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Integrated quality environmental monitoring and warning-alarming system for emergencies due to technical accidents at waste deposits in mining industry

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Introduction

- The feasibility studies show:
  - the investment and operating costs of a monitoring system coupled with warning and alarming procedures

  are less expensive than the potential damages occurring due to accidental pollution with trans-boundary impact.
- Enhanced water quality manangement & the water users and the pottential polluters is based on:

- effective measures undertaken for waters disaster prevention and mitigation, especially by modeling the contamination propagation, with the input data from the water quality monitoring stations.

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Quality monitoring approaches:

i. designing the environmental quality objectives for the monitoring of the water quality;

ii. location of the water quality monitoring stations;

iii. water quality sampling in the monitoring sections;

iv. main parameter for identifying the pollutions in the cross section of the monitoring system;

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i. Designing the environmental quality objectives for the monitoring of the water quality

The main parameters taken into consideration are as following:

1). f (s,t) – spatial-temporal evolution of the concentration;

2) Li= f (s,t) – spatial-temporal evolution of the associated loads;

3.1) $\frac{C_i}{C_i^*} = f(s,t)$ – spatial-temporal evolution of the compliance with the quality standards;

3.2.) Li/Qo = f (s,t) – spatial-temporal evolution of the observance of the quality objectives;

4) operative warning in case of an accidental pollution.

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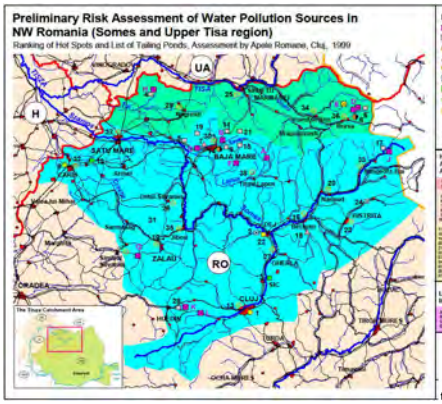
ii. Establishing the location of the water quality monitoring stations



- Water quality monitoring stations downstream of pollution sources and upstream of the border of the trans-boundary watercourses.

iii. The water quality sampling procedure in the monitoring sections

The number of the samples:

$$n = (us/d)^2$$

where:

n: the number of samplings for a certain precision;

u: the normal deviation corresponding the requested trust level (ex. 1.65 for 90% trust);

s: standard deviation (mg/l);

d: necessary precision (for ex. 0.1 mg/l).

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iv. Main parameter for identifying the pollutions in the cross section of the monitoring system

One of the most economical method for a continuous in situ evaluation of the water quality status is based on the dissolved oxygen contents and the water quality analysed in the monitoring stations can be assessed according to 5 quality classes of the classification system (table 1).

Table no. 1 Dissolved oxygen used as a main parameter for identifying the pollutions in the cross section of the monitoring system

Water quality parameter	Unit	Class limit values				
		I.	II.	III.	IV.	V.
A/ Parameter of oxigenation						
O_2	mg/l	>7.0	6	4	3	<3.0

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Conclusions:

Targets for mining companies:

-improving the monitoring system capability of the mining sites in order to avoid further accidental pollutions:

- The monitoring activity should take into consideration pollutions events neglected so far, including values of water pollutant below the maximum admissible values, because of the bioaccumulation effects of the toxic substances, especially for heavy metals.
- River quality modelling for larger streams should be different compared with the one used for smaller rivers.

- precautionary measures at the level of industrial facilities:

- Endowment with propagation models for inner rivers for a rapid evaluation of the concentration plume in surface waters, to establish the necessary measures for pollution control (assurance of a dilution below the alert thresholds, controlled sampling knowing when the pollutant maximum concentration reach the control section, reducing the cost of the monitoring activity, etc.).
- Existence of more accurate and updated inventory of the dangerous substances located at the industrial facilities in order to know exactly the spilled quantities based on the difference of the quantities at the storage and the registered quantities.

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Photo: a disaffected church surrounded by invasive acidic tailings, treated with lime: Valea Sesei, Alba county, Romania

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