

**Survey on the implementation of the “justification”,  
“optimisation” and “limitation of doses” radiological principles  
in national regulations in Europe**

**Kazakhstan**

**1 The implementation of European Directives**

1. *Since when have the European Directives 96/29 and 97/43 been implemented in your country?*
2. *If they are not implemented, is it expected and when?*

The basic Law/regulations on radiation protection in Kazakhstan are the Law of the Republic of Kazakhstan “On radiation safety of population” (approved 23.04 1998), the normative document “Norms of radiation safety (NRB-99)” (approved 09.12.1999) and “Sanitary and hygienic requirements for radiation safety provision” (approved 31.01.2003). These regulations refer to the IAEA BSS (Safety Series No 115).

**2 Justification principle**

1. *What is the exact wording of the justification principle in the Law?*

The Law stipulates the following justification principle:

- Prohibition of all types of activities on use of ionizing radiation sources, where a received benefit doesn't exceed a risk of potential detriment from radiation, additional to a natural radiation background.
2. *Which practices are explicitly named as unjustified or forbidden?*
  3. *Which regulatory body(ies) is (are) responsible to determine if a practice is justified or not?*

State supervision for implementation of “Norms of radiation safety” is responsibility of State Sanitary-Epidemiological Services and other corresponding state authorities.

### 3 Optimisation principle

1. *Could you give us the exact wording (citation) of the optimisation principle (ALARA) as defined in the Law or national regulation?*

The Law stipulates the following optimization principle:

- Taking into account all economic and social factors, keeping on the possible low and achievable level of individual radiation doses and a number of exposed people when using any source of ionizing radiation.

2. *Does the national regulation give a description on the practical way to implement the optimisation principle (e.g. need to perform dose prediction and to establish dose objectives, need to perform real-time dose follow-up, need to write feedback experience report, etc)?*

According to “Norms of radiation safety” radiation protection risk calculation expenses are based on optimization principle: collective effective dose 1 man-Sv exposure leads to potential detriment amount to loss 1 man-year population life. Money equivalent to loss 1 man-year population life is established by instructions. Individual life risk during operation sources for personnel is  $1.0 \times 10^{-3}$ , and  $5.0 \times 10^{-5}$  – for population.

3. *Does it exist a specific guidance to help operators / end-users in implementing the optimisation principle?*

The corresponding guidance related to this question is the normative document “Sanitary and hygienic requirements for radiation safety provision”. In the appendix 1 of this document it is added the recommendations for operators in implementation of radiation safety principles.

### 4 Dose limits

1. *Can you provide us with present regulatory dose limits established to reduce the probability of occurrence of stochastic effects?*

According to “Norms of radiation safety” two categories of people exposure (see table below) are established:

- Personnel who work with man-caused sources (group A) or being in the sphere of its influence on conditions of their job (group B);
- Population including personnel who is out of work with ionizing radiation sources.

### Basic dose limits

	Category “A” personnel <sup>a</sup>	Population
<b>Effective dose</b>	20 mSv per year averaged for any five (5) consecutive years, but not more than 50 mSv per year	1 mSv per year averaged for any five (5) consecutive years, but not more than 5 mSv per year
<b>Equivalent dose</b>		
- Lens of the eye	150 mSv per year	15 mSv per year
- Skin	500 mSv per year	50 mSv per year
- Extremities	500 mSv per year	50 mSv per year

a. Basic dose limits as the rest dose limit of group B (personnel), are equal to 1/4 of group A values.

Effective dose for personnel for employment activity (50 years) should not exceed 1000 mSv and for population life (70 years) – 70 mSv.

For women before 45 year-old involved in works with ionizing radiation sources, the equivalent dose on lower part of surface of abdomen must not exceed 1 mSv per month, and radionuclide intake into body must not be more than 1/20 of annual intake of personnel. In that case the equivalent dose to the fetus for 2 month of uncertain pregnancy will not exceed 1 mSv.

Intervention levels for population temporary evacuation are:

- At the beginning of evacuation – 30 mSv per month;
- At the end of evacuation – 10 mSv per month.

2. *What are the legal dose limits to prevent public and workers from deterministic health effects?*

If supposed irradiation dose for a short period (2 calendar days) reaches levels of the deterministic effects (see table below), immediate protective actions are required.

#### Projected exposure levels for immediate intervention

Organ or tissue	Absorbed dose in organ or tissue, for 2 calendar days (Gy)
Whole body	1
Lungs	6
Skin	3
Thyroid	5
Lens of eyes	2
Gonads	3
Fetus	0.1

Exceeding the annual absorbed dose on chronic irradiation (see table below) gives deterministic effects and intervention level is required.

### Intervention levels on chronic irradiation

Organ or tissue	Annual absorbed dose (Gy)
Gonads	0.2
Lens of eyes	0.1
Red marrow	0.4

## 5 Dose constraints

1. *Here again, could you give is the exact wording (citation) of the Law or regulations where the concept of dose constraint is mentioned.*
2. *In which domain (e.g. public dose, occupational dose, patient dose, etc) and by whom (regulatory body, operators, etc) are dose constraints implemented in your country?*
3. *What are the corresponding values and rationales behind these values?*
4. *What is(are) the status(es) of dose constraint(s)?*
5. *What is effectively done if a constraint is exceeded?*

Dose levels below the dose limits. In this case according to “Norms of radiation safety” safety requirements do not apply to the sources, which provide at any jobs with it:

- Individual effective dose per year less than 10  $\mu$ Sv;
- Individual equivalent dose per year less 50 mSv on skin and not more than 15 mSv on lens;
- Collective dose not more than 1 man.Sv.

Chief Sanitary Health-Officer of the Republic of Kazakhstan establishes dose limits parts of population and sum of parts must not exceed basic dose limits.

Population exposure by man-caused ionizing radiation sources is provided by good quality management with radiation sources and radiation control.

Control and limitation exposure principals in medicine are based on obtaining of necessary and useful diagnostic information or therapeutic effects using minimum possible exposure level.

Effective dose limit for persons (that are not X-ray department’s workers), who help patients during x-ray examination (children, suffering patients) is not exceed 5 mSv per year.

Intervention level:

According to “Sanitary and hygienic requirements for radiation safety provision” intervention level is the value of the preventable dose at achievement of which in case of chronic or accidental irradiation situations occurrence it is necessary to undertake the protective or post accidental measures.

At the radiation accident conditions the principle of substantiation relates not to the radiation sources and irradiation conditions, but to the protective actions. As a unit of use the prevented by the given action dose shall be evaluated. But the actions, aiming at restoration of control over radiation source shall be performed on the compulsory basis.

Optimization principle provides for keeping at the possible low and available level as individual so the collective irradiation doses, taking into consideration social and economic factor in accordance with appendix 1 to abovementioned document.

In conditions of the radiation accident, when instead of the dose limits the higher levels of intervention are active and the principle of optimization shall be applied to the protective actions, taking into consideration the preventable radiation dose and damage, connected with the intervention.

Planned increased exposure of group A personnel higher than basic dose limits during the accident can be permitted only in case of rescue people and (or) prevention their irradiation. Planned increased exposure is allowed for males elder 30. They must be informed of possible irradiation doses and hazard for their health, after that they must give a written agreement to work in this situation.

Planned increased exposure of the effective dose up to 100 mSv per year and equivalent doses not more than double basic dose limits values allowed with permission of local authorities of State Sanitary-Epidemiological Services. Planned increased exposure of the effective dose up to 200 mSv per year and in 4-fold values of equivalent doses according to basic dose limits is allowed only by the permission of the Chief Sanitary Health-Officer of the Republic of Kazakhstan.

Increased exposure is not allowed for:

- Workers, already being irradiated for a year as a result of accident or planned increased exposure and have received the 200 mSv effective dose, or equivalent dose exceeding 4 times of the basic doses limits;
- Persons, having medical contraindications to work with sources.

Persons, who have been irradiated by effective dose, exceeding 100 mSv per a year, must not be exposed more than 20 mSv per a year during their work.

Irradiations by effective dose over 200 mSv per year are a potentially hazardous. Exposed person must immediately leave the radiation zone and pass the medical examination. After that they have to receive work permission from the authority medical commission.

Protective actions in accident or radioactive contamination are carried out for environment and (or) human. These actions may disturb normal people life, and determinate as intervention. Intervention level is based on justification and optimization principles.

If supposed irradiation dose for a short period (2 calendar days) reaches levels of the deterministic effects is a required immediate protective action.