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## Federal Environment Agency

### Dessau, Germany



Seminar on good practices and lessons learned in  
implementing the UNECE Convention on the  
Transboundary Effects of Industrial Accidents  
3/4 February 2022

# Session 2 – Identification and notification of hazardous activities

## Identification and notification of tailings management facilities (TMFs) in the Danube River Basin and beyond, using the **TMF Methodology**

# Dam-Failure Brazil 2019



<https://youtu.be/sKZUZQytads>

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# What is the TMF-Methodology?

Methodology dealing with the Safety of TMF

1. Hazard Identification
2. Risk Identification
3. Checklist for evaluation of TMF-Safety

**Methodology to improve TMF safety  
(TMF-Method)**

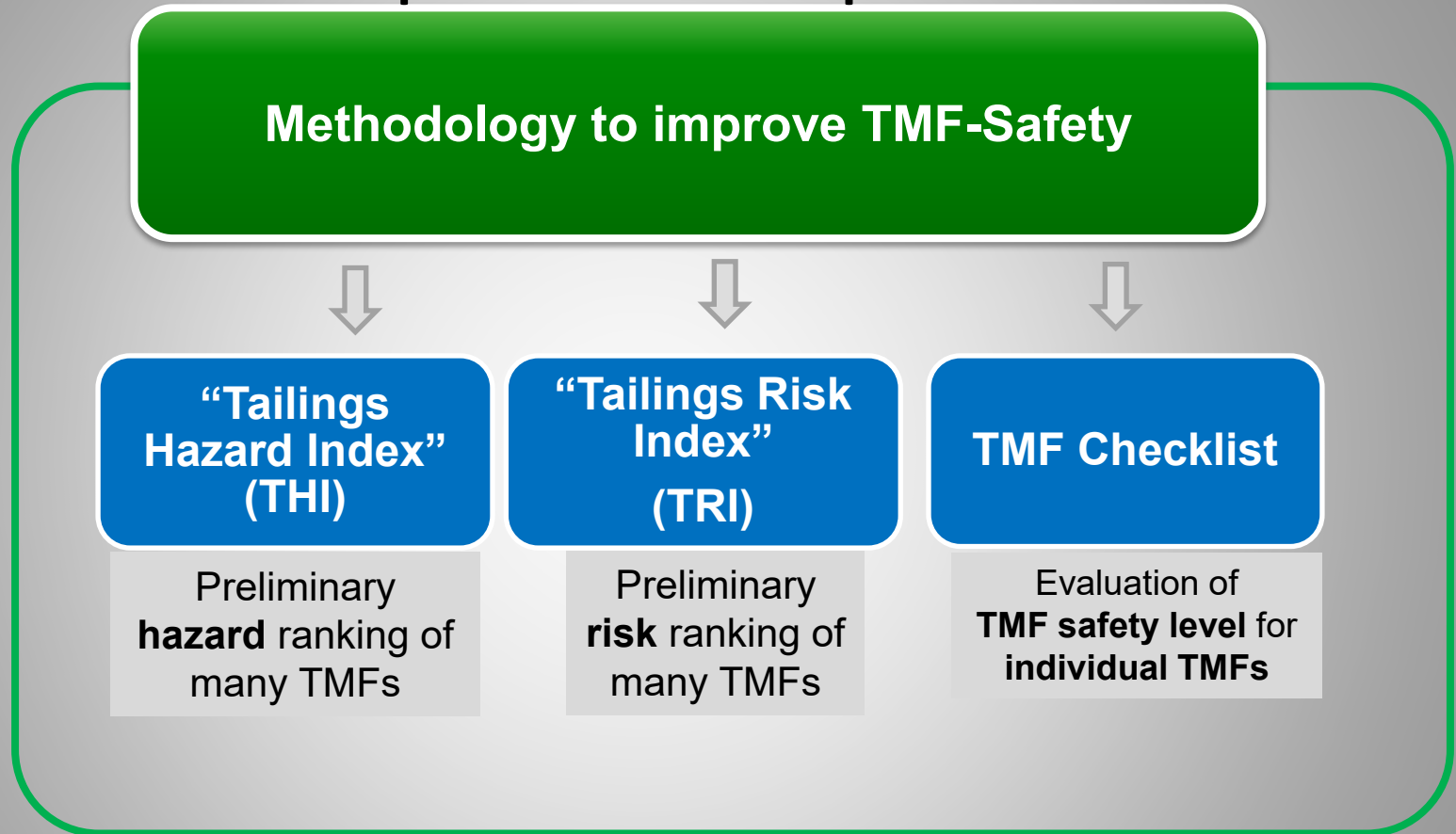
**“Tailings  
Hazard Index”  
(THI)**

**“Tailings Risk  
Index” (TRI)**

**TMF Checklist**

# Developed 2015 – 2022

## as Tools for Operators and Competent Authorities



# TMF-Methodology

**Based on the UNECE Safety Guidelines for TMF, Germany guided several Technical Assistance Projects to work out an approach to raise the Safety of TMF**

1. **Ukraine (2013 -2016) → Basic methodology**
2. **Armenia/Georgia (2018 -2021) → including TMF Closure**
3. **Danube River Catchment (2019 – 2021) → including Risk evaluation**
4. **Kyrgyzstan (2021-2022) → including LUP and Contingency Planning**

# 1. Tailings Hazard Index (THI)

for TMF hazard evaluation

**THI → 6 Parameter**

$$THI = THI_{Cap} + THI_{Tox} + THI_{Manag} + THI_{Nat} + THI_{Dam} + THI_{Rad.}$$

Abbreviation	Component of Hazard
<b><i>THI<sub>Cap</sub></i></b>	TMF capacity
<b><i>THI<sub>Tox</sub></i></b>	Toxicity of tailings
<b><i>THI<sub>Man</sub></i></b>	Management of TMF
<b><i>THI<sub>Nat</sub></i></b>	Natural Conditions specific to the TMF site
<b><i>THI<sub>Dam</sub></i></b>	Dam-Safety
<b><i>THI<sub>Rad</sub></i></b>	Radioactivity

# 1. Tailings Hazard Index (THI)

for TMF hazard evaluation

## *THI → 6 Parameter*

$$THI = THI_{Cap} + THI_{Tox} + THI_{Manag} + THI_{Nat} + THI_{Dam} + THI_{Rad.}$$

- Hazard: activity/object with a **potential** of causing harm → important for assessment of TMFs on national/international scale to allocate necessary personnel and financial Priorities
- Deficiency of THI: no consideration of **exposure of potential impact receptors** (people, environment)  
→ Tailings Risk Index: taking the impact of potential failures into account to people and environment



## 2. Tailings Risk Index for TMF Risk evaluation

$$TRI = THI + TEI$$

**THI** combined with the **Tailings Exposure Index (TEI)**,  
resulting in the **TRI**

And  $\rightarrow$   $TEI = TEI_{Pop} + TEI_{Env}$

Abbreviation	Component of risk to people or environment
$TEI_{Pop}$	the downstream population in a distance up to <b>10 km</b> from the TMF (PAR)
$TEI_{Env}$	the size of the nearest waterbody to the TMF located downstream in the distance of <b>10 km</b> from TMF that may be polluted by a TMF accident

# THI and TRI

## THI

- Assessing potential **danger**
- Prioritization of TMFs to **optimize** resources and **targeting inspections** to critical safety conditions (screening)
- Link to **early warning systems** (transboundary effects)

## TRI

- Assessing **chance** of harm
- **Awareness raising** on accident risk, information to the public, putting in place **contingency plans & preparedness measures**
- Link to **land use planning** (new sites, capacity enlargement)

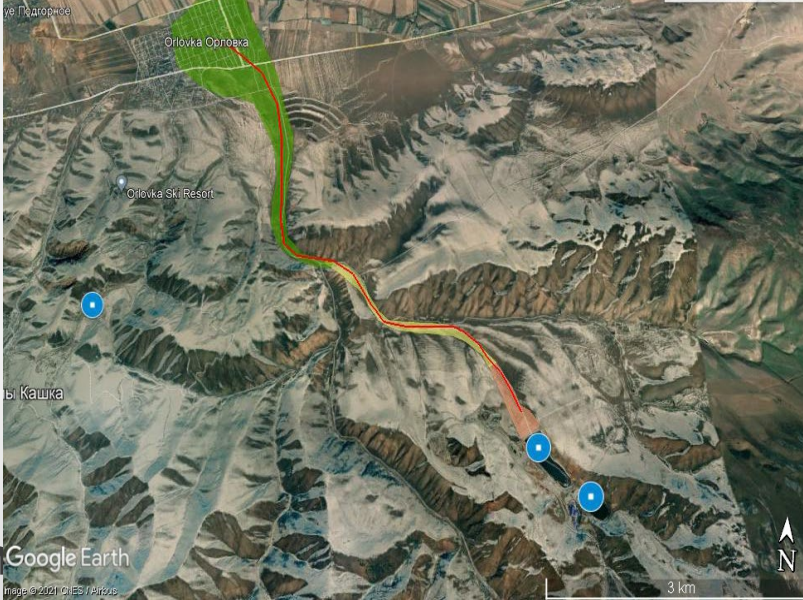
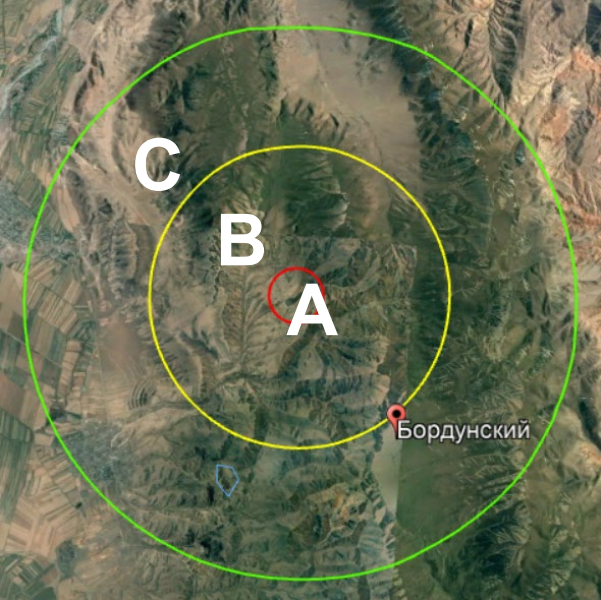
## → TRI can be used

- **Overview** to the different risks in large areas (e.g. transboundary river basins or several countries)
- Most risky TMFs on **national level** (territory of the whole country or some regions)
- To enable the **prioritization** of the different types of risk (to environment and population)
- **Information** to Ministers and the Public
- To support TMF **land use plannings**
- To develop **warning- and alert-systems**

# Land Use Planning

## Risk-/Sanitary Zones at Altyn-Ken TMF, based on TRI

### "Altyn-Ken" TMF



**Zone A – 1 km**  
**Zone B – 5 km**  
**Zone C – 10 km**

River Taldibulak

# TMF mapping in the UNECE region (TOP 10% TRI and THI for the UNECE region)

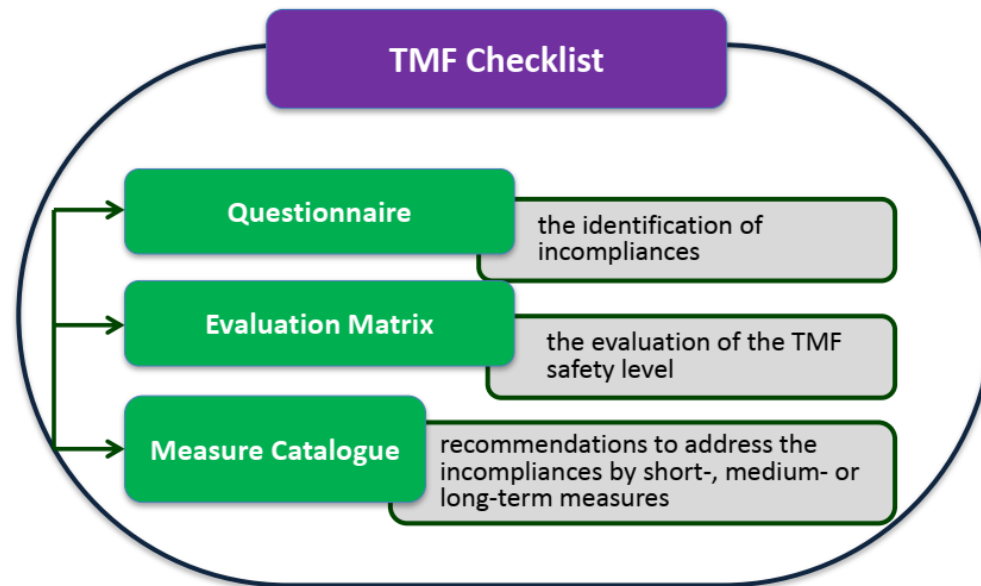
- TMF mapping based on THI/TRI are powerful tools to prioritize the hazard and risk at national and international levels
- THI/TRI-based map of TMFs in the UNECE region.



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# 3. Checklist Approach

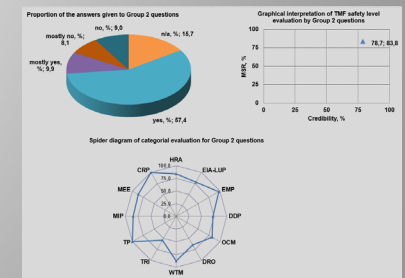
## TMF Checklist Structure



### 3. Checklist-Approach

- Assessing the actual safety conditions according the **TMF life cycle** (design, operation, closure)
- Specifying safety deficits according to **hazard categories**
- **Harmonized approach** to different TMF facilities
- **Reproducible Results** (+-5%)
- **Supporting the inspection** procedure by competent authorities and/or operators and serves as a documentation of safety trends at the TMF

→ **Excellent Training Tool for Inspectors and Operators**



# Guidelines to facilitate the identification of hazardous activities for the purposes of the Convention

“...within the catchment areas 2/ of transboundary and border rivers, transboundary or international lakes, or within the catchment areas of transboundary groundwaters, for activities involving hazardous substances that fall under **category 1, 2, 3, 9, 16, 17 or 18 of part I of annex I** to the Convention (including any substance mentioned in **part II of annex I ..**”

- A lot of TMF are not falling under this categories,
- But they are nevertheless hazardous, as the damages caused by Oxygen-Depletion after contamination with TMF-mud
- As a consequence TMF should be notificated as a group dependent on their Capacity or Risk (i.e. 1 Mio or TRI>10)



# Transboundary TMF Contingency Planning

- **UNECE Checklist for Contingency Planning:**  
Checking whether all measures are in place or arranged
  
- **Transboundary Alert System in case of a TMF accident**
  - Transboundary Communication System
  - Agreed Thresholds for TMF Accidents
  
- Kyrgyzstan: **100 m<sup>3</sup> or t**
  
- this is an consensus expert approach, derived from equivalent approaches of the IKSE and recently ICPDR

## Map of Tailings Management Facilities (TMFs) in Kyrgyzstan

Total number of TMFs - 62  
 Transboundary TMFs 10 km approach -35  
 Transboundary TMFs UNECE approach -33

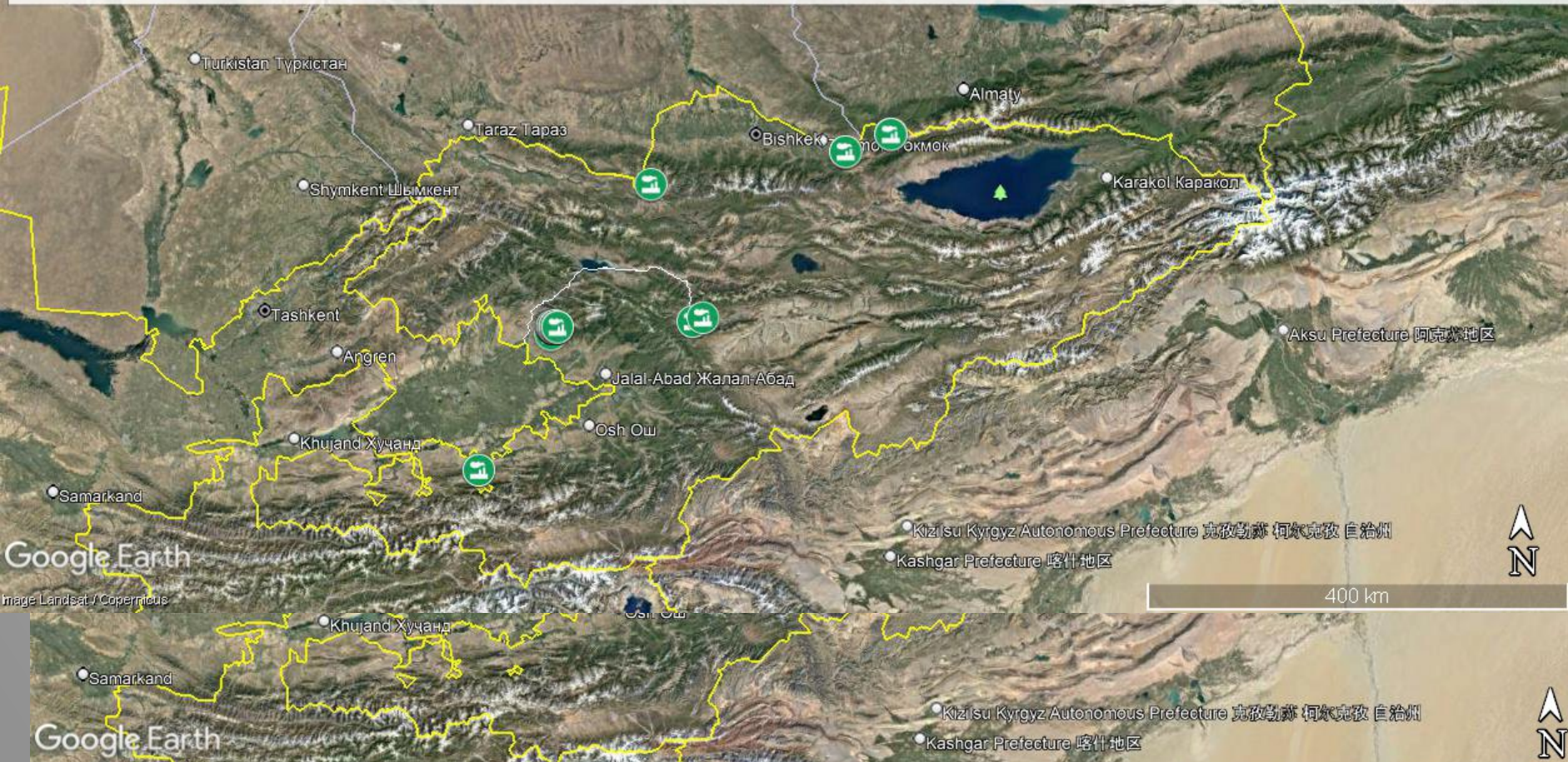
The project is funded by the German Federal Environment Ministry's Advisory Assistance Programme (AAP) for environmental protection in the countries of Central and Eastern Europe, the Caucasus and Central Asia.

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This map was developed by "Sustainable Development Platform" in the frame of the project No. 154973 Project: "Improving the safety of tailings management facilities in Kyrgyzstan"

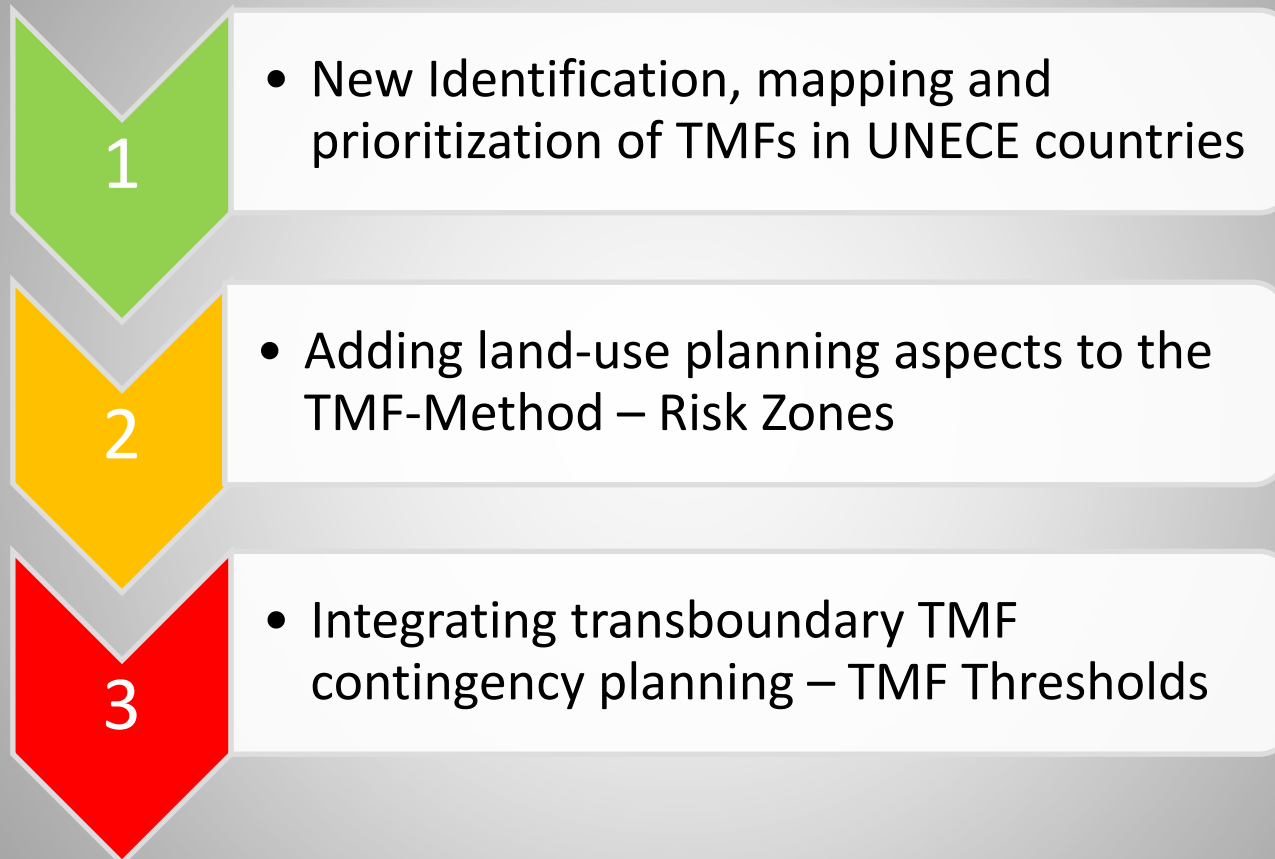
### Legend

-  Transboundary TMFs UNECE approach
-  all TMFs Kyrgyzstan
-  Transboundary TMFs 10 km approach

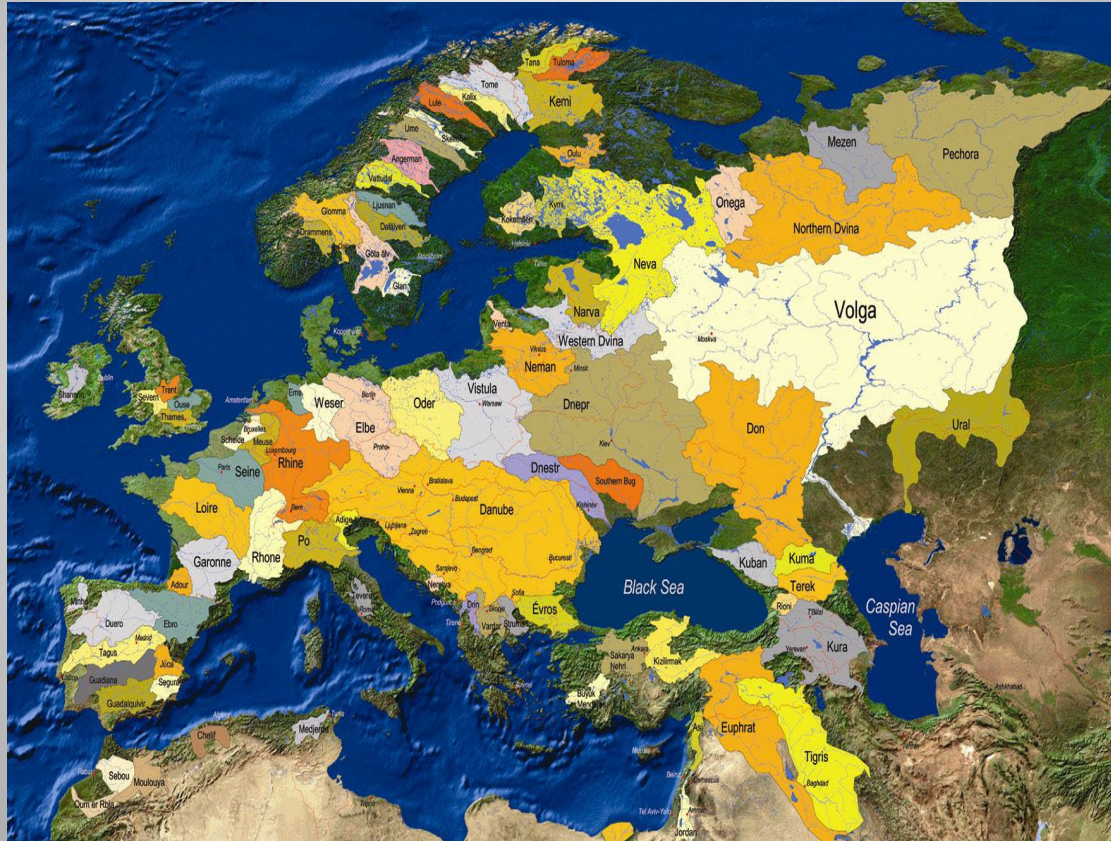


# Outlook for further TMF developments

## - International Level -



# Thank You for Your Attention



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