the **dose constraints** for planned exposure situations and **reference levels** for existing and emergency exposure situations, but no change in the values of the dose limits in planned exposure situations
- Remark: **No mention of the tolerability of risk model in Pub 103**

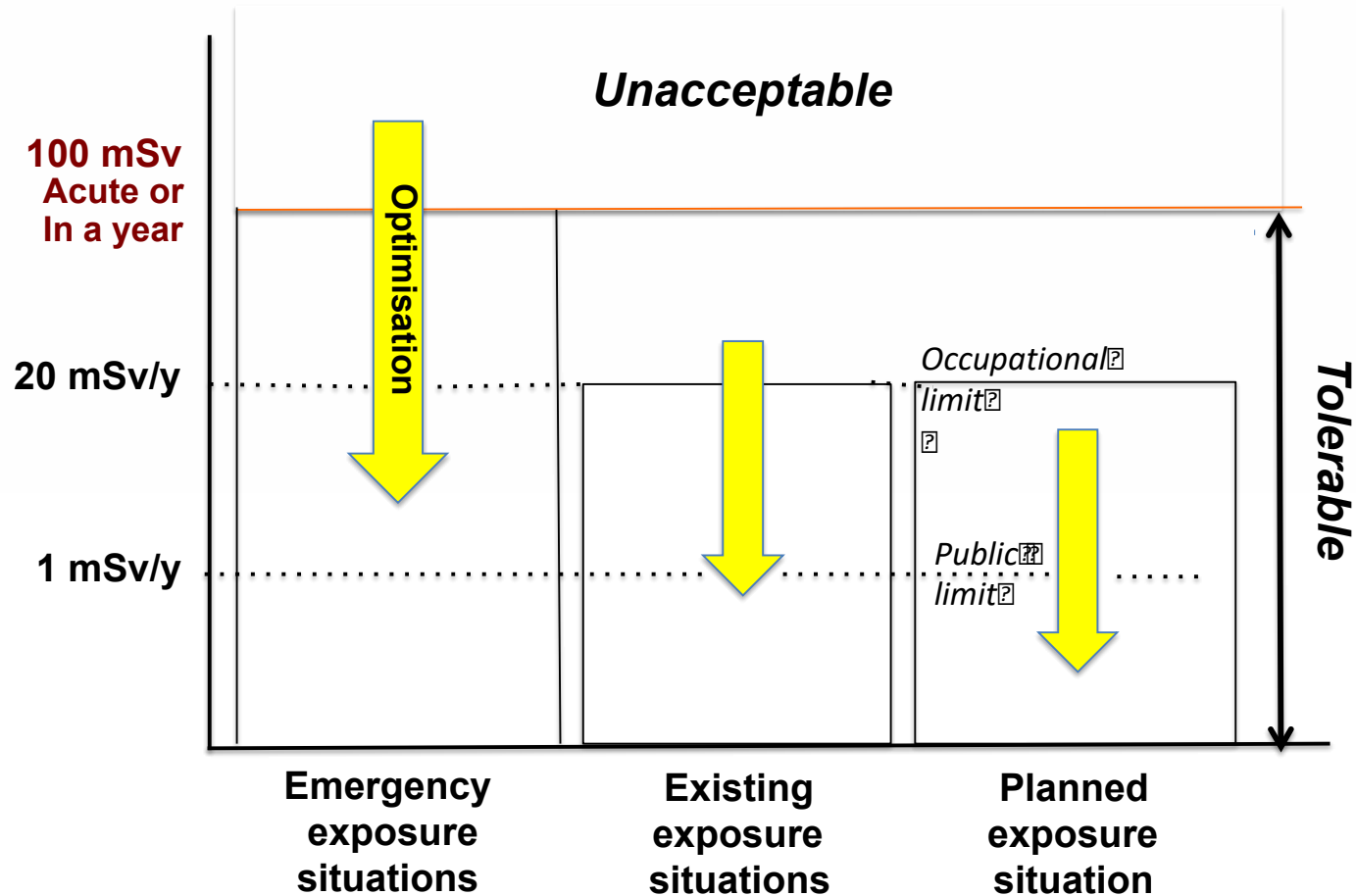


The dose scale for selecting dose constraints and reference levels in ICRP 103

- **Applies to the 3 exposure situations**
- **3 bands of values:** 1 mSv/y or less; greater than 1 mSv/y to 20 mSv/y; greater to 20 mSv/y to 100 mSv (acute or one year)
- The selection of the value to **guide** the optimisation process depends on:
 - The **characteristics of the exposure situations:** controllability of the source and/or the pathways, levels of exposure, benefit for the exposed individuals,...
 - The **requirements to protect the exposed individuals:** individual or general information to exposed people, assessment of individual exposures, training,...



A possible extension of the tolerability of risk model to the 3 types of exposure situations



The tolerability of risk model and the 'societal' dimension

- In Publication 103 the Commission indicates that beyond 'the nature of the exposure, the benefits from the exposure situation to individuals and society, and the practicability of reducing or preventing the exposures' other '**societal criteria**' should be considered, without giving further details
- From this point of view, the **attitude** of exposed people with regard to the exposure situation and **the way to respond** to the risk (whether actual or potential) are certainly key factors in judging the tolerability of risk
- The preliminary reflection in the context of ICRP Committee 4 on the subject led to introduce the distinction between three basic attitudes towards risk **depending on the need, or not, for exposed people to act based on the level of risk**

* *LOCHARD J. - Application of the Commission's Recommendations: The 2013-2017 Committee 4 Programme of Work. Annals of the ICRP, 44 (S1), 33-46, 2015*

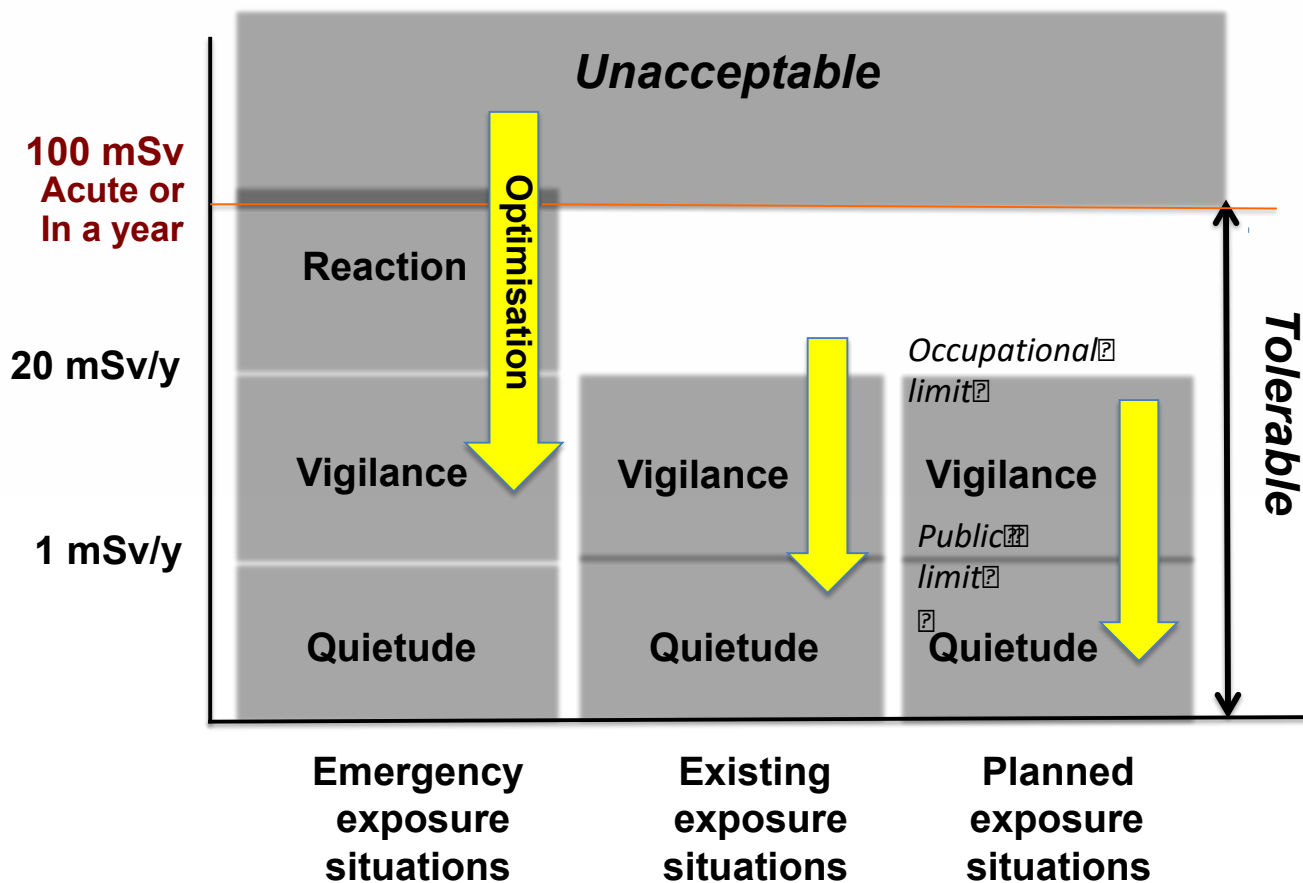


The Quietude, Vigilance and Reaction (QVR) model

- **Quietude:** *Going about daily activities without worrying about potential risks.* It involves to be **confident** in the arrangement put in place to control these risks and to **trust** the organizations and people who manage them. This is typically the case for public exposures in planned exposure situations when the risk is fully under control
- **Vigilance:** *Keeping careful watch for possible difficulties or risks.* This is typical of occupational exposures in planned exposure situations for which workers must exercise constant vigilance. This is also true for the public in existing exposure situations
- **Reaction:** Acting and moving quickly in order to avoid sudden risks. This is typically the case of exposure situations resulting from the loss of control of a source, such as a nuclear accident, or from any unexpected situation when the risk becomes potentially **unacceptable**



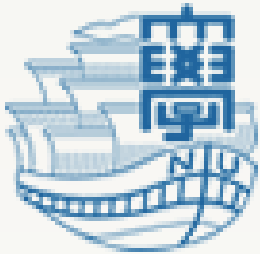
Combination of the QVR model and the tolerability of risk model applied to ICRP 103



Concluding remarks

- The tolerability of risk model was introduced in ICRP 60 to justify the setting of dose limits for workers and the public for the exposure situations that are now called planned
- The introduction in ICRP 103 of the 3 types of exposure situations led the Commission to define a dose scale and a set of qualitative criteria for setting dose criteria (dose constraints and reference values) to guide optimization in these situations
- The above developments show that it is quite **possible to combine the risk tolerability model of Publication 60 with the approach of Publication 103**
- The reflection undertaken by the ICRP Committee 4 TG 114 should undoubtedly make it possible to further develop this **preliminary framework**





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