



**Training**  
under the project to improve the safety of mining facilities, including  
tailings, in Kazakhstan and Central Asia

**Kokshetau (Kazakhstan) June 11-13, 2019**



# Checklist for improving the safety of tailings and assessing their safety

UNECE Convention on the  
Transboundary Effects of  
Industrial Accidents

**Assistance  
Programme**



Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra

**Prof. D. Rudakov**  
**National Technical University “Dnipro  
Polytechnic”**  
**Dnipro, Ukraine**

# Checklist Formats

Text (MS Word)	Spreadsheet (MS Excel)
For the work of the inspector at the facility and the preliminary filling of the checklist	To calculate the safety level of a tailing dump with answers received in advance
Appendix 2 Methodologies	Separate MS Excel file with 3 groups of questions, diagram templates and an Event Catalog.

# Quantification of responses

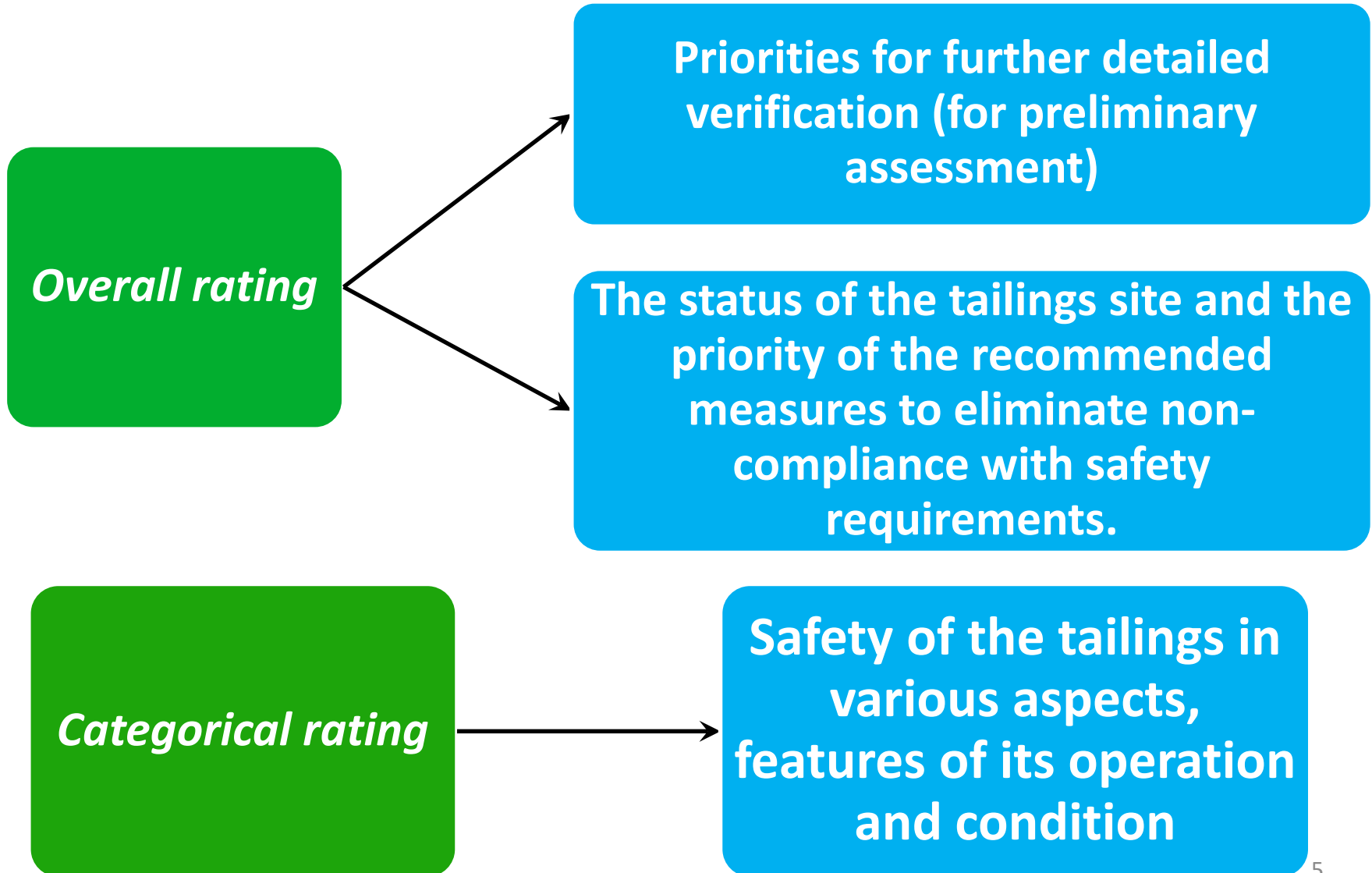
- The positive answer “Yes” is interpreted as the maximum level of tailing dump safety according to the assessed factor.
- The negative answer “No” is interpreted as the minimum level of security for the assessed factor.
- The vague answers “Probably yes” and “Probably not” allow the user to give answers, taking into account the availability and reliability of the data.

Answer	Not applicable	Yes	Probably yes	Probably not	Not
Value	yes/not	3	2	1	0

# Conditionally applicable issues

- Some of the questions on the Checklist, for example 53 of the 304 questions of Group B (“Detailed Verification”), are not always applicable. Example: Question 14 of subgroup B1 about a soil layer removed before construction - not always such a layer exists.
- These questions are listed at the end of "(if applicable)", in the Excel table the numbers of these questions are highlighted. The inapplicability of these issues in a particular situation should be justified.
- When assessing the safety level of a tailing dump, inapplicable issues are not taken into account.

# Types of tailings safety assessments



# Characteristics of the overall level of tailings safety

- The “Compliance with Safety Requirements” (“CSR”) indicator in the Checklist is defined as an index that quantitatively characterizes the degree to which the tailings parameters and characteristics meet environmental and industrial safety requirements.
- The “Reliability” indicator in the Checklist is defined as an index quantitatively characterizing the sufficiency and consistency of the data used in calculating the “CSR” indicator.

# An example of a general assessment of the safety level of a tailing dump

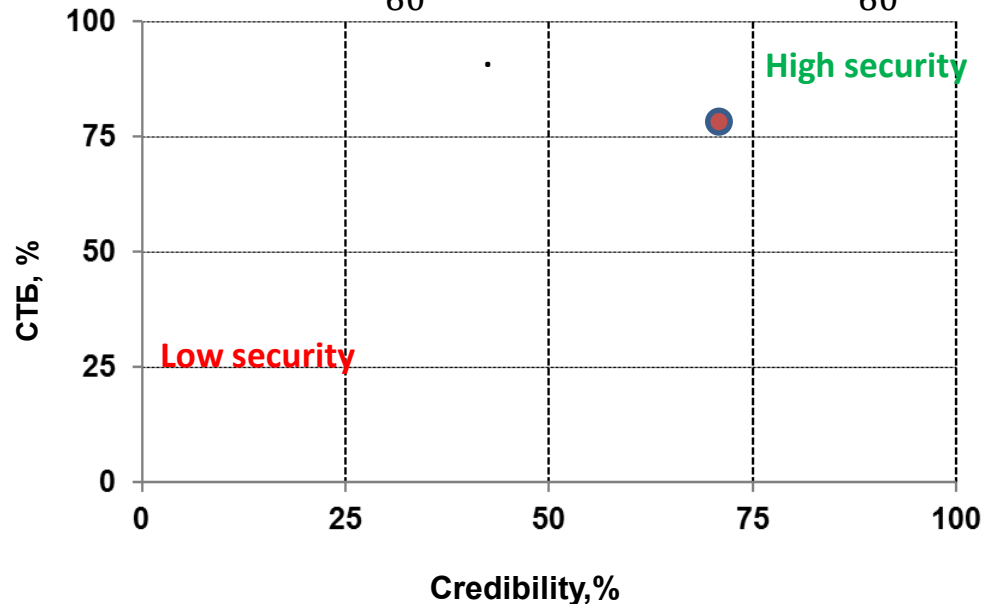
Assessment results for Group A of the Checklist.

Number of applicable questions	Yes	Probably YES	Probably not	Not
60	38	10	8	6

Values of “STB” and “Reliability” indicators

$$CSR = 100\% \cdot \frac{1}{3 \cdot 60} (36 \cdot 3 + 10 \cdot 2 + 8 \cdot 1 + 6 \cdot 0) = 100\% \cdot \frac{136}{180} \approx 76\%$$

$$Credibility = 100\% \cdot \frac{1}{60} (60 - 18) = 100\% \cdot \frac{42}{60} \approx 70\%$$



# Tailings classification according to assessment results

Tailings Safety Level	Criterion
<b>Acceptable</b>	Satisfied with 100% of the minimum security requirements (STB = 100%)
<b>Unacceptable</b>	Satisfied with less than 100% of the minimum security requirements (STB <100%)



# Categorical rating. Category Importance

- **Critical (Extremely Important) safety** categories are those tailings safety categories that relate mainly to the technical aspects of tailings operation and are vital for maintaining the facility in a safe condition.
- **Non-critical security categories** - relate to issues related mainly to documentation and reporting.

# Category Priority

No	Category	Priority for tailings safety
I	Geological, climatic and local risks	Uncritical
II	Tailings Location Plan	Uncritical
III	Substances (tailing capacity, toxicity)	Critical
IV	Dam and screens	Critical
V	Transport and infrastructure	Critical
VI	Water management	Critical
VII	Environmental impact assessment	Critical
VIII	Emergency plan	Critical
IX	Monitoring	Critical
X	Training and staff	Critical
XI	Verification and Reporting	Uncritical
XII	Closing and Reclamation Strategy	Uncritical

# Categorical Assessment Examples

1



2



3



1. Tailings near Kalush (Ukraine)
2. Tailing dump near the Dnieper (Ukraine)
3. Tailing dump near Akhtala (Armenia)

**Thanks for attention!**