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Complex program for bringing nuclear legacy sites to a safe state: concept, methodology for nuclear legacy sites ranking, approaches to financing

XIIth ATOMEXPO 2022 International Forum

Round table "Nuclear Legacy Sites: Experience and Prospects for Cooperation"

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The main goal and current issues



- ✓ Increasing the role of nuclear energy and technologies in the CIS economies
- ✓ High sensitivity of the national and international community to nuclear accidents
- ✓ Higher international requirements for the nuclear sites safety
- ✓ Increasing the number of nuclear energy sites
- ✓ Not brought to safety nuclear legacy sites

40+
objects



- Inventory of all nuclear legacy radiation hazardous facilities
- Reducing the risks of emergencies with radioecological consequences in the territories of the CIS member states
- Creation and development of methods, means and technologies for bringing nuclear legacy sites into a safe state and rehabilitation works in the areas of their location
- Ensuring safe living conditions and living standards of the population in these regions

EXPECTED OUTCOMES OF COMPLEX PROGRAM IMPLEMENTATION

COMPLEX PROGRAM for bringing nuclear legacy sites to a safe state in the CIS countries, including facilities for the management of radioactive waste and remediation of territories exposed to uranium mining

- Reducing of radiation pollution level in the areas.
- Reducing the number of diseases associated with increased radiation among the population living near facilities.
- Accident prevention.
- Prevention of possible emergencies with radioecological consequences due to the spread of pollution under the influence of natural disasters
- Application of software tools to improve the efficiency of problem solving.
- Assistance to the socio-economic development of the affected territories.
- The creation of a modern systems for SNF and RAW management as a key to stopping the appearance of new problems (the Russian Federation and the Republic of Belarus examples) .
- Solving accumulated problems (decommissioning, ensuring an acceptable safety level).
- Creation of modern safety and security management systems (control, accounting, emergency response, monitoring, health care)

Nuclear legacy sites

DEFINITION:

Nuclear legacy sites are facilities for the use of nuclear energy for peaceful and defense purposes that were created before the establishment of modern requirements for the provision of nuclear safety, including sites whose operation has been discontinued for its functional purpose and which are at the decommissioning, disposal, utilization stages, the operating organization for which has not been determined*

FOR REFERENCE:

According to preliminary estimates, there are more than 40 large nuclear heritage facilities in the CIS member states, including such as:

- Solid RAW storage facilities
- Tailing dumps
- Liquid RAW storage facilities
- Surface liquid RAW reservoirs-storage
- Research reactors
- Radioisotope electricity sources

The CIS member states	Facility
Republic of Armenia 	3
Republic of Belarus 	7
Republic of Kazakhstan 	10
Kyrgyz Republic 	14
Republic of Tajikistan 	7
Republic of Uzbekistan 	5

Nuclear legacy sites ranking methodology

The development of the sites ranking Methodology provides:

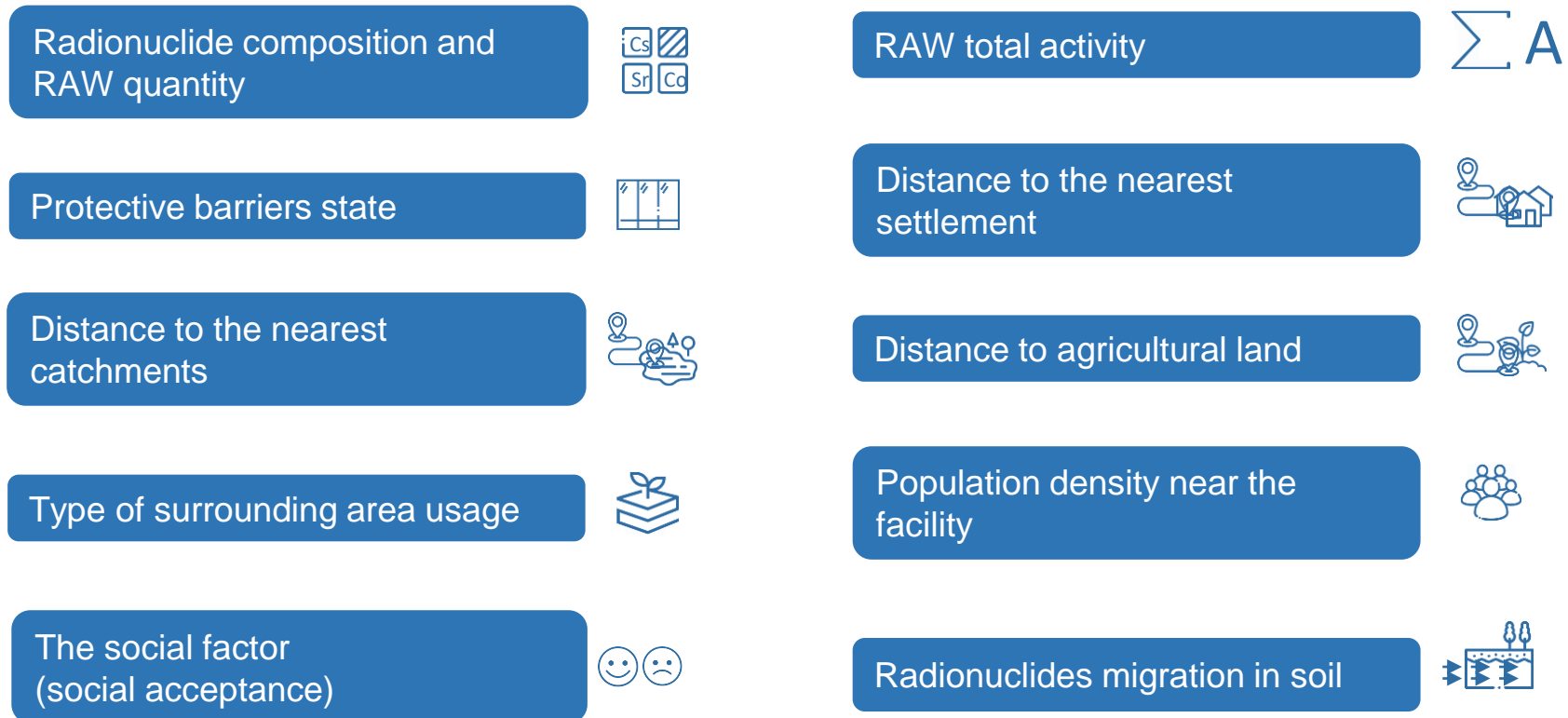
- I Taking into account the accumulated foreign and domestic experience in assessing the nuclear energy facilities' state ;
- II Taking into account the features of the nuclear legacy sites of the Commonwealth member states, considered in **the Program**;
- III Improvement of existing schemes for assessing the danger of sites.



- 1) NEA № 7374, Preparing for Decommissioning During Operation and after Final Shutdown, OECD, Paris, 2018
- 2) NDA Prioritization – Calculation Of Safety And Environmental Detriment Scores, Doc No EGPR02 Rev 6, April 2011
- 3) RB-164-20 "Recommendations for assessing the safety level of storage facilities and conducting an analysis of non-compliance with the requirements of current Federal norms and regulations in the field of atomic energy use«
- 4) RB-153-18 "Recommendations on justification of the choice of the option of decommissioning of nuclear energy facilities"

Nuclear legacy sites ranking methodology

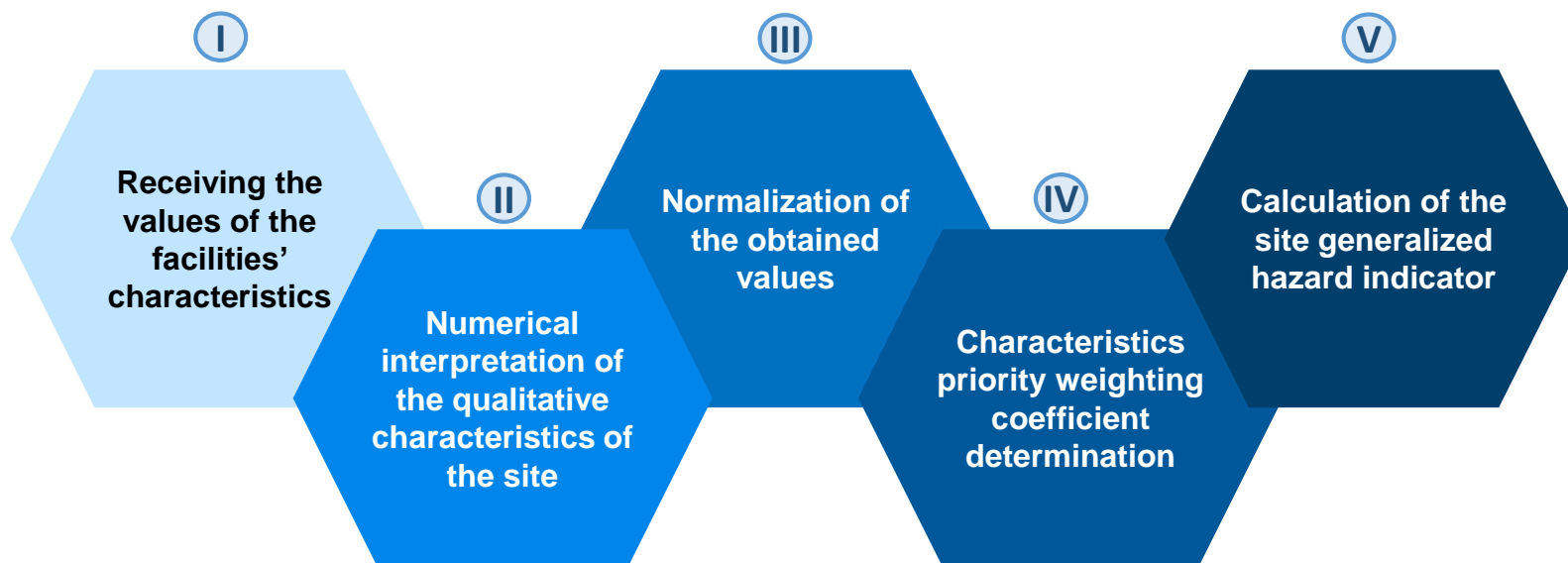
In order to assess the danger of the nuclear legacy sites of the CIS countries, the methodology takes into account the following characteristics and features of the sites:





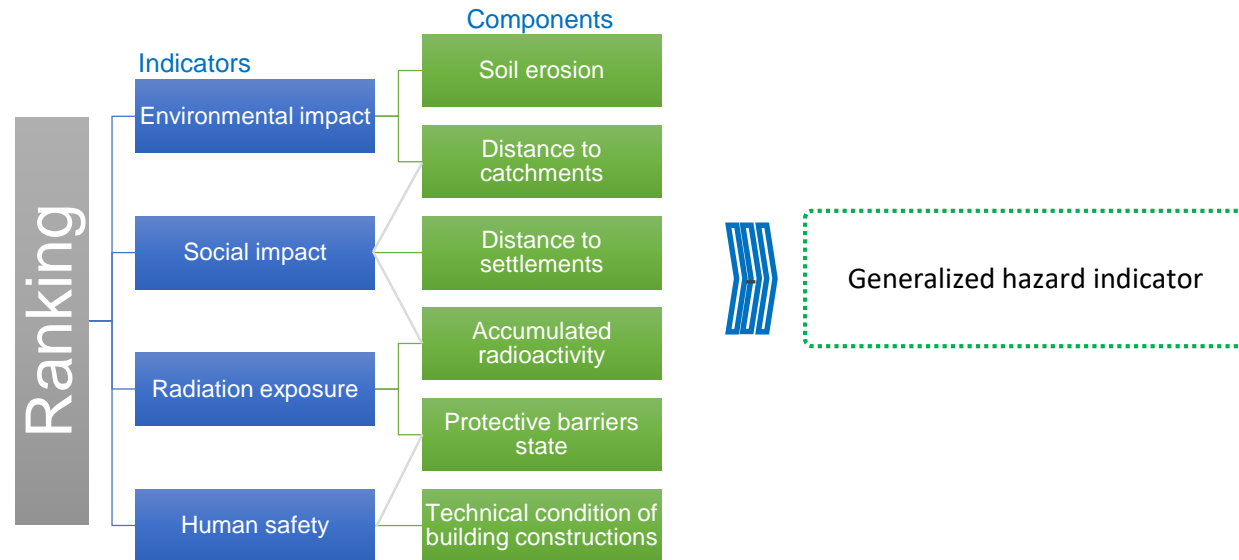
Nuclear legacy sites ranking methodology

According to the danger degree the algorithm for the nuclear legacy site ranking consists of the following stages:



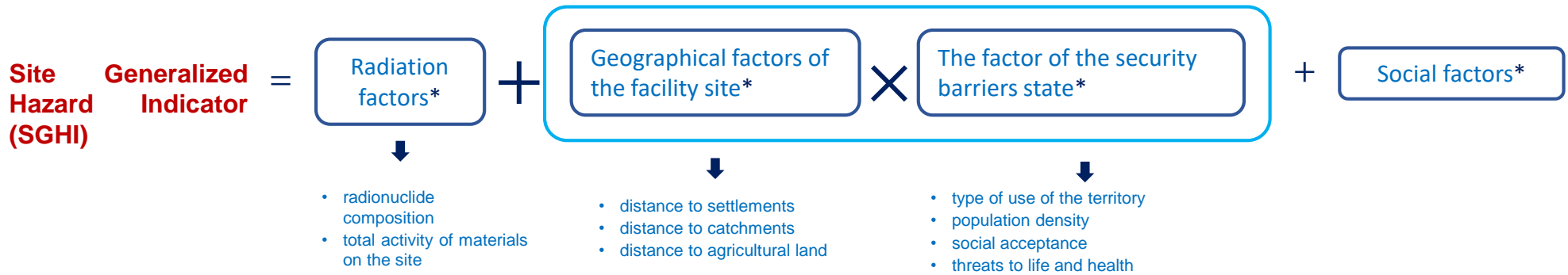
Methodology: Site Generalized Hazard Indicator (SGHI)

- I Site generalized hazard indicator is calculated on the basis of the dimensionless values of the characteristics .
- II The site generalized hazard indicator is the result of aggregation and analysis of various characteristics of nuclear legacy facilities in order to ensure comparison of the facilities that differ greatly from each other in terms of the hazard degree to the population and the environment.



Methodology: Site Generalized Hazard Indicator (SGHI)

The Facility generalized hazard indicator is determined by 10 main factors:



* All factors are multiplied by weight coefficients determined for each factor by expert method (W_i)

According to the calculated generalized hazard indicator nuclear legacy sites ranking makes it possible to identify the most dangerous sites, taking into account the assessment of the site state.

Example (based on available archival data):

Object	GHI
Tailing dump (Istiklol, Taboshar) 5 sub-objects	0,219
Khujand tailings dump and dumps (4 pieces)	0,097
Chkalovskoye (Buston) tailings dump	0,054
Adrasman tailing dump	0,006
Gafurov tailing dump	0,00048

The Methodology algorithm

- ① Calculation of the values of the Generalized hazard indicator for each site
- ② Nuclear legacy sites ranking in each country
- ③ Determining the order of rehabilitation, beginning with the most dangerous one under the CIS program

PREPARATION FOR THE BRINGING TO A SAFE STATE PROGRAM IMPLEMENTATION

- ① Initiative offer of Base organization for Program development
- ② Determination of potential financial sources approved at the ATOM CIS Commission
- ③ Approval in the CIS statutory bodies (Council of Heads of Government)
- ④ Establishment of the program operator

Roadmap for implementation of the Program



- I Initiative offer "The concept of a nuclear legacy sites bringing to a safe state Complex program in the CIS countries"
- II Development of a bringing nuclear legacy sites to a safe state program in the CIS countries
- III Development of practical measures for the implementation of projects in a multilateral/bilateral form
- IV Development of financing instruments for implementation of projects in a multilateral/bilateral form

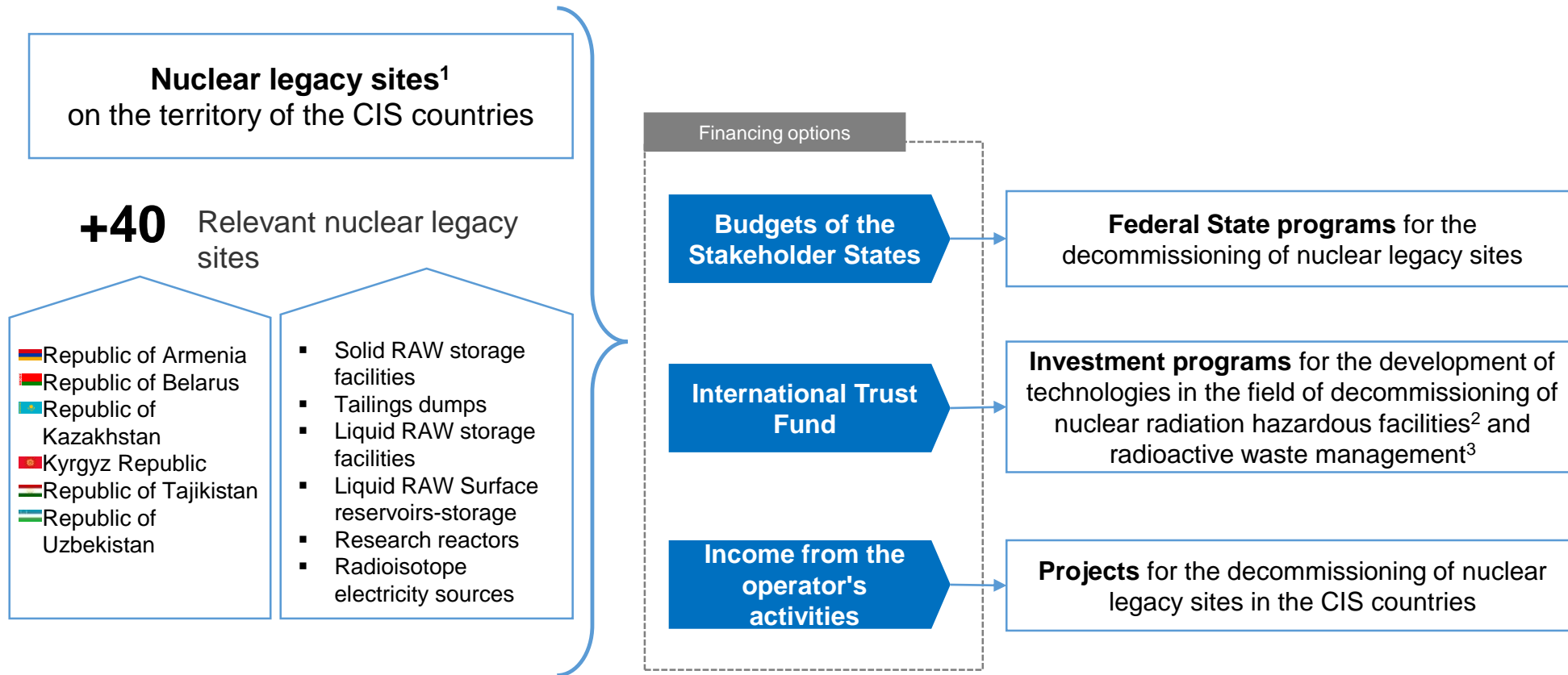
The expected results

Bringing nuclear legacy sites in the CIS countries to a safe state

Creation of modern safety and security systems (control, accounting, emergency response, monitoring, health care)



Financing of bringing nuclear legacy sites to a safe state projects in the CIS countries



- ¹ Nuclear installations, radiation sources, storage facilities and other natural and man-made facilities containing radioactive substances and (or) nuclear materials created in the course of past activities, in respect of which additional measures are necessary to complete their life cycle and/or rehabilitation.
- ² Decommissioning of nuclear and radiation hazardous sites
- ³ Radioactive waste



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Thank you for your attention!

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