

**9th Conference of the Parties to the UNECE Convention on the
Transboundary Effects of Industrial Accidents**

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**Preventing Water Pollution Based on
the UNECE Safety Guidelines and
Good Practices for Tailings
Management Facilities**

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Activities in this project are funded by the German Federal Environment Ministry's Advisory Assistance Programme (AAP) for environmental protection in the countries of Central and Eastern Europe, the Caucasus and Central Asia and other countries neighbouring the European Union. It is supervised by the German Environment Agency (UBA).

Content

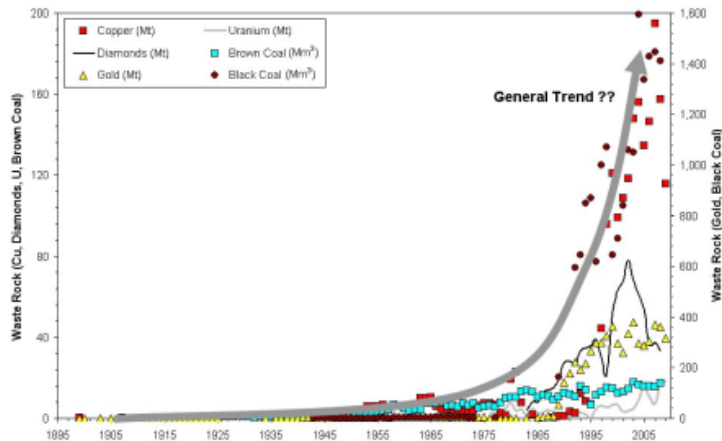
- Introduction.
- UNECE Safety Guidelines as a tool for preventing TMF accidents.
- The GEA project to develop TMF Methodology based on the example of Ukrainian facilities (2013-2015).
- The TMF Methodology as the key product of the GEA project.
- Application and improvement of the TMF Methodology within the education project of GEA on TMF safety at National Mining University (Ukraine).

GEA = German Environmental Agency

TMF = Tailings Management Facilities

Introduction

- Dramatic growth of mining waste amount in the world last decades.
- Accidents and failures at TMFs in Rumania (2000), Hungary (2010), Ukraine (2008, 2011), Finland (2012), Brazil (2015), Kazakhstan (2016).



Volumes of different mining wastes in the world (G.V. Mudd, 2007)



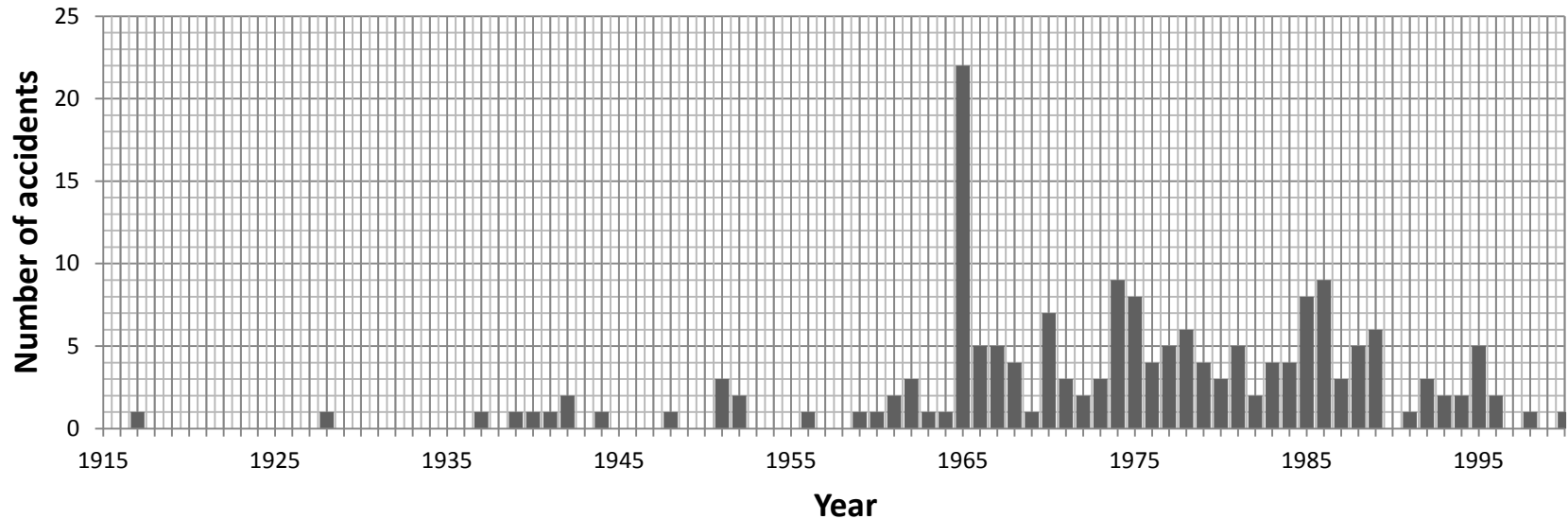
The TMF at Ajkai (Hungary) after the dam failure (2010)



The river after dam failure at the TMF of Ridder in East Kazakhstan (2016)

Introduction.

Incidents at TMFs in XX-th Century (ICOLD Bulletin No. 121)



- **Dramatic increase in the mid 1960s due to the intensive development of mining industry and creation of a large number of TMFs,**
- **Reducing number of incidents since 1990s due to the introduction of stricter safety standards, contraction of mining production in some countries, the introduction of new technologies of sustainable mining.**

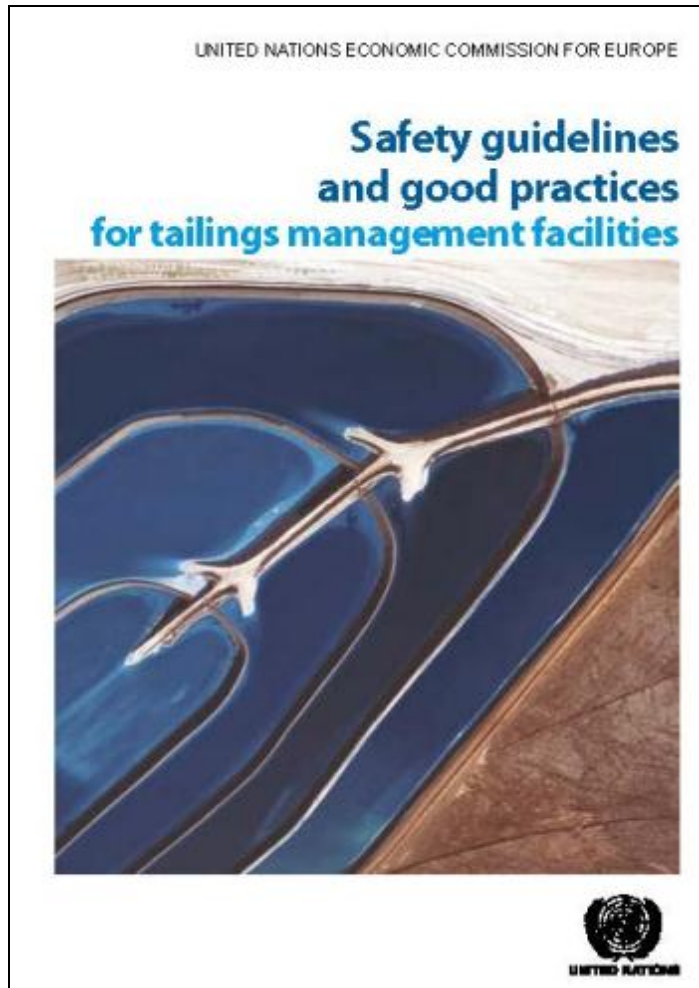
Introduction.

Environmental After-effects of TMF Accidents

- Releases of heavy metals and other contaminants to rivers and seepage to groundwater.
- Acidification of rivers.
- Growth of organic micro-pollutants.
- Biota degradation.



UNECE “Safety Guidelines and Good Practices for Tailings Management Facilities”



- The Guidelines were developed by the Joint Expert Group on Water and Industrial Accidents, with the support of the United Nations Economic Commission for Europe (UNECE) secretariat.
- The Guidelines were endorsed by the Conference of the Parties to the Industrial Accidents Convention (2008) and by the Meeting of the Parties to the Water Convention (2009).
- The document was updated in 2014.

UNECE “Safety Guidelines and Good Practices for Tailings Management Facilities”

Issues Addressed



Part A

- Safety principles for tailings management facilities,
- Recommendations to member countries, competent authorities, and tailings management facility operators.



Part B

- Technical and organizational aspects such as
- pre-construction and construction,
 - operation and management,
 - facility inspections,
 - identification, assessment and management of abandoned sites,
 - internal and external emergency planning.

The Project to Develop the TMF Methodology

In 2013 German Environmental Agency has started a project in Ukraine to develop a **Methodology to improve the safety of tailings management facilities** as a practical tool for the implementation of the UNECE Guidelines with minimum requirements to tailings safety.

INITIATOR

**United Nations
Economic Commission
for Europe (UNECE)**

SUPPORT

**International
Commission for the
Protection of the
Danube River (ICPDR)**

The Project to Develop the TMF Methodology

Contractor

- International HCH and Pesticides Association (IHPA), Denmark

Executors

- Ukrainian project team (5 people)
- A group of international experts from 11 countries including **Armenia, Austria, Czech Republic, Georgia, Finland, Germany, Hungary, Romania, Sweden, Switzerland, and the USA.**

Host country

- Ukraine



The Project to Develop the TMF Methodology Project Products

TMF Methodology

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graph TD; A[TMF Methodology] --> B[Method of Evaluation "Tailings Hazard/risk Index" (THI)]; A --> C[TMF Checklist];
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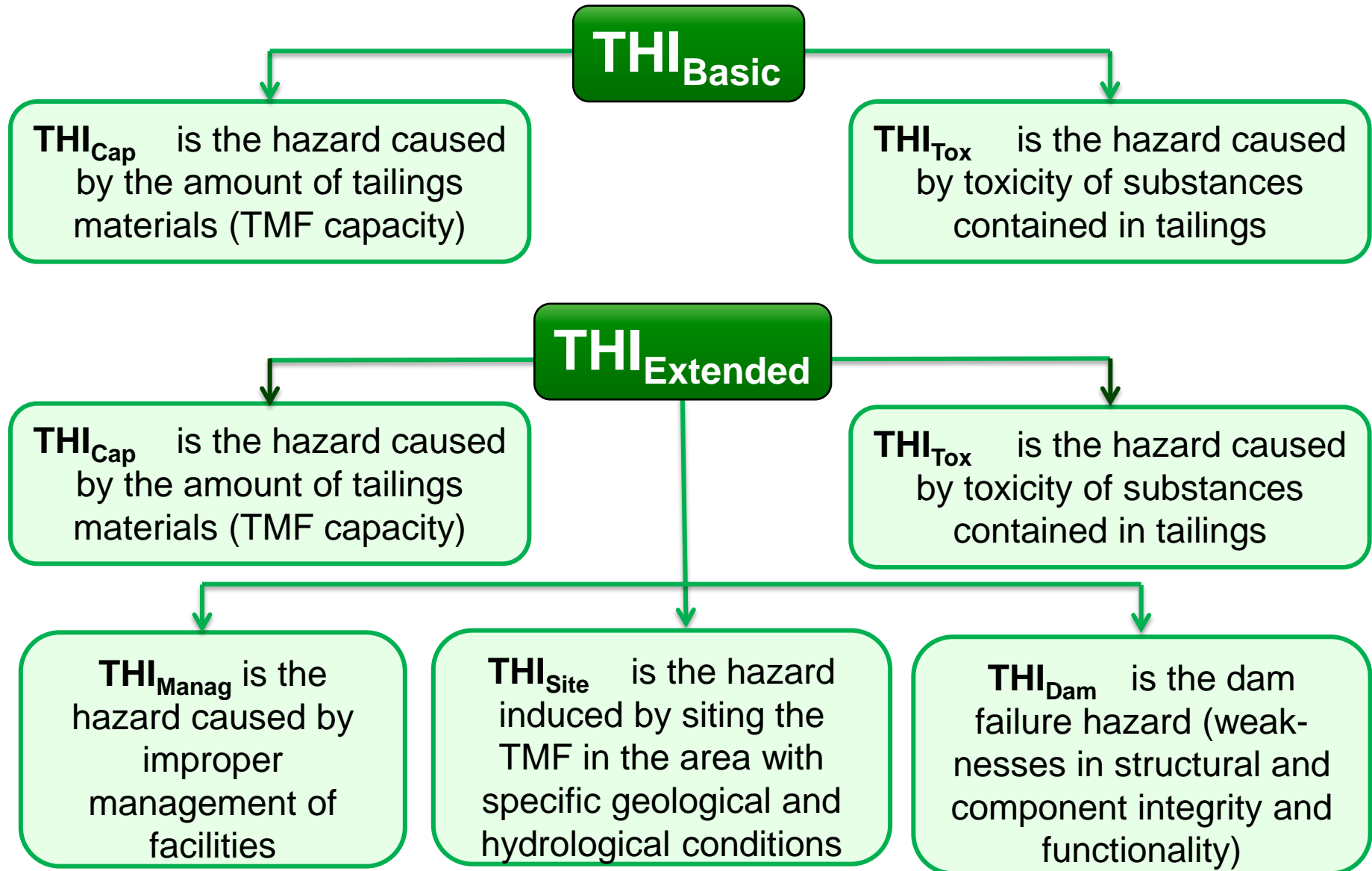
Method of Evaluation “Tailings Hazard/risk Index” (THI)

is intended for prompt preliminary **evaluation of tailings hazard for the large amount of TMFs** on the national/regional level

TMF Checklist

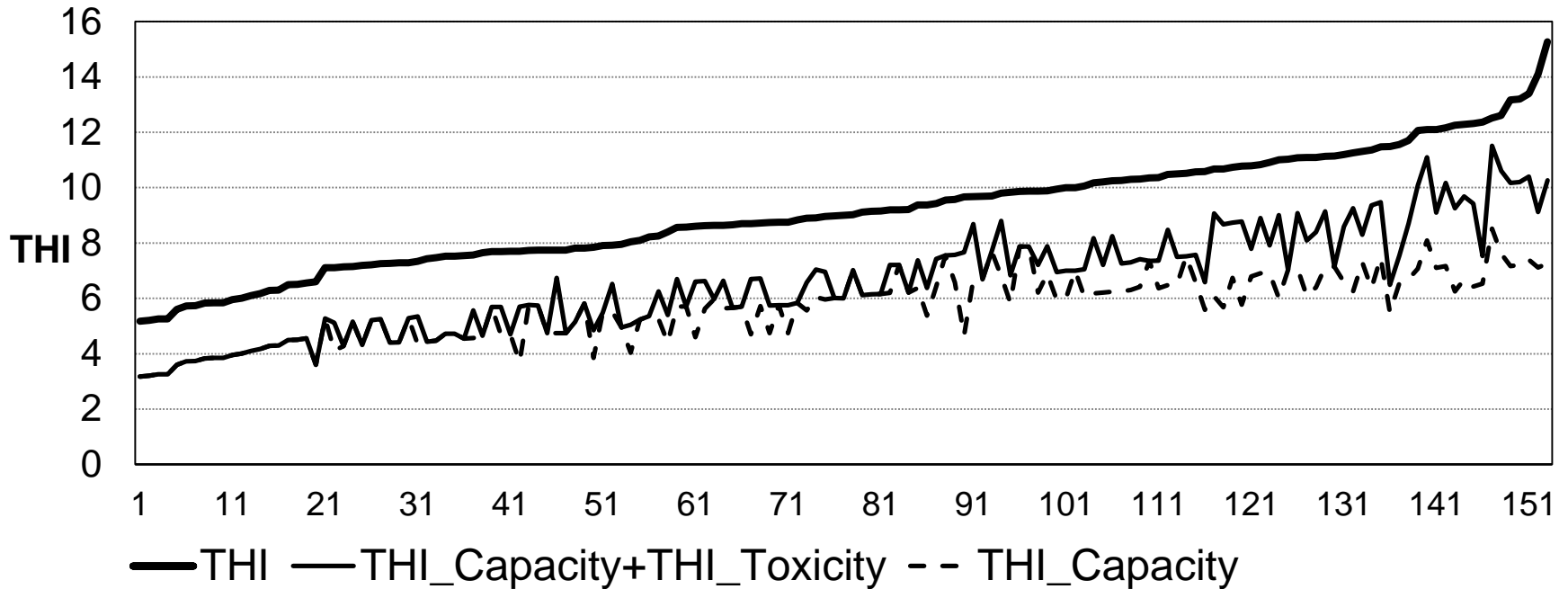
is developed for **evaluation of the safety level** of individual TMFs

Project Products. Tailings Hazard Index (THI)



Project Products.

Ranking 153 Ukrainian TMFs by $THI_{EXTENDED}$

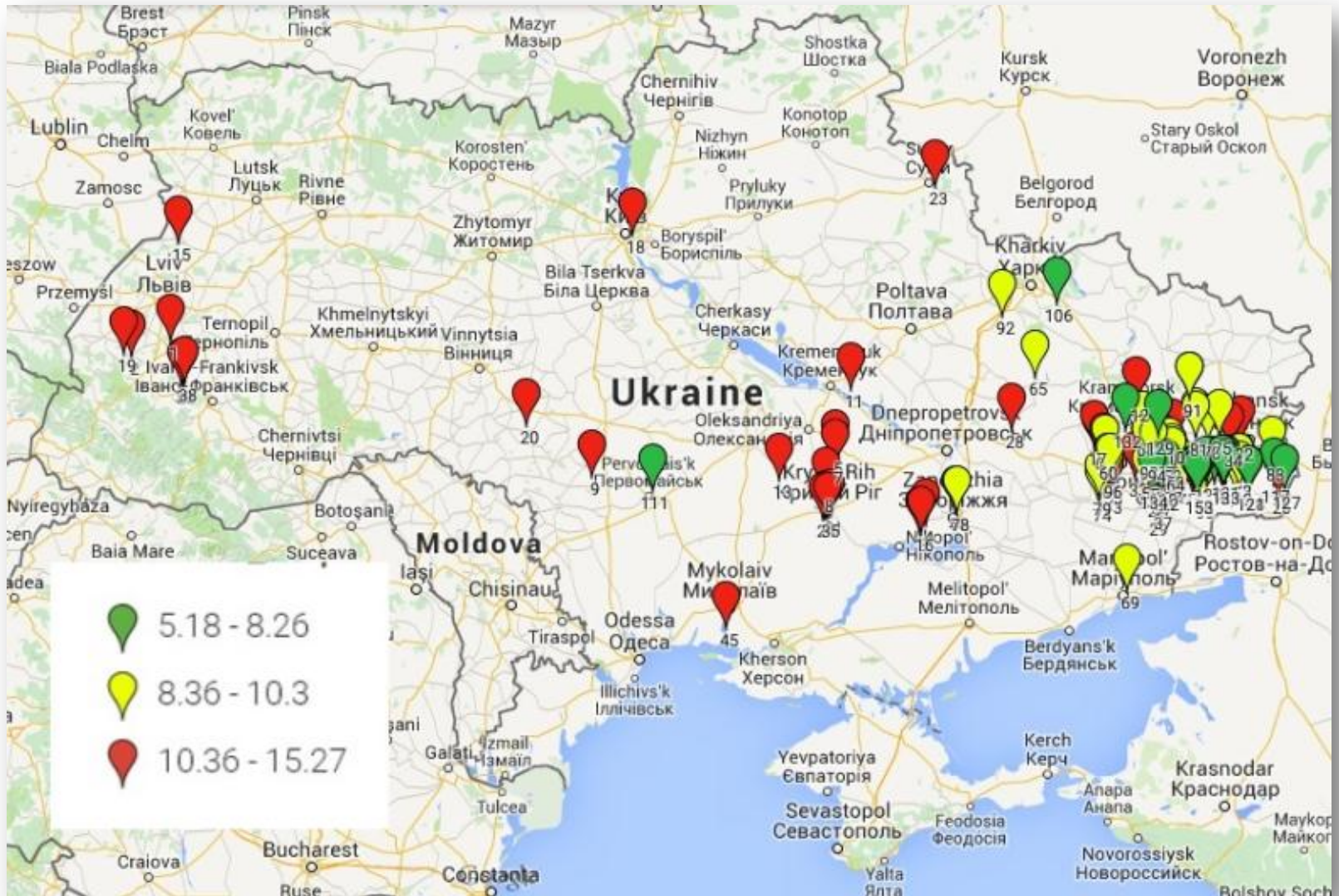


$THI_{Extended}$ value	TMF quantity
below 6	11
from 6 to 8	42
from 8 to 10	47
from 10 to 12	38
over 12	15

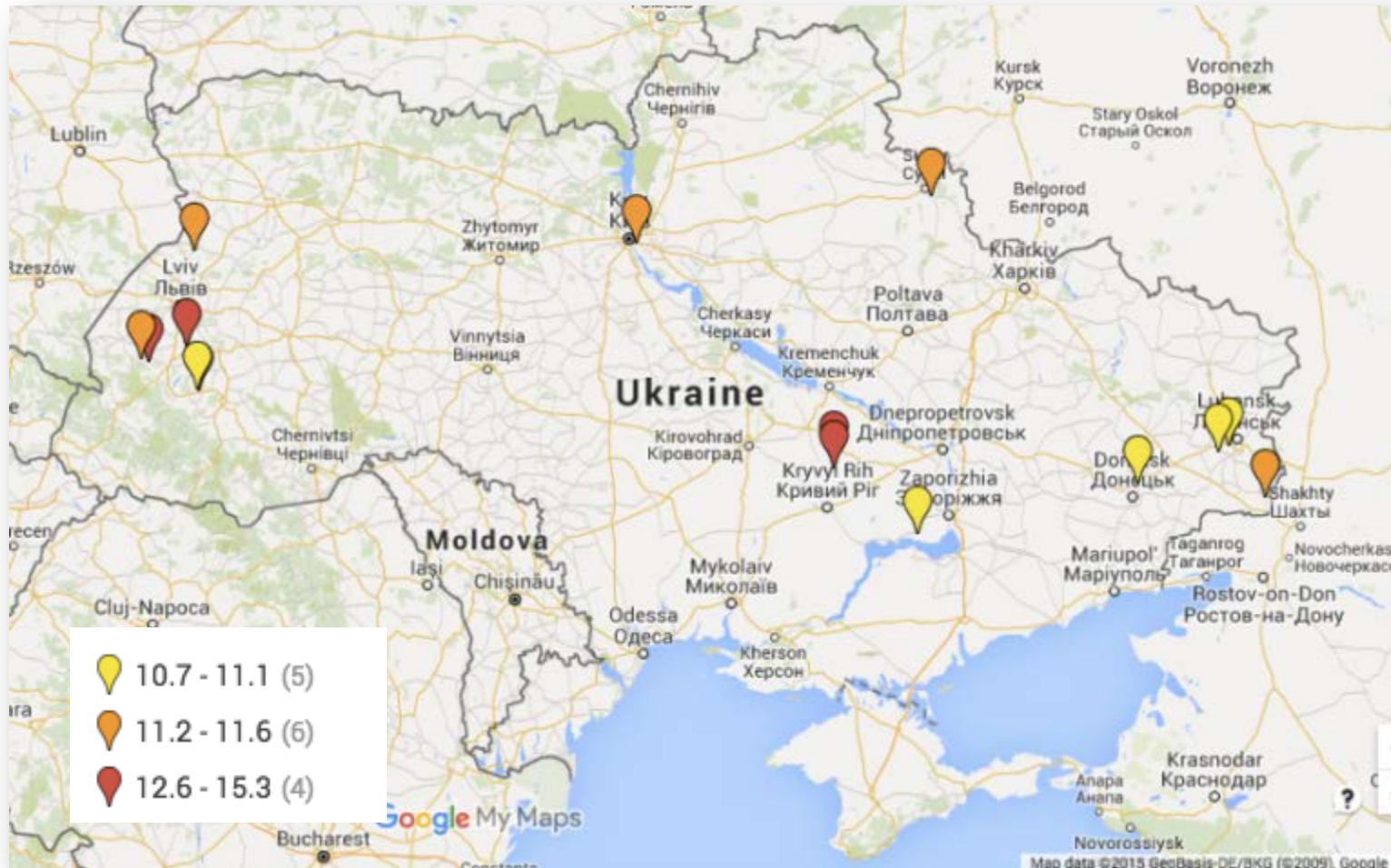
Minimum value of THI is 5,2

Maximum value of THI is 15,3

Project Products. Map of 153 Ukrainian TMFs Ranked by THI_{EXTENDED}

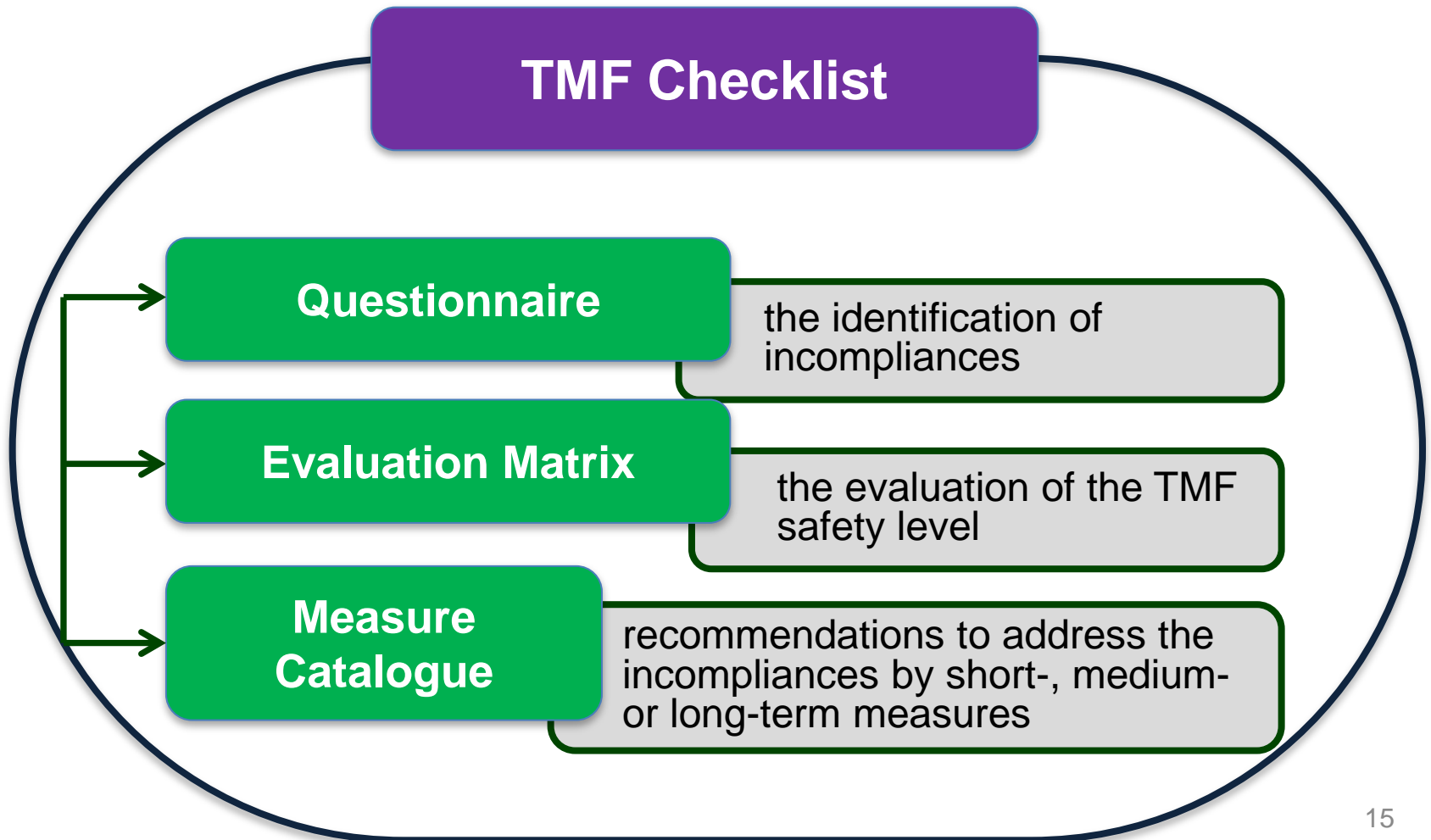


Project Products. Locations of 15 Most Potentially Hazardous Ukrainian TMFs



Project Products. TMF Checklist

TMF Checklist is based on minimum safety requirements adopted in the UNECE «**Safety guidelines and good practices for tailings management facilities**»



Project Products. Evaluation Matrix

Evaluation Matrix includes the criteria for

- Answer interpretation and quantification;
- Overall and categorial evaluation;
- Assessment of evaluation credibility.

The overall safety level summarizes numerical contributions of all answers to Checklist questions

The categorial evaluation reveals the TMF safety in different aspects and details of TMF performance

Project Products. Measure Catalogue

- Measure Catalogue includes the list of actions to be taken in case of establishing incompliances of TMF conditions to applicable safety requirements or regulations.
- Measure Catalogue includes the measures from the UNECE **“Reference Document on Best Available Techniques for Management of Tailings and Waste-Rock in Mining Activities”** and successful national practices in post-mining environment restoration.

#	Problem to be solved	Measures prescribed	Priority
PRE-CONSTRUCTION AND CONSTRUCTION			
1	Design documentation is incomplete	1A. Update design documentation made by a licensed company	Short-term
		1B. Update design documentation involving licensed and skilled staff	Short-term
		1C. Perform expert analysis of design documents for authorities	Short-term
		1D. Prepare or complete design documentation according to regulatory requirements	Short-term
		1E. Prepare a detailed map of the TMF site and the surrounding area	Short-term

Project Products. Advantages of the Developed TMF Checklist in MS Excel template



Automatic Check of Answers



Momentary Calculation of the TMF safety level



Links to the recommended measure list, which facilitates prescription of measures for each specific case

TMF Checklist Application to the Kalush Site (Western Ukraine)

Location. Ivano-Frankivsk region
0.85 km from the city of Kalush,

Name. TMF No. 2 of State Enterprise
“Potassium Plant” JSC “Oriana”

Constructed in 1984

Tailing materials. Solid waste of
potassium production including
halite, sludge, gypsum and brines



Waste volume.

Solid phase $9 \times 10^6 \text{m}^3$;
liquid phase $1.7 \times 10^6 \text{m}^3$

Kalush TMFs threat to

- local aquifers
- and rivers in the Dniester basin

TMF Checklist Application for the Kalush Site



TMF No. 2 in 2010



TMF No. 2 in 2014



Salt water seepage through the dam

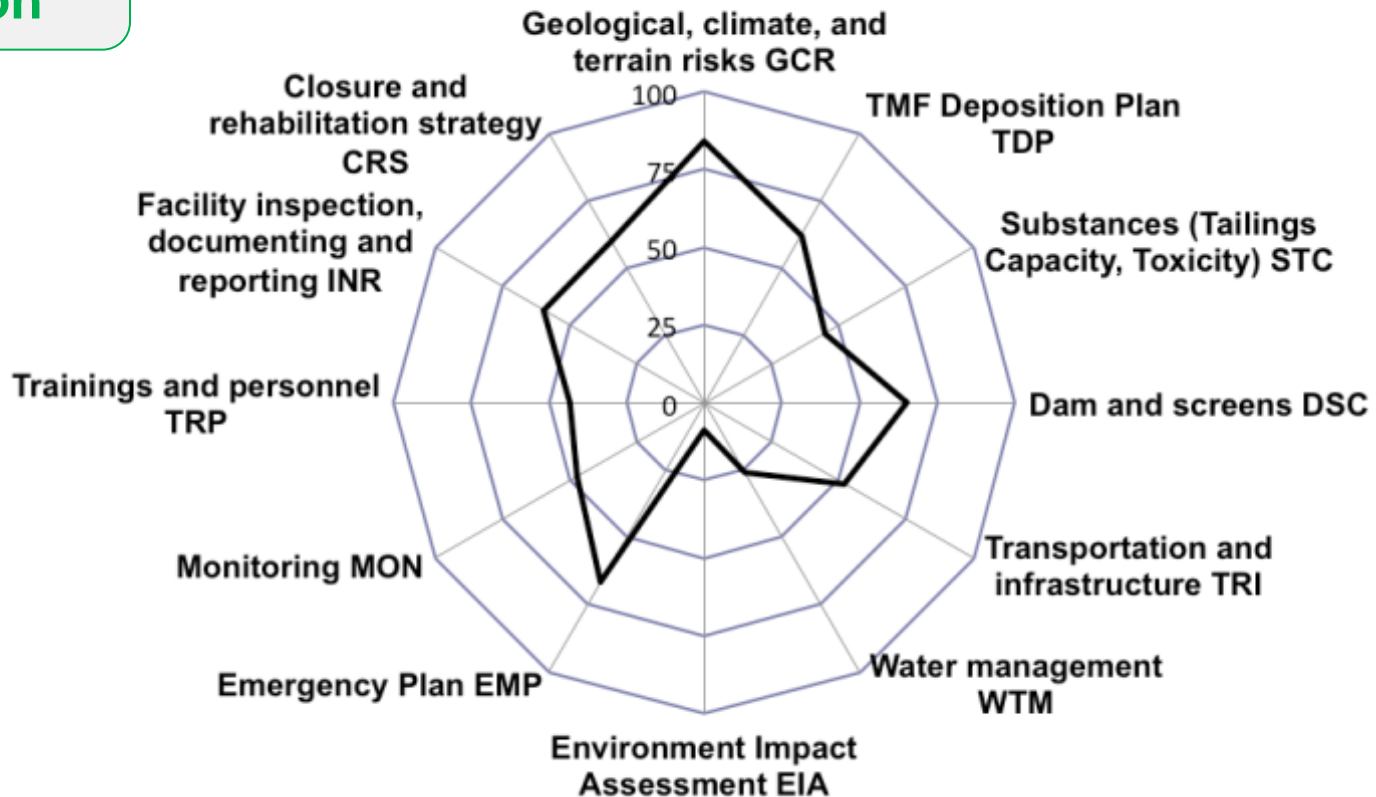
- 2010** Emergency situation declared
- 2011** Recommendations of UN OCHA mission for assistance given what has to be done
- 2014** TMF project experts stated no progress in the site safety level except elimination of non-TMF HCB waste

TMF Checklist Application for the Kalush TMF Site

Overall evaluation

Credibility, 58.2%
Overall Safety evaluation 51.7%

Categorial evaluation



Education project of GEA on TMF safety at National Mining University (Ukraine) as the current activities

Raising Knowledge among Students and Teachers on Tailings Safety and its Legislative Review in Ukraine

Contractor

- National Mining University (Dnipro, Ukraine)

Host country

- Ukraine



Duration

- June 2016 – May 2017

Education project of GEA on TMF safety at National Mining University (Ukraine)

Project Participants

Ukrainian project team (5 people)

Tutors and trainees from 4 universities of the city of Dnipro (24 people)

Ukrainian experts (10 representatives of competent authorities)

International experts in tailings safety including Joint Expert Group of UNECE

TMF operator representatives

Education project of GEA on TMF safety at National Mining University (Ukraine)

Project Objectives

Dissemination of the TMF Methodology among its potential users

Familiarization of the target audience with European principles of the TMF safety (UNECE “Safety Guidelines and Good Practices for TMFs”)

Adaptation of the education course to the audience (students and teachers of universities, state inspectors, and TMF operating staff)

Increase of the qualification level through training modules that comprise both theoretical lectures and practical exercises including TMF site visits

Education project of GEA on TMF safety at National Mining University (Ukraine)

First Training 3–7 October 2016

- Lectures on the TMF Methodology
- Site visit to the TMF
- Filling in the TMF Checklist (visual inspection)
- Presentation on TMF safety level evaluation

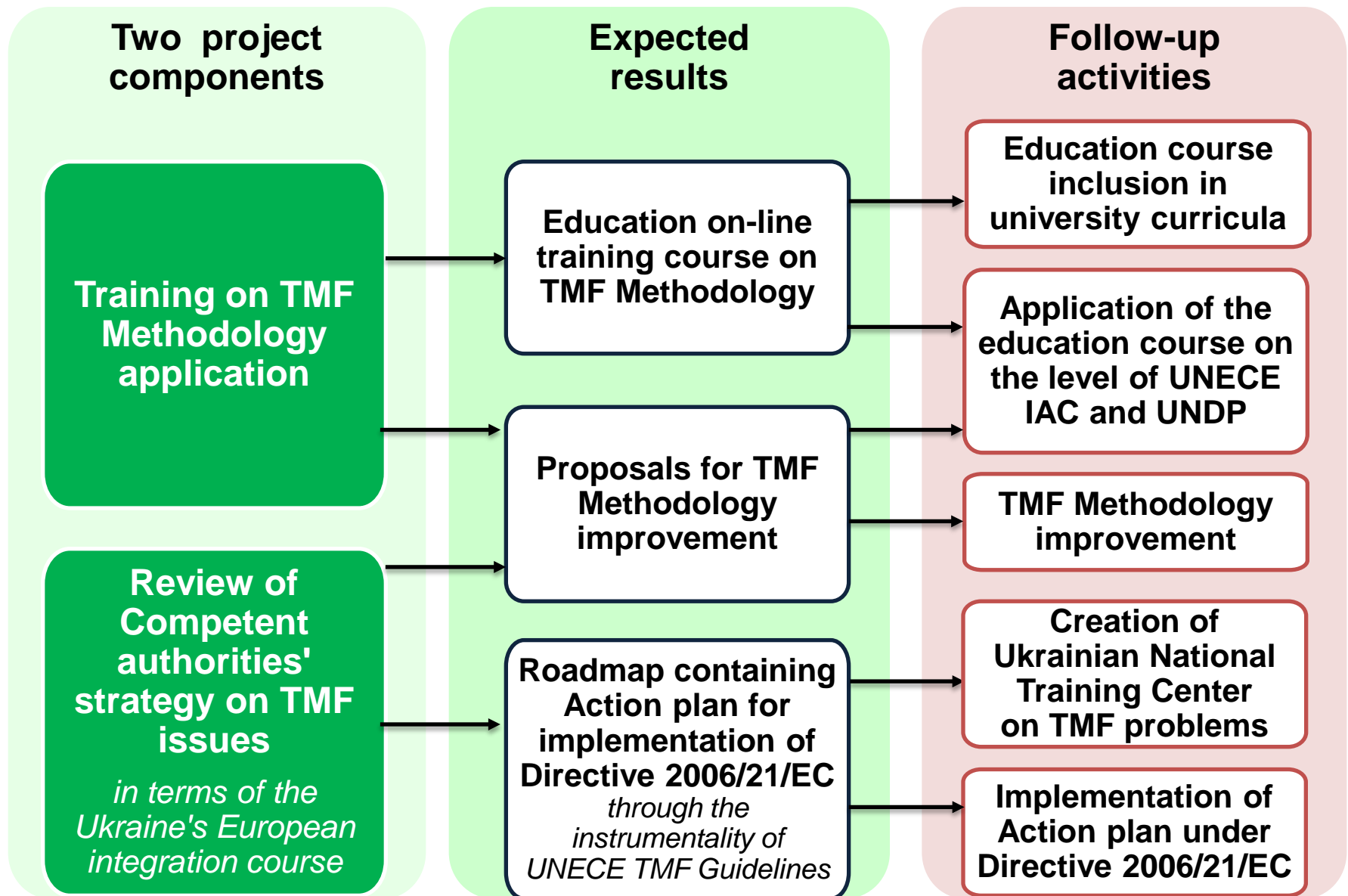


Second Training 22–26 November 2016

- Lectures on THI method and Legislative review
- Filling in the TMF Checklist (check of documentation)
- Presentation on TMF safety level evaluation



Education project of GEA on TMF safety at National Mining University (Ukraine)




You are kindly invited to take part in the Final International Workshop within the project “Raising Knowledge among Students and Teachers on Tailings Safety and its Legislative Review in Ukraine” at National Mining University to be held in Dnipro (Ukraine) on May, 17-18 2017

ENG
RUS

Home Page Participants Stages and Milestones Latest news Photo gallery Contact

International project

“Improving the safety of industrial tailings management facilities based on the example of Ukrainian facilities”*

“Safety Guidelines and Good Practices for Tailings Management Facilities”, developed by the UNECE (hereinafter – the UNECE Guidelines), includes recommendations for countries and the competent authorities on improving the legal framework and licensing system for the safe operation of the tailings as well as technical details on the organization of technical security and control of industrial tailings.

This project will examine each principle and recommendation of the UNECE Guidelines and compare the specific situation in Ukraine on its application. The result can be structured to assess the situation in Ukraine, so that, based on the results suggestions can be given on the technical measures to improve the operation of industrial tailings and taking appropriate administrative and legislative decisions.

Additionally a significant technical part of the UNECE Guidelines can be used to develop a checklist. The checklist will be developed with the involvement of the experience of international experts in this field. With it, you can pinpoint weaknesses in the technical safety of tailings in the Ukraine, in order to develop short, medium and long term measures to address them. New directory of activities can be used for international harmonization of minimum standards for technical safety in this area.

The designed Checklist will be used in training to Ukrainian inspectors and specialists when examining specific tailing in Ukraine. Training will be held in the Carpathian region (Danube basin) and the Dnipropetrovsk region (Dnieper basin) where there is huge tail, which represent an enormous threat to the entire Black Sea basin.

Cooperation of governmental and non-governmental organizations of Ukraine and a group of international experts is envisaged for

News

- 17.11 Second TFM Training Report
- 05.07 Anons: Second Testing of the Checklist
- 21.06 Main documents of the TFM project
- 21.06 Why Ukraine?

* This project is financed by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety with means of the Advisory Assistance Programme for Environmental Protection in the Countries of Central and Eastern Europe, the Caucasus and Central Asia. It is supervised by the Federal Environment Agency (Umweltbundesamt, UBA). The content of this publication lies within the responsibility of the authors.



Main documents of the TFM-Ukraine
[User's Guide to the TFM Checklist](#)

Learn more about the TFM Methodology and current project activities on our website www.tmf-ukraine.org

Thank you for your attention!

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