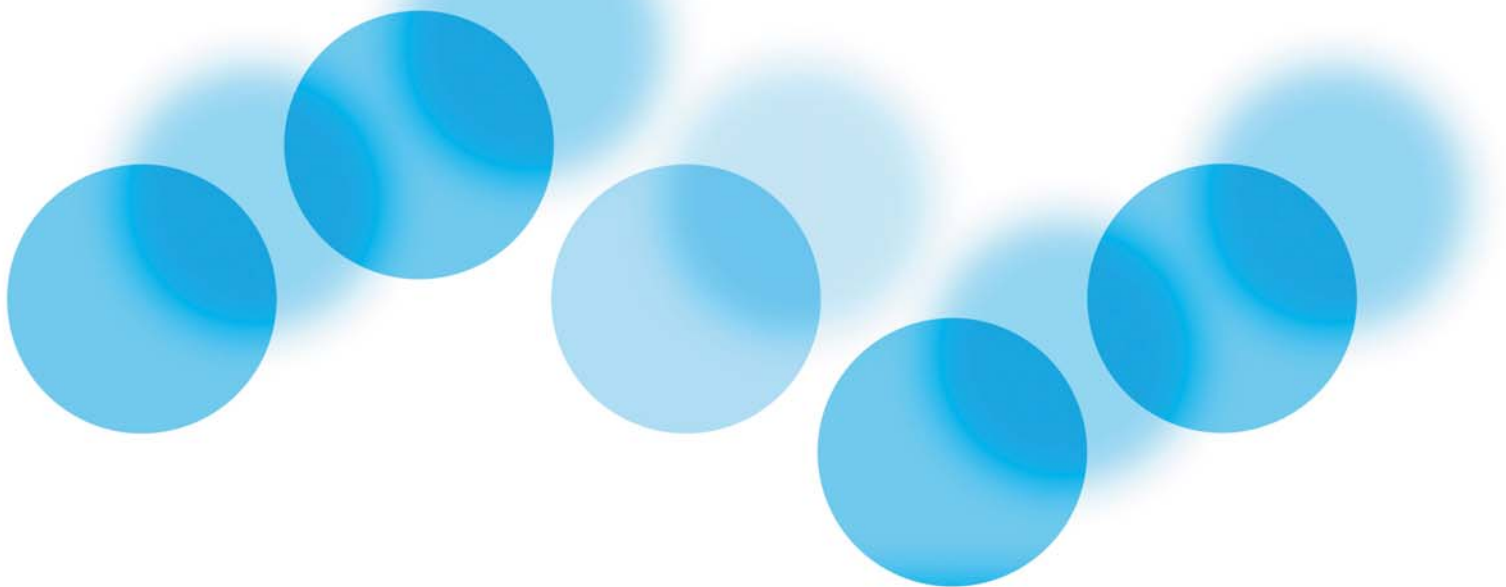


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FINAL REPORT FOR UNDP/GEF DANUBE REGION PROJECT

DEVELOPMENT OF M2 METHODOLOGY / CHECKLIST



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PREFACE

The Federal Environment Agency Ltd., Austria was instructed to perform services "Development of M2 methodology / checklist" (Project No. RER/03/G31/A/1G/31) as specified in the small contract for services by UNDP/GEF Danube Regional Project of 31 March 2005.

TABLE OF CONTENTS

1	Description of Required Services	13
2	Inception Report/Progress Reports	15
3	M1 methodology	17
3.1	Problem to be solved	17
3.2	Goals.....	17
3.3	Description of the methodology	17
3.4	Conclusions:	20
4	Task 1: Development of M2 methodology	21
4.1	Factors for M2 methodology	21
4.2	Classification system for M2 methodology	22
5	Task 2: Revised ranking of contaminated sites using M2 methodology	23
5.1	Existing data set	23
5.2	Output of the data set.....	24
5.2.1	Contaminated deposit sites:	26
5.2.2	Output of the data set regarding the considered countries:	30
5.2.3	Contaminated industrial and/or abandoned industrial sites:	31
5.3	Summary:.....	33
5.3.1	Deposit sites:	33
5.3.2	Industrial and/or abandoned industrial sites:	34
5.4	Solution/recommendations to the ICPDR:	34
6	Task 3: Revised checklist for site investigation	35
6.1	Checklist for the investigation and risk assessment of contaminated sites in flood risk areas	35
6.2	Recommendations	38
7	Meetings.....	41
7.1	31 st APC-EG meeting in Bratislava (7 th and 8 th April 2005).....	41
7.2	Meeting in Vienna (29 th July 2005).....	41
7.3	32 nd APC-EG meeting in Berlin (23 rd , 24 th September 2005).....	41
7.4	Workshop on M2 methodology and refineries pilot project (17. July 2006 and 1 st AP Task Group Meeting in Constanta, Rumania (20.-21. July 2006)	42
8	Recommended Solutions	47
9	Literature	49

LIST OF APPENDIX AND ANNEXES

Appendix 1	Working list of reported contaminated sites (data set)
Table (a):	All reported deposit and industrial/abandoned sites (97 records)
Table (b):	All reported deposit and industrial/abandoned sites (97 records) (coloured)
Table (c):	Reported deposit sites, Slovakia (18 records)
Table (d):	Reported deposit sites, Hungary (32 records)
Table (e):	Reported deposit sites, Romania (25 records)
Table (f):	Reported deposit and industrial sites, Austria (5 deposit sites, 11 industrial sites)
Table (g):	Reported deposit sites, Germany (2 records)
Table (h):	Reported deposit sites, Ukraine (3 records)
Table (i):	Reported deposit sites, Czech Republic (1 record)
Table (j):	Reported deposit sites (Igor Liska, Version 13.06.2005) (98 records)
Appendix 2:	Checklist for the Investigation and Risk Assessment of Contaminated Sites in Flood Risk Areas
Annex 1:	Questionnaire of Contaminates Sites in Flood Risk Areas
Annex 2:	Branch Catalogue of Germany
Annex 3:	European Waste Catalogue

LIST OF TABLES

Table 1 and Table 2	Excerpt from the European Waste Catalogue and from the Branch Catalogue of Germany	19
Table 3	Factors for "flooding potential" (FP)	21
Table 4	Factors for "safety measures" (SM)	21
Table 5	Classification system – priority classes	22
Table 6	Results of the M1 methodology for deposit sites	26
Table 7	Overview of reported information regarding "flooding potential" and "safety measures" and output of M2 methodology for deposit sites	28
Table 8	Determined contaminated deposit sites with an M2-value ≥ 50	29
Table 9	Overview of reported information regarding "flooding potential" and "safety measures" and output of M2 methodology for industrial sites	32
Table 10	Determined contaminated industrial sites with an M2-value ≥ 50	33
Table 11	Evaluation table for deposit sites.....	44

LIST OF PICTURES AND GRAPHS

Figure 1 and Figure 2	Evaluation tables with extended size classes	20
Figure 3	Total reported contaminated sites	25
Figure 4	Reported deposit sites and industrial sites	26
Figure 5 (a, b, c, d)	Contribution of the relevant contaminated deposit sites (M1 methodology)	27
Figure 6 (a, b, c, d)	Contribution of the relevant contaminated deposit sites (M2 methodology)	31
Figure 7	Contribution of the relevant contaminated deposit sites (M2 methodology).....	33
Figure 8	Flowchart of the assessment of contaminated sites in flood risk areas.....	37
Picture 1	Map from Rompetrol, Navodari, Rumania, 20 th July 2006	42
Picture 2	Participants of the workshop at Rompetrol (in front of the main-entrance of Rompetrol), 20 th July 2006	43
Picture 3	Contaminated deposit site (oil sludge pond), 20 th July 2006	43
Picture 4	Participants of the "workshop on M2 methodology" at Rompetrol, 20 th July 2006...	45

ABBREVIATIONS

DRB	Danube River Basin
DRP	Danube Regional Project
EG	Expert Group
EU	European Union
ICPDR	International Commission for the Protection of the Danube River
UNDP	United Nations Development Programme
CS	Contaminated Sites
WGI	Working Group Inventory
APC EG	Accident Prevent and Control Expert Group

EXECUTIVE SUMMARY

PURPOSE OF THE PROJECT

The aim of this project was to develop methodologies for assessment and ranking of the risks from contaminated sites in potential flood risk areas within the Danube River Basin and to develop Checklists for site inspections of high risk contaminated sites.

The “M2 methodology” will be an enhancement of an approach already developed within the region known as “M1 methodology”.

In a further step the ranking of contaminated sites in the Danube River Basin by using the existing data sets prepared under the M1 assessment of contaminated sites (about 100 contaminated sites in flood risk areas are listed within the Danube River Basin) needs to be revised, in accordance with the safety measures and the risk of flooding at the site.

BACKGROUND INFORMATION

The Danube Regional Project (DRP) has been established to contribute to the sustainable human development in the Danube River Basin (DRB) through reinforcing the capacities in the basin to develop effective co-operation in order to ensure the protection of the Danube River. The objective of the DRP is to complete the activities of the International Commission for the Protection of the Danube River (ICPDR), to provide a regional approach to the development of national policies, legislation and the definition of actions for nutrient reduction and pollution control in the DRB.

The tasks of the ICPDR are mandated by the “Convention on Cooperation for the Protection and Sustainable Use of the Danube River” (Danube River Protection Convention, DRPC). From this Convention also derive the responsibilities of the ICPDR directed towards ensuring its implementation and to enhancing the cooperation of the Contracting Parties fulfilling their respective obligations.

The ICPDR and its Expert Group on Accident Prevention and Control (APC EG) have established a methodology (referred to as M1 methodology) for the pre-assessment of contaminated sites in flood risk areas. The DRP working with the APC EG, has supported the development of a checklist assessment of at-risk contaminated sites. A more detailed assessment and ranking of the potential risks of contaminated sites in flood risk areas was required, necessitating the development of a more precise ranking system and revised checklist for the assessment of the higher risk contaminated sites.

The APC EG and its Working Group on Inventories (WGI) have developed and applied an initial screening of contaminated sites using the M1 methodology. This has been a desk-based assessment based of:

- Identification of contaminated sites above a specified size (including landfills, industrial, military sites etc.) in potential flood areas;
- A pre-assessment using evaluation tables agreed by the APC EG;
- Development of factors based on the size of the contaminated site and waste type;
- A risk value, which dictated if further investigation was required.

The M2 methodology will use the M1 evaluations as an initial starting point for the revised assessment. This assessment and ranking will be refined by the inclusion of a “flooding potential factor” (FP) and an evaluation of “safety measures” (SM) available at the site (see chapter 4, Task 1: Development of M2 methodology).

It was expected that the operational use of the M2 methodology assessment will involve a site inspection. To facilitate the site inspection, a checklist was further elaborated in this assignment (see chapter 7.4 and Appendix 2).

This assignment is an activity (referred to as Accident Emergency Response – DRP Output 2.3) within the DRP overall programme under its objective 2 – Capacity Building and Transboundary Co-operation.

Outputs of the Phase 1 of the DRP are available from the DRP’s web site – www.undp-drp.org and the activities of the APC EG (and the WGE) are available from the ICPDR’s web site – www.icpdr.org.

SUMMARY

Development of M2 methodology

One aim of this project was to develop the M2 methodology for assessment and ranking of the risks from contaminated sites in flood risk areas within the Danube River Basin.

The M2 methodology will use the M1 evaluation as an initial starting point and a further enhancement by the factor FP (flooding potential) (see Table 3) and the factor SM (set safety measures at the site) (see Table 4). The M2-value can be calculated by the formula

$$M2 = M1 * FP * SM$$

The M2-value can be classified into 4 priority classes (see Table 5). For each priority class 1, 2, 3 and 4 the necessity for the need for further measures to be established at the contaminated site to improve the safety of contaminated site in flood risk areas and to reduce the risk of contamination related on waters is proposed. This was discussed and agreed by the members of the APC-EG in July 2006 in Constanta (Rumania).

Revised data-sets (working list)

A further task of this contract was to revise the existing data set (working list) prepared under the M1 assessment of contaminated sites and to refine the ranking of these sites in accordance with the safety measures (SM) and the risk of flooding (FP) (M2 methodology).

13 countries of the Danube River Basin (Slovakia, Hungary, Romania, Austria, Germany, Ukraine, Czech Republic, Slovenia, Bosnia&Herzegovina, Croatia, Moldova, Bulgaria and Serbia) were ask to report their contaminated sites (deposit sites and industrial and/or abandoned industrial sites) to the APC-EG. 7 countries (Slovakia, Hungary, Romania, Austria, Germany, Ukraine and Czech Republic) reported in total 97 contaminated sites (86 deposit sites, 11 industrial sites and/or abandoned industrial sites).

Deposit sites:

The paper “Methodology for the Pre-Assessment of Suspected Contaminated Sites in the Danube River Basin (M1 methodology), September 2004” propose a minimum-size for deposit sites to be investigated from about 100.000 m³. The consultant however recommends for deposit sites a minimum-volume of about 10.000 m³. This was agreed with the UNDP and ICPDR in October 2006

76 deposit sites (out of reported 86 deposit sites) have a volume higher or equal 10.000 m³ (10 sites are smaller 10.000 m³) (see Table 6).

After applying the M1 methodology (by using the evaluation tables) 43 deposit sites show an M1-value higher or equal 47 → that mean, that further investigations (by taking into account the flooding potential (FP) and the safety measures (SM)) are necessary. For one site no information about the type of waste was reported, therefore no evaluation of the M1-value could be made. The remaining 42 of the investigated deposit sites (out of 86 deposit sites) show an M1-value smaller than 47 → this sites can be sorted out and are no longer relevant (unless the suspicion is not totally excluded) for the M2 methodology.

43 contaminated sites show an M1-value ≥ 47 , but for only 23 sites sufficient information about the "flooding potential" and "safety measures" is given. After the run of the M2 methodology 12 contaminated deposit sites (out of 23) show an M2-value higher or equal 47. For those contaminated sites further "short-, middle- and long-term-measures" are necessary.

For approximately 50 % (12 contaminated deposit site out of 23 contaminated deposit sites with all relevant information) of the reported contaminated deposit sites "short-, middle- and long-term-measures" are recommended.

Industrial and/or abandoned industrial sites:

Regarding contaminated industrial and/or abandoned industrial sites the information is poor. Only Austria reported sufficient information (11 contaminated industrial and/or abandoned industrial sites) about the present situation of contaminated industrial sites in their countries. Germany reported no relevant industrial and/or abandoned industrial site within the Danube River Basin.

All reported 11 contaminated industrial sites from Austria deliver an M1-value higher 50. After applying the M2 methodology (by taking into account the "flooding potential" and "safety measures") 3 contaminated industrial sites show an M2-value higher 50. For those 3 sites "short-, middle- and long-term-measures" are necessary.

For approximately 27 % (3 contaminated industrial site out of 11 contaminated industrial sites) of the reported contaminated industrial sites "short-, middle- and long-term-measures" are necessary.

Solution/recommendations to the ICPDR:

Because of the lack of reported contaminated sites within the Danube River Basin, the Umweltbundesamt Vienna will recommend to the ICPDR for future activities following steps (request from the APC-EG, 32nd APC-EG-meeting):

- statistical extrapolation of the estimated number of contaminated sites in flood risk areas (basis data from Austria) to get an idea how many contaminated sites (deposit sites and industrial sites) can be expected within the Danube River Basin
- support for the Danube-countries in collecting contaminated sites (deposit sites and industrial and/or abandoned industrial sites)
- providing of financial funds for the Danube Countries to built up a national collecting system of contaminated sites for selected countries
- support with technical experts if necessary
- continue of collecting contaminated sites in flood risk areas within the Danube River Basin
- set prevention measures and remediation activities (for contaminated sites with an M2-value ≥ 50).

Checklist:

The third main-task was to rework the 4th draft of the "Checklist for the Investigation and Risk Assessment of Contaminated Sites in Flood Risk Areas" (delivered by the International Commission of the protection of the Danube River, APC-EG).

The reworked checklist will serve as a hand guide for a desk-study and for a first visit of sites, suspected to be contaminated by substances hazardous to water.

The incorporated M1 and M2 methodology will allow the competent authorities to classify the contaminated sites in flood risk areas into the 4 priority classes. The checklist includes also general information for proposed safety measures (short, middle and long term measures) and recommendations which will allow the authorities to reduce the risk at a contaminated site in flood risk areas and to increase public safety and to protect the environment in the Danube River Basin.

The purpose of a first desk-study and site visit is to find out:

- where highly contaminated zones are suspected and located within flood risk areas
- whether immediate action is needed

The checklist covers contaminated sites as follows:

- deposit sites (minimum volume: 10.000 m³) (e.g. old, unsorted landfills, waste deposals),
- industrial sites and/or abandoned industrial sites (minimum area: 5.000 m²) (e.g. closed down industrial sites, mining sites, sewage sludge/water treatment, or other sources of contamination (past incidents, leakages, operational losses))

Contaminated sites with radioactive substances are excluded.

The reworked checklist "Checklist for the Investigation and Risk Assessment of Contaminated Sites in Flood Risk Areas" was tested in July 2006 in Constanta Rumania at a contaminated site (Romp petrol in Navodari, Constanta, Rumania (see Appendix 1, Table 1, item 97)).

The checklist was discussed and agreed by the members of the seminar "workshop on M2 methodology and refineries pilot project"(20th, 21st July 2006). Comments on the tested checklist were incorporated into the checklist by the author.

1 DESCRIPTION OF REQUIRED SERVICES

The consultant was expected to participate in a site visit by the WGI to test the Checklist and to incorporate any necessary changes. Further more, to attend up to two APC EG meetings (location of the meetings within the Danube River Basin).

Additionally the Consultant was expected to undertake the following tasks:

- Develop a methodology and classification system for the ranking of contaminated sites in flood risk areas and to propose an approach for using this methodology (M2 methodology). This should be discussed and agreed in a meeting of the WGI (Working Group of Inventories).
- Using the existing data sets prepared under the M1 assessment of contaminated sites, to refine the ranking of these sites in accordance with the safety measures at the site and the risk of flooding. This will result in the identification of the highest priority sites needing action.
- Develop checklist for site inspections of high risk contaminated sites

2 INCEPTION REPORT/PROGRESS REPORTS

The Consultant was expected to start with an Inception Report and to provide brief reports every 2 months, indicating work completed and on-going, any problems and solutions recommended.

The Contractor calculated five Progress Reports for this project. Within this duration time (March 2005 until May 2006) 7 Progress Reports were carried out.

- Inception Report, April 2005
- 1st Progress Report, May 2005
- 2nd Progress Report, July 2005
- 3rd Progress Report, September 2005
- 4th Progress Report, November 2005
- 5th Progress Report, January 2006
- 6th Progress Report, March 2006
- 7th Progress Report, May 2006

The Inception Report and all Progress Reports you will find at the CD (delivered with the Final Report, November 2006).

3 M1 METHODOLOGY

Excerpt from "Methodology for the Pre-Assessment of Suspected Contaminated Sites in the Danube River Basin (M1 methodology)", September 2004:

Contaminated sites generated by former industrial activities pose a potential danger for the environment. This refers in particular to contaminated sites containing hazardous substances, which could lead to a significant contamination of water bodies, in case the substances are mobilized (e.g. by flood). During recent years dramatic floods on the Elbe, the Danube and the Oder have shown that the toxic impact of those contaminated sites could cause a significant threat to water bodies in Europe. For that reason the ICPDR decided to draw up a basin wide inventory of contaminated sites (CS) in flood risk areas in the Danube River Basin.

3.1 Problem to be solved

For the Danube River Basin recommendations are necessary, which would enable the competent authorities of the riparian countries to perform the following activities:

- Establishment of a methodology for a preliminary risk assessment of the CS reported in the inventory of the Danube countries
- Drawing up the recommendations for respective safety measures which could serve as regulatory guidelines.
- Drafting a Measure Catalogue as a handbook for the implementation of these safety guidelines.

3.2 Goals

The major goal was to develop in a first step a methodology for an initial risk assessment of contaminated sites in flood risk areas, based on the data from the inventory of contaminated sites in the Danube River Basin. However, in principle, the M1 methodology is applicable to the pre-assessment of any contaminated sites. The reported sites where a high risk potential is assumed should be screened by a preliminary assessment. This methodology will serve as a guide for the elaboration of safety recommendations and a concrete measure catalogue in the next steps.

In the next step the detailed analysis of the priority hot spots will lead to the elaboration of safety recommendations for contaminated sites. Together with a detailed measure catalogue these recommendations will serve for a checklist which will allow the competent authorities to improve the safety of the contaminated sites and to reduce the risk of contamination of surface waters.

3.3 Description of the methodology

The methodology allows the initial risk assessment of contaminated sites by applying the following parameters:

- The toxic potential of soil or waste (it depends on the harmful substances to be expected in a type of waste or in a specific industrial branch and it is expressed as a risk value).
- The volume of an old deposit or the area of an old industrial site.

For each waste type of the EUROPEAN WASTE CATALOGUE (examples given in Table 1) and for each branch of the BRANCH CATALOGUE OF GERMANY (examples given in Table 1) a risk-value r_0 was proposed in classes from 1 to 5. This risk factor r_0 is derived by experience gained in several German Federal States (e.g. Saxony) and it takes into account the toxic potential of soil or waste that can be expected from a branch or waste specific contamination.

For a concrete waste type or industrial branch a range of risk is given (e.g. r_0 from 3-5). The first figure corresponds to the lowest class of risk to be expected, the higher figure indicates the highest class of risk to be expected ("worst case scenario"). This opens up the possibility for an expert judgement to adjust the r_0 value if further information about the site is available (e.g. if the contaminants are known). In this case the liability of the assessment is improved. In the other cases, the average risk value is calculated and rounded up. The risk values r_0 should be between 1 and 5.

The risk values are linked with the site magnitude (specified in case of old deposits as volume [m^3] or in case of old industrial sites as surface area classes [m^2]) to an "initial risk factor" m_1 , which gives an information about the potential risk of each site (see example in Figure 1).

For example:

A site with a contaminated volume of 200.000 m^3 with a risk value of 5 receives an M_1 -value of 55.

A site with a contaminated area of 15.000 m^2 with a risk value of 4 receives an M_1 -value of 51.

To select the sites with a high priority the assessment was concentrated only at those sites, which are potentially impacted by floods. Additionally only those sites should be investigated, which include more than 100.000 m^3 of contaminated volume or cover an area larger than 5.000 m^2 .

The consultant however recommends all sites which include more than 10.000 m^3 of contaminated volume (deposit sites, landfills) to be investigated. The evaluation table for contaminated volume larger or equal 10.000 m^3 shows M_1 -values higher 50 (see Figure 1), which are relevant for the next investigation (M2 methodology).

This matter was discussed agreed by UNDP (Mr. P. Whalley) and ICPDR (Mrs. M. Popovici) in October 2006.

Table 1 and Table 2 Excerpt from the European Waste Catalogue and from the Branch Catalogue of Germany

Table 1:

List of wastes pursuant to Article 1 (a) of Council Directive 75/442/EEC on waste (EUROPEAN WASTE CATALOGUE).

e.g.

CODE	WASTE TYPE	r0 VALUE	
		Average	(Min,Max)
010000	WASTE RESULTING FROM EXPLORATION, MINING, DRESSING AND FURTHER TREATMENT OF MINERALS AND QUARRY		
010100	Waste from mineral excavation	3.5	(1.0 6.0)
010101	Waste from mineral metalliferous excavation	5.0	(4.0 6.0)
010102	Waste from mineral non-metalliferous excavation	2.5	(2.0 3.0)
010200	Waste from mineral dressing	3.5	(1.0 6.0)
010201	Waste from the dressing of metalliferous minerals	5.0	(4.0 6.0)
010202	Waste from the dressing of non-metalliferous minerals	2.5	(2.0 3.0)
010300	Waste from further physical and chemical processing of metalliferous minerals	4.0	(3.0 5.0)
010301	Tailings	3.0	(2.0 4.0)

The r0 values "5" and "6" are both considered as being "5".

Table 2:

Branch related hazard classifying of Industries (BRANCH CATALOGUE OF GERMANY)

e.g.

BRANCH No.	BRANCH NAME	CLASS OF HAZARD, r0 Min and Max
MANUFACTURING AND PROCESSING INDUSTRIES		
0005	Gas, mining, related products	2-5
0010	Gas production (town gas)	4-5
0020	Coal mining	3-4
0021	Brown coal mining and briquette production	3-4
0022	Ferrous ores mining	2-5
0023	Production of non-ferrous metals	3-5
0024	Potassium and rock salt mining	2-2
0025	Petroleum and natural gas extraction	3-4
0030	Coking	4-5
0040	Briquettes coal production	3-4

Figure 1 and Figure 2 Evaluation tables with extended size classes

Evaluation table for industrial sites:					
M1-value for industrial sites with regard to hazard potential					
Area (m ²)	Class of hazard, r0				
	1	2	3	4	5
1.000-4.999	0	18	36	46	48
5.000-9.999	0	20	40	49	50
10.000-19.999	0	21	42	51	52
20.000-49.999	0	22	43	53	54
50.000-99.999	0	22	45	55	56
100.000-499.999	0	23	46	57	58
500.000-999.999	0	24	47	58	59
≥1.000.000	0	24	48	59	60
(e.g.: surface area of 15.000 m ² , r0 = 4 → M1 = 51)					
Evaluation table for deposit sites:					
M1-values for deposits with regard to hazard potential					
Volume (m ³)	Class of hazard, r0 (by type of wastes)				
	1	2	3	4	5
5.000-9.999	2	10	23	39	49
10.000-19.999	3	13	27	41	51
20.000-49.999	4	15	31	43	53
50.000-99.999	5	17	34	45	54
100.000-499.999	5	19	37	47	55
500.000-999.999	5	20	40	49	56
1.000.000-1.999.999	5	22	42	50	57
≥2.000.000	5	28	45	53	60
(e.g.: volume of 200.000 m ³ , r0 = 5 → M1 = 55)					

3.4 Conclusions:

The presented evaluation tables serve for the pre-assessment of the contaminated sites (waste deposits and abandoned industrial sites). The tables should be looked upon as a first screening of those sites, which have to be preferably visited and further investigated. A finer ranking is not possible at this investigation stage, because the inaccuracy of the data is very high. All sites with an initial risk value equal or higher 50 should be inspected to perform a risk assessment by using the checklists. For a better differentiation of the m1-ranked sites the criterion of flood probability should be applied (M2 methodology).

4 TASK 1: DEVELOPMENT OF M2 METHODOLOGY

The consultant was expected to develop a methodology and classification system for the ranking of contaminated sites subject to flood risks and to propose an approach for using the methodology.

To refine the ranking of the sites prepared under the m1 assessment of contaminated sites an enhanced methodology (i.e. M2 methodology) has to be developed taking into account the safety measures (SM) at the site and the risk of flooding (FP).

In Table 3 and Table 4 the factors for "safety measures" and "flooding potential" are listed. These factors have been agreed upon by the participants of the Accident Prevention and Control Expert Group (APC EG).

4.1 Factors for M2 methodology

In the following tables the relevant factors for the M2 methodology is given.

Table 3 Factors for "flooding potential" (FP)

Flooding potential	Flood-frequency (years)	Factor of flooding potential (FP)
Low	> 100	0
Medium	≤ 100	1
High	< 30	3
Very high	< 10	10

Table 4 Factors for "safety measures" (SM)

Level of set safety measures (MS) is/are	Description	Factor for safety measures (SM)
Low	No safety measures are set	3
Medium	Safety measures are set partly	2
High	Necessary safety measures are set	1

For the "flooding potential" (FP) a score from 0 to 10 (e.g. water flooding occurs once in 10 years → factor FP = 10), and for the "safety measures" (SM) a score from 1 to 3 (e.g. all required safety measures are implemented on a specific site → factor SM = 1) has been set.

For example:

The factor of safety measures is 1 when the level of set safety measures and/or preventive measures to lower the risk at the site is high.

The factor of safety measures is 3 when the level of set safety measures and/or preventive measures to lower the risk at the site is low.

To receive the M2-values for m2 assessment the formula is as follows:

$$M2 = M1 \times FP \times SM$$

FP ... factor flooding potential; SM ... factor safety measures;

M1 ... M1-value from evaluation tables taking into account the volume/area and risk potential from a specific contaminated deposit/industrial- and/or abandoned site.

4.2 Classification system for M2 methodology

In a further step the contaminated sites will be classified into priority classes (by considering the determined M2-value). For all contaminated sites within the priority classes 1, 2 or 3 preventive and/or remediation measures have to be set at the sites to improve the safety of the contaminated site and to reduce the risk of contamination related on waters (see Table 5).

This proposal was discussed and agreed by the members of the APC-EG in July 2006 in Constanta.

Table 5 **Classification system – priority classes**

Priority class for remediation	M2-values	Need for further measures to be established at the site
1	≥1000 – 1.800	Very high
2	≥250 - <1000	High
3	≥50 - <250	Relevant
4	<50	Low

5 TASK 2: REVISED RANKING OF CONTAMINATED SITES USING M2 METHODOLOGY

5.1 Existing data set

A further main task of this contract was to revise the existing data set (working list) prepared under the M1 assessment of contaminated sites and to refine the ranking of these sites in accordance with the safety measures (SM) and the risk of flooding (FP) (M2 methodology).

The consultant (Hermine Weber) received several documents (existing data set, working-list) (listed below) from Mr. Igor Liska (ICPDR) (13th June 2005):

- The existing data set with the reported data (Version 6th April 2004)
- Correspondence from the countries regarding the information of the data set

The countries of the Danube River Basin were asked to report old contaminated sites in flood risk areas within the Danube River basin, i.e. old deposit sites and old industrial and/or abandoned industrial sites (also military sites). Sites contaminated with radio active substances were excluded.

The version of the data set from 6th April 2004 contains 98 recorded contaminated sites reported from 7 countries (Slovakia, Hungary, Romania, Germany, Austria, Ukraine and Czech Republic). From Slovenia, Bosnia & Herzegovina, Croatia, Moldova, Bulgaria and Serbia no contaminated sites were recorded.

The consultant tried to receive more information about contaminated sites (especially industrial sites) from the riparian countries, because the lack of information was remarkable.

On 2nd August 2005 the consultant sent a mail to the members of the APC-EG with the request to check the 98 reported contaminated sites and to give – if necessary – more information on the factors “flooding potential” and “safety measures” (see mail below).

Dear members of the APC EG,

Regarding the OCS (old contaminated sites) within the Danube catchment area the "Umweltbundesamt Vienna" revised the existing data sets (prepared under M1 assessment) taking into account the factors for "flooding potential" and "safety measures".

I would like to ask you all to check your reported sites for any changes or faults and to respond your comments until the latest until middle of September – 16th Sept. 2005.

Please find enclosed the refined data sets (excel-file) and a brief summary (given below).

*Thank you for your cooperation,
Best regards
Hermine Weber*

Only a few countries reported more information about the situation regarding contaminated sites in their countries:

15.09.2005: Hungary: no further comments

19.09.2005: Slovakia: after a revaluation of the contaminated sites in Slovakia two sites could be taken out of the working list: (1) (Skadka odpadov OFZ Siroke - Bezmenný creek) and (2), Teplaren, Povazska Bystrica - Ziar (in tube)) (see

Appendix 1, Table (j): Reported deposit sites (Igor Liska, Version: 13.06.2005), Nr. 19 and Nr. 51).

21.9.2005: Germany: 2 comments: (1) there are no industrial sites relevant for Germany and (2) r0-Value for Deponie Peterswöhrd is 3.5 instead of 5 (see Appendix 1, Table (j): Reported deposit sites (Igor Liska, Version: 13.06.2005), Nr. 10).

According the minutes of the 32nd APC-EG-meeting in Berlin, the countries reported problems of collecting data of contaminated sites in flood risk areas within the Danube River Basin.

The major reason is because of the missing legislative basis and financial support.

Other reasons might be:

- No or insufficient collection system of contaminated sites
- Lack of financial funds
- Lack of technical experts

After a site visit in Constanta Rumania (20th July 2006) to test the proposed "Checklist for the Investigation and Risk Assessment of Contaminated Sites in Flood Risk Areas" the consultant extended the working list (data sets) with one more contaminated deposit site "Romp petrol in Navodari, Constanta, Romania, oil sludge pond, industrial deposit" (see Appendix 1, Table (a), item 97).

5.2 Output of the data set

The revised data set (July 2006) (working list) contains 97 contaminated sites (see Figure 3 and Appendix 1, Table (a)):

Slovakia: 18 contaminated sites

Hungary: 32 "

Romania: 25 "

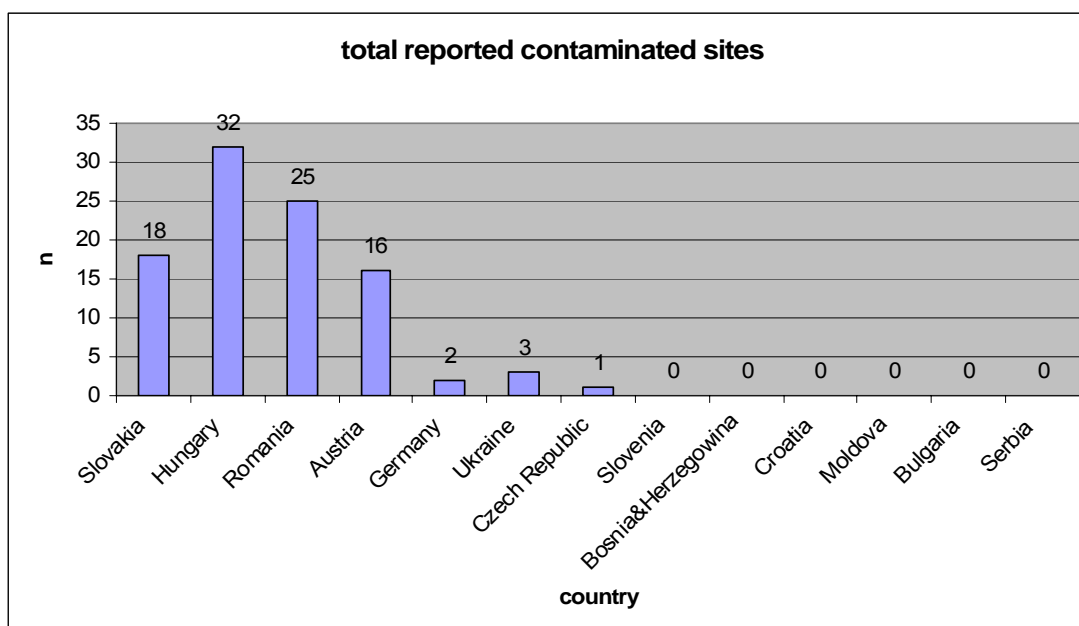
Austria: 16 "

Germany: 2 "

Ukraine: 3 "

Czech Republic: 1 contaminated site

Total: 97 contaminated sites

Figure 3 Total reported contaminated sites

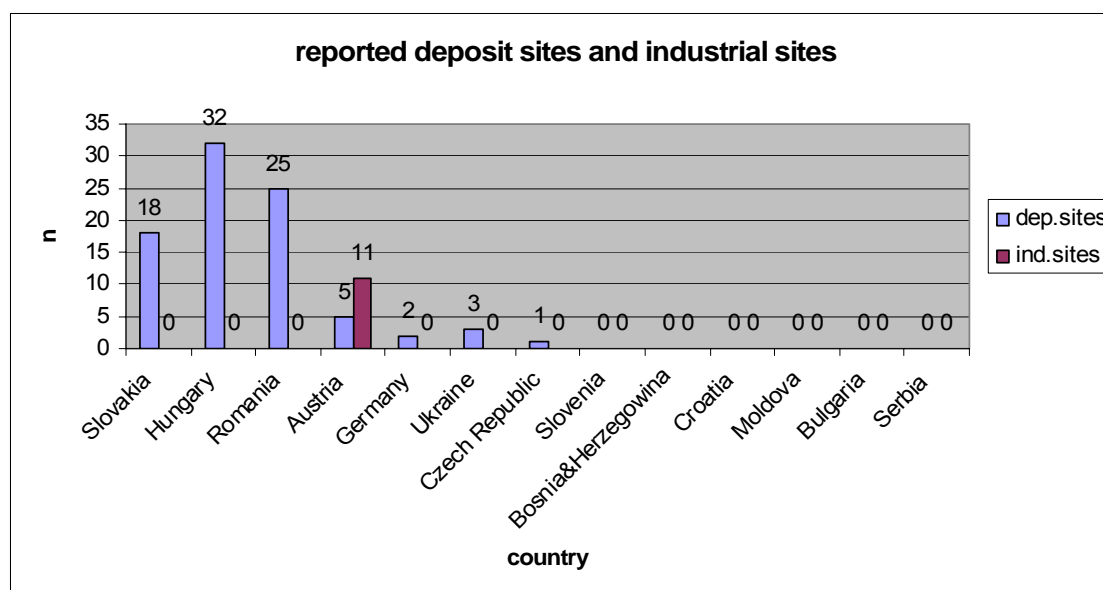
Seven countries (Slovakia, Hungary, Romania, Germany, Austria, Ukraine and Czech Republic) reported deposit sites in flood risk areas. But only 4 countries (Hungary, Romania, Austria and Germany) reported additional information about the flooding situation and the safety measures set at a contaminated site (see Table 7).

Reported deposit sites and industrial sites (see Figure 4 and Appendix 1, Table (b)):

Slovakia:	deposit sites: 18;	industrial sites: no information
Hungary:	deposit sites: 32;	industrial sites: no information
Romania:	deposit sites: 25;	industrial sites: no information
Austria:	deposit sites: 5;	industrial sites: 11
Germany:	deposit sites: 2;	industrial sites: 0 (no relevant ind. Sites)
Ukraine:	deposit sites: 3;	industrial sites: no information
Czech Rep.:	deposit sites: 1;	industrial sites: no information

all other countries: dep.sites and industrial sites: no information

Total: deposit sites: 86; industrial sites: 11; Σ 97

Figure 4 Reported deposit sites and industrial sites**5.2.1 Contaminated deposit sites:**

For one site in Romania (item 1: Tulcea, Turcoaia, sterile pond) no information about the type of waste is given, therefore no evaluation of the M1-value could be made.

After the first evaluation of the M1-value (M1 methodology) by using the evaluation tables (see Figure 1 and Figure 1) the out-put can be shown as follows:

Table 6 Results of the M1 methodology for deposit sites

country	CS in total	deposit sites	dep.sites \geq 100.000 m ³	dep.sites \geq 10.000 m ³	dep.sites < 10.000 m ³	M1 \geq 50	M1 \geq 47	M1 < 47
Slovakia	18	18	15	18	0	4	14	4
Hungary	32	32	27	31	1	6	10	22
Romania	25	25	16	17	8	8	12	12
Austria	16	5	5	5	0	3	3	2
Germany	2	2	2	2	0	0	1	1
Ukraine	3	3	1	3	0	2	2	1
Czech Republic	1	1	0	0	1	0	1	0
Slovenia	no data	no data	no data	no data	no data	no data	no data	no data
Bosnia& Herzegovina	no data	no data	no data	no data	no data	no data	no data	no data
Croatia	no data	no data	no data	no data	no data	no data	no data	no data

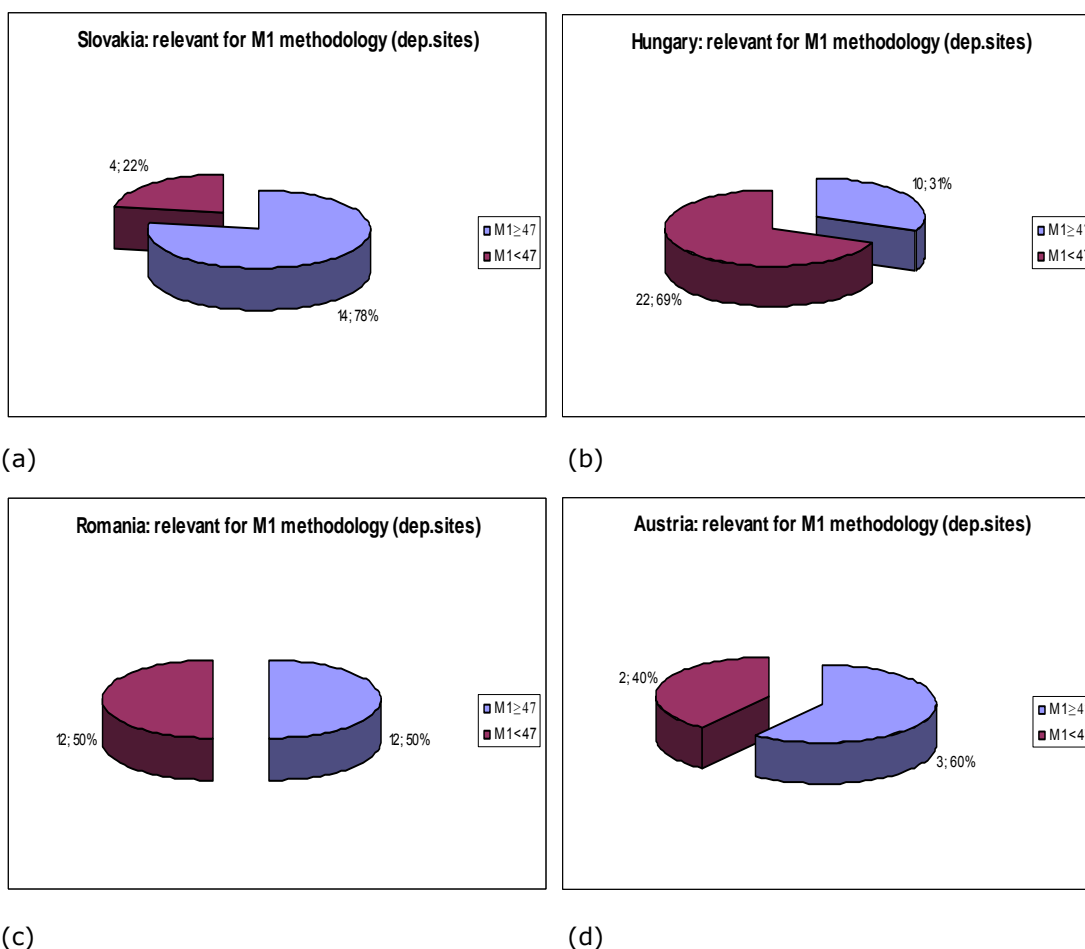
country	CS in total	deposit sites	dep.sites \geq 100.000 m ³	dep.sites \geq 10.000 m ³	dep.sites < 10.000 m ³	M1 \geq 50	M1 \geq 47	M1 < 47
Moldova	no data	no data	no data	no data	no data	no data	no data	no data
Bulgaria	no data	no data	no data	no data	no data	no data	no data	no data
Serbia	no data	no data	no data	no data	no data	no data	no data	no data
Total	97	86	66	76	10	23	43	42

The cut-off value for the calculation of the M2-value is $M1 \geq 50$.

By using a buffer-zone the following determination of the M2-value considers all contaminated deposit sites with an M1-value higher or equal 47 ($M1 \geq 47$).

In Figure 5 (a, b, c, d) the relevant contaminated deposit sites (according the M1 methodology) for the countries Slovakia, Hungary, Romania and Austria are shown.

Figure 5 (a, b, c, d) Contribution of the relevant contaminated deposit sites (M1 methodology)



The next table (see Table 7) gives information about “flooding potential” and “safety measures” and the about the output of the M2 methodology.

Table 7 Overview of reported information regarding “flooding potential” and “safety measures” and output of M2 methodology for deposit sites

country	CS in total	deposit sites	M1 ≥ 47	M1 < 47	FP available	SM available	M2 ≥ 50	M2 < 50
Slovakia	18	18	14	4	yes	no data	no data for SM	no data for SM
Hungary	32	32	10	22	yes	yes	2	8
Romania	25	25 ¹⁾	12	12	yes	partly	9 ²⁾	-
Austria	16	5	3	2	yes	yes	0	3
Germany	2	2	1	1	yes	yes	1	0
Ukraine	3	3	2	1	no data	no data	no data for FP,SM	no data for FP,SM
Czech Republic	1	1	1	0	no data	no data	no data for FP,SM	no data for FP,SM
Slovenia	no data	no data	no data	no data	no data	no data	no data	no data
Bosnia&Herzegovina	no data	no data	no data	no data	no data	no data	no data	no data
Croatia	no data	no data	no data	no data	no data	no data	no data	no data
Moldova	no data	no data	no data	no data	no data	no data	no data	no data
Bulgaria	no data	no data	no data	no data	no data	no data	no data	no data
Serbia	no data	no data	no data	no data	no data	no data	no data	no data
Total	97	86	43	42	-	-	12	11

FP ... flooding potential; SM ... safety measures

¹⁾ ... including one site in Romania (Tulcea, Turcoaia, (see Appendix 1, Table (b), item: 1): no waste-information given

²⁾ ... for 3 deposit sites no data for SM

For 43 contaminated sites (out of 86 reported contaminated deposit sites) an M1-value ≥ 47 could be determined, but only for 23 deposit sites (Hungary 10, Romania 9, Austria 3 and Germany 1) with an M1-value ≥ 47 a further investigation (by applying the M2 methodology) could be made. For the remaining 20 contaminated sites with an M1-value ≥ 47 (Slovakia 14, Romania 3, Ukraine 2 and Czech Republic 1) insufficient information about the “flooding

potential" (FP) and/or the "safety measures" (SM) is given. From the countries Slovenia, Bosnia & Herzegovina, Croatia, Moldova, Bulgaria and Serbia no data for contaminated sites and/or information about "flooding potential" and "safety measures" are reported.

After applying the M2 methodology 12 contaminated deposit sites show an M2-value higher or equal 50 that means, that for those sites further "short, middle and long-term measures" are necessary.

Table 8 represents the relevant contaminated deposit sites after applying the M2 methodology and their classification in priority classes (see Appendix 1, Table (b)).

Table 8 Determined contaminated deposit sites with an M2-value \geq 50

n	Item-Nr.	Country	Name	M2-value	Priority class
1	13	Romania	Sibiu, Copsa Mica, slags from primary and secondary melting	114	3
2	14	Romania	Hunedoara, Calan, not processed slag, lining and refractory waste materials, furnace slag, foundry shapes containing organic ligands, wastes from mixture preparation previously thermic processing, other tars	171	3
3	15	Romania	See 14 (double?)	171	3
4	26	Romania	Bacau, Letea Veche, Fuel burning	318	2
5	31	Hungary	Middle Tisa, Environmental Inspectorales Area, Szolnok, Beghin-Say Cukorgyar Inc., waste water sludge in lake	50	3
6	32	Romania	Teleorman, Tumu Magurele, Pyrite ash pond, not specified (wastes containing metals)	100	3
7	33	Romania	Sibiu, Copsa Mica, Tarnave Mare River, Visa brook, industrial waste, slags from primary and secondary melting	100	3
8	37	Romania	Dolj, Calafat, slag and ash pond from coal burning	98	3
9	46	Germany	Dillingen, Hühnerwörth, old deposit, municipal waste	141	3
10	50	Romania	Dolj, Calafat, industrial waste, wastes from sugar beet processing	141	3
11	52	Hungary	Middle Danube Environmental Inspectorates area, Budapest, Csepel-island Nord, abandon sewage, sludge depots, heavy metal and hydrocarbon polluted organic compounds	141	3
12	97	Romania	Rompetrol in Navodari, Constanta. Oil sludge pond	330	2

5.2.2 Output of the data set regarding the considered countries:

Hungary:

Hungary reported 32 deposit sites. One deposit site shows a volume smaller 10.000 m³ and is no longer relevant for the M1 methodology. For 10 contaminated deposit sites (out of 31) an M1-value higher or equal 47 could be determined. Sufficient information about "flooding potential" and "safety measures" is given. After running the M2 methodology 2 sites show an M2-value equal or higher 50. For this 2 deposit sites (see Table 8 and Figure 6 (a)) "short-, middle- and long-term-measures are necessary.

The reported deposit sites are listed in Appendix 1, Table (d).

Romania:

Romania reported 25 deposit sites. For one site no information about the type of waste is given (Appendix 1, Table (b), Item Nr. 1). 12 contaminated deposit sites show an M1-value higher or equal 47, but only for 9 contaminated deposit sites the M2 Methodology could be applied. For the remaining 3 sites (Appendix 1, Table (b), Item Nr. 39, 53 and 54) less information about the "safety measures" is given.

For all 9 contaminated deposit sites (M2 methodology) an M2-value higher or equal 50 can be shown. That means that for all those 9 deposit sites (see Table 8 and Figure 6 (b)) "short-, middle- and long-term-measures are necessary. The reported deposit sites are listed in Appendix 1, Table (e).

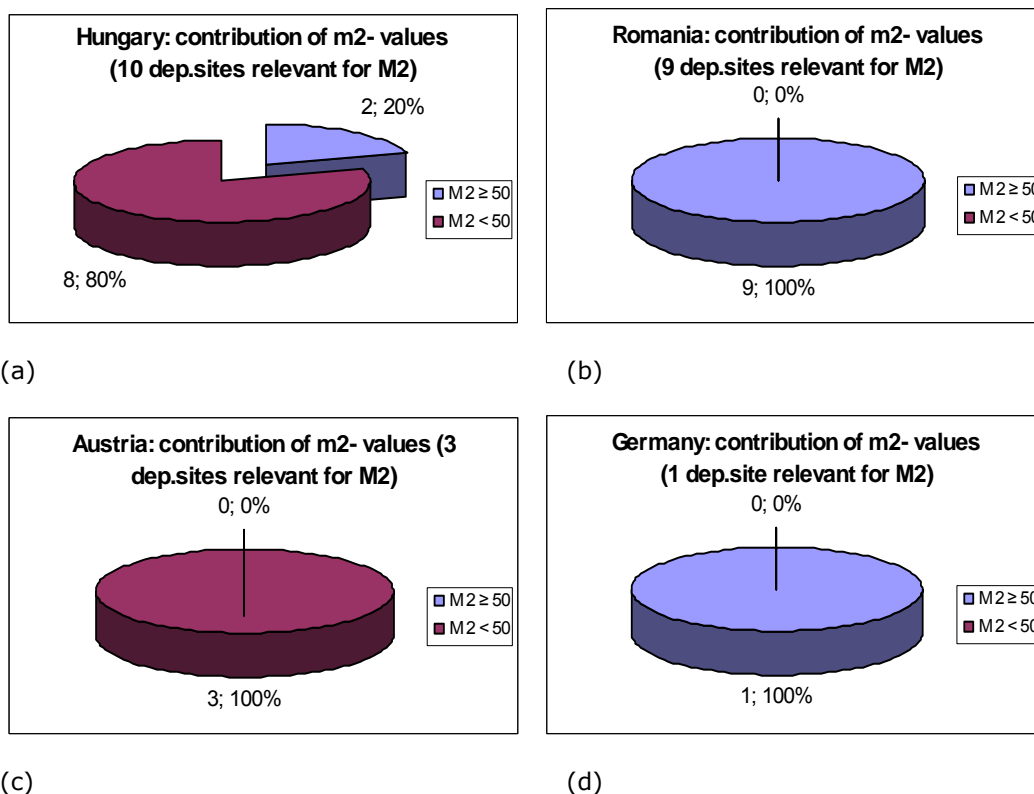
Austria:

Austria reported 5 deposit sites. 3 (out of 5) are relevant for the M2 methodology. But no deposit sites show an M2-value higher or equal 50 (see Table 8 and Figure 6 (c)). The reported deposit sites are listed in Appendix 1, Table (f).

Germany:

From the two reported contaminated deposit sites in Germany only one site is relevant for the M2 methodology. This site shows an M2-value higher 50 (see Table 8 and Figure 6 (d)), that means "short-, middle- and long-term-measures are necessary. The reported deposit sites are listed in Appendix 1, Table (g).

Figure 6 (a, b, c, d) Contribution of the relevant contaminated deposit sites (M2 methodology)



Slovakia, Ukraine and Czech Republic reported contaminated deposit sites but insufficient or no information about the “flooding potential” (FP) and/or “safety measures” (SM) (see Table 7). The reported deposit sites are listed in Appendix 1, Table (c), (h) and (i).

From Slovenia, Bosnia & Herzegovina, Croatia, Moldova, Bulgaria and Serbia no data sets were reported (see Table 7).

5.2.3 Contaminated industrial and/or abandoned industrial sites:

Only the countries Austria and Germany reported information about industrial and/or abandoned industrial sites within the Danube River Basin. Austria reported 11 contaminated industrial and/or abandoned industrial sites and Germany reported no relevant industrial sites within flood risk areas.

Table 9 Overview of reported information regarding “flooding potential” and “safety measures” and output of M2 methodology for industrial sites

n	country	CS in total	indust. sites	ind.sites \geq 5.000 m ²	ind.sites < 5.000 m ²	M1 \geq 47	M1 < 47	FP available	SM available	M2 \geq 50	M2 < 50
1	Slovakia	18	no data	no data	no data	no data	no data	no data	no data	no data	no data
2	Hungary	32	no data	no data	no data	no data	no data	no data	no data	no data	no data
3	Romania	25	no data	no data	no data	no data	no data	no data	no data	no data	no data
4	Austria	16	11	11	0	11	0	yes	yes	3	8
5	Germany	2	0	0	0	0	0	-	-	0	0
6	Ukraine	3	no data	no data	no data	no data	no data	no data	no data	no data	no data
7	Czech Republic	1	no data	no data	no data	no data	no data	no data	no data	no data for FP,SM	no data for FP,SM
8	Slovenia	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
9	Bosnia& Herzegovina	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
10	Croatia	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
11	Moldova	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
12	Bulgaria	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
13	Serbia	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
13	Total	97	11	11	0	11	0	0	0	3	8

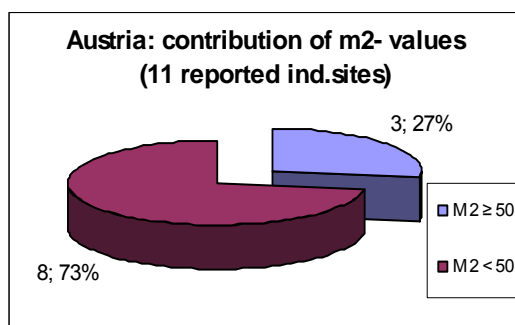
For all reported 11 contaminated industrial sites (Austria 11 ind. sites \geq 5.000 m²) the m1- and the M2 Methodology could be applied.

After applying the m1- and the M2 methodology (by taking into account the flooding potential (FP) and the safety measures (SM)) three industrial sites show a necessity for further “short-, middle- and long-term-measures”. These three industrial sites are shown in Table 10 and Figure 7).

Table 10 Determined contaminated industrial sites with an M2-value ≥ 50

Nr.	Item-Nr.	Country	Name	M2-value	Priority class
1	8	Austria	Lower-Austria, Korneuburg Shpyard, metals, hydrocarbon oil	513	2
2	16	Austria	Carintia, Sankt Veit an der Glan, Brückl, Trichlorethen, Tetrachlorethen, Hexachlorbutadien	112	3
3	29	Austria	Lower-Austria, Korneuburg, Tankfarm Mare, mineral oil depot	306	2

Figure 7 Contribution of the relevant contaminated deposit sites (M2 methodology)



5.3 Summary:

13 countries of the Danube River Basin (Slovakia, Hungary, Romania, Austria, Germany, Ukraine, Czech Republic, Slovenia, Bosnia & Herzegovina, Croatia, Moldova, Bulgaria and Serbia) were asked to report their contaminated sites (deposit sites and industrial and/or abandoned industrial sites) to the APC-EG. 7 countries (Slovakia, Hungary, Romania, Austria, Germany, Ukraine and Czech Republic) reported in total 97 contaminated sites (86 deposit sites, 11 industrial sites and/or abandoned industrial sites).

5.3.1 Deposit sites:

The “Methodology for the Pre-Assessment of Suspected Contaminated Sites in the Danube River Basin (M1 methodology), September 2004” propose a minimum-size for deposit sites to be investigated of 100.000 m³. The consultant however recommends for deposit sites a minimum-volume of 10.000 m³. This was discussed and agreed with UNDP and ICPDR in October 2006.

76 deposit sites (out of reported 86 deposit sites) have a volume higher or equal 10.000 m³ (10 sites are smaller 10.000 m³) (see Table 6).

After applying the M1 methodology (by using the evaluation tables) 43 deposit sites show an M1-value higher or equal 47 → that mean, that further investigations (by taking into account the flooding potential (FP) and the safety measures (SM)) are necessary. For one site no information about the type of waste was reported, therefore no evaluation of the M1-value could be made. The remaining 42 of the investigated deposit sites show an M1-value smaller than 47 → this sites can be sorted out and are no longer relevant (unless the suspicion is not totally excluded) for the M2 methodology.

43 contaminated sites show an M1-value ≥ 47 , but for only 23 sites sufficient information about the “flooding potential” and “safety measures” is given. After the run of the M2 methodology 12 contaminated deposit sites (out of 23) show an M2-value higher or equal 47. For those contaminated sites further “short-, middle- and long-term-measures” are necessary.

For approximately 50 % (12 contaminated deposit site out of 23 contaminated deposit sites with all relevant information) of the reported contaminated deposit sites “short-, middle- and long-term-measures” are necessary.

5.3.2 Industrial and/or abandoned industrial sites:

Regarding contaminated industrial and/or abandoned industrial sites the information is very poor. Only Austria reported sufficient information (11 contaminated industrial and/or abandoned industrial sites) of the present situation of contaminated industrial sites in their countries. Germany reported no relevant industrial and/or abandoned industrial site within the Danube River Basin.

All reported 11 contaminated industrial sites from Austria deliver an M1-value higher 50. After applying the M2 methodology (by taking into account the “flooding potential” and “safety measures”) 3 contaminated industrial sites show an M2-value higher 50. For those 3 sites “short-, middle- and long-term-measures” are necessary.

For approximately 27 % (3 contaminated industrial site out of 11 contaminated industrial sites) of the reported contaminated industrial sites “short-, middle- and long-term-measures” are necessary.

5.4 Solution/recommendations to the ICPDR:

Because of the lack of reported contaminated sites within the Danube River Basin, the Umweltbundesamt Vienna will recommend to the ICPDR for future activities following steps (request from the APC-EG, 32nd APC-EG-meeting):

- statistical extrapolation of the estimated number of contaminated sites in flood risk areas (basis data from Austria) to get an idea how many contaminated sites (deposit sites and industrial sites) can be expected within the Danube River Basin
- support for the Danube-countries in collecting contaminated sites (deposit sites and industrial and/or abandoned industrial sites)
- providing of financial funds for the Danube Countries to built up a national collecting system of contaminated sites for selected countries
- support with technical experts if necessary
- continue of collecting contaminated sites in flood risk areas within the Danube River Basin
- set prevention measures and remediation activities (for contaminated sites with an M2-value ≥ 50).

6 TASK 3: REVISED CHECKLIST FOR SITE INVESTIGATION

A further main task of this contract was to develop a checklist for site inspections of high risk contaminated sites in flood risk areas.

6.1 Checklist for the investigation and risk assessment of contaminated sites in flood risk areas

All necessary information of a contaminated site will be collected by using the proposed checklist. The checklist will also include general information for proposed safety measures, which will allow the competent authorities to reduce the risk at a contaminated site in flood risk areas and to increase public safety and to protect the environment in the Danube River Basin.

This checklist will serve as a hand guide for a desk-study and for a first visit of sites, suspected to be contaminated by substances hazardous to water.

The purpose of this first desk-study and site visit is to find out:

- where highly contaminated zones are suspected and located within flood risk areas
- whether immediate action is needed

The data collected by making use of the checklist deliver the basis to assess if further steps are necessary to enhance the safety level of contaminated sites in flood risk areas.

The checklist includes the following information:

- General data, which providing information about location, extension type, ownership structure of the site and about any precedent investigations
- Hydrological data to estimate whether the contaminated site is endangered by flooding (flooding potential)
- Evaluation of the hazard situation answering the following questions:
 - Is there an indication of potential hazards at the site?
 - Is the site assessment with regard to the site's risk potential completed or is it necessary to record further data?
 - Which additional information is already available and can be used for the assessment?
 - Is an assessment possible or is a further data record or investigation necessary?

The checklist applies to all properties containing suspected contaminated sites in flood risk areas.

The following sites in flood risk areas are covered by the scope of the checklist:

- Sites suspected to have high potential for posing a hazard to water,
- Sites contaminated as a result of former industrial activities and former waste disposal operations, and
- closed-down plants and plant components containing water endangering substances, which are not effectively secured and might present a hazard to water in case of flooding.

Radioactively contaminated sites do not fall within the scope of this checklist, nor do sites presenting a potential hazard due to genetically modified organisms.

Former military sites and former military production sites are usually regarded as former industrial sites.

Only those sites have to be investigated under this checklist, which

- include more than 10.000 m³ of contaminated volume (former waste disposal sites, landfills)
- cover an area larger than 5.000 m² of a contaminated area (former industrial sites, closed-down plants)

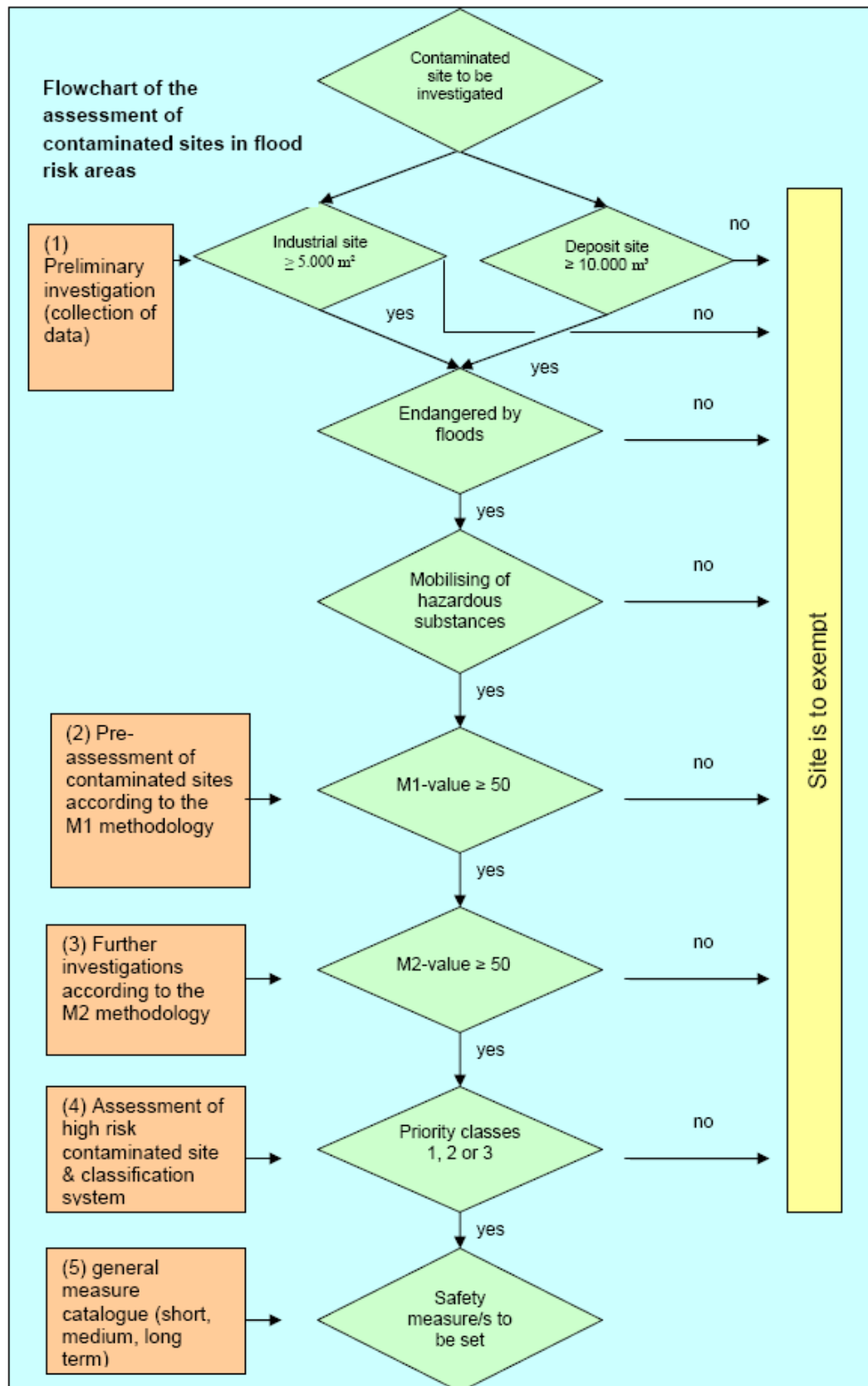
In certain cases a further investigation of the property (smaller than 10.000 m³ and/or smaller than 5.000 m²) is still necessary if the suspicion of contamination for contaminated sites cannot be totally excluded.

Facilities covered by this checklist include, for example:

- Former waste disposal sites
- Industrial and/or abandoned industrial sites
- Components of closed-down plants
- Underground installations
- Surface facilities
- Above-ground storage systems within buildings
- Sewage sludge/waste-water treatment facilities

The proposed checklist consists of five parts which include the following templates:

- (1) Preliminary investigation (basic study) of contaminated sites in flood risk areas
- (2) Pre-assessment of contaminated sites in flood risk areas according to the M1 methodology
- (3) Further investigations of contaminated sites in flood risk areas according to the M2 methodology
- (4) Assessment and classification system – priority classes – of M2-values of high risk contaminated sites in flood risk areas
- (5) Measure catalogue (short, medium and long term measures)

Figure 8 Flowchart of the assessment of contaminated sites in flood risk areas

Please find the "Checklist for the Investigation and Risk Assessment of Contaminated Sites in Flood Risk Areas" in Appendix 2.

6.2 Recommendations

The Recommendation applies to all contaminated sites, which are prone to flooding and contaminated by substances hazardous to water. The case of flooding includes, besides flooding,

- backflow from water bodies or sewer systems or
- a rise of the groundwater table as a result of long-term flood events.

The following sites are covered by the scope of the recommendation:

- Sites suspected to have high potential for posing a hazard to water,
- sites contaminated as a result of former industrial activities and former waste disposal operations, and
- closed-down plants and plant components containing water endangering substances, which are not effectively secured and might present a hazard to water in case of flooding.

Radioactively contaminated sites do not fall within the scope of these requirements, nor do sites presenting a potential hazard due to genetically modified organisms.

Facilities covered by this recommendation include, for example:

- Underground installations
- Surface facilities
- Above-ground storage systems within buildings
- Components of closed-down plants
- Former waste disposal sites

Safety requirements:

Administrative requirements:

- Potentially contaminated sites should be recorded in appropriate database (e.g. land registry).
- In general the "Polluter Pays Principle" has to be applied
 - in investigations necessary to determine the contamination situation of sites suspected of being contaminated and further necessary measures and
 - when formulation proposals for remedial actions and in their implementation.
- The financing of investigations and remediation should be ensured, e.g. through national agreements or funds, especially in cases where the polluter cannot be held liable.
- Authorities should be enabled to:
 - carry out the monitoring of contaminated sites and sites suspected of being contaminated
 - order monitoring measures and/or remedial measures

- Enabled authorities are responsible for ensuring that identified suspected sites are investigated and, if necessary, remedial measures are implemented.

Requirements of risk estimation:

- Site identification:
All abandoned industrial and waste disposal sites located in flood-risk areas are suspected of being hazardous to water bodies in case of flooding. The following measures should be carried out in an initial survey to determine whether suspect sites are hazardous or non hazardous to water in case of flooding:
 - Initial estimation of the risk by classifying the water endangering potential of the former use (type of industrial branch or type of waste disposed of).
 - Priorisation of suspect sites according to the estimated water endangering potential.
 - Estimation of the flood risk at the site.
- Sites for which a safety risk has been identified should be investigated in more detail. A first proposal for immediate measures should be formulated if there are obvious safety risks.
- Further site investigations:
They serve to generate additional information for a more precise characterisation of the hazard situation of the investigated site.
- This information should cover the following points
 - a description of the contamination situation,
 - the determination of any assets that would be endangered in case of flooding, and
 - a proposal for further measures to enhance the safety of the site, if necessary.
- Detailed investigations
Based on detailed investigations and the identification of highly contaminated zones a list of measures should be drawn up to serve as a basis for the selection of specific remedial measures.
- Results of each investigation step should be documented in a database.

Technical requirements:

Preventive measures:

Preventive measures include:

- Controlling the stability and necessary static design and capacity of dams,
- Regular supervision and control of sites with a high risk potential,
- Increasing the retention time through:
 - storage basins for heavy rainfall and snowmelt water
 - building of reservoirs
 - renaturation and/or protection of floodplain forests
- Construction of dams at sites with a high flood risk.

Requirements for the remediation of contaminated sites:

Different decontamination methods are available for contaminated sites in flood-risk areas:

- removal of soil and disposal in safe landfills,
- removal of barrels and tanks, or
- decontamination by chemical, physical or biological methods

In addition to conventional decontamination measures, containment measures, designed to permanently prevent the spread of pollutants, can be considered. Such measures include for example:

- Encapsulating of contaminated bodies of soil
- Sealing of surfaces

Investigations should be performed to select the optimal treatment for each site.

If immediate action is necessary because human health is threatened, appropriate protective or restrictive measures should be carried out (e.g. restriction of access).

Advices for utilization of contaminated sites:

In the area of the contaminated site and in its immediate vicinity, at least the following points have to be taken into consideration:

- Possible change of use should neither result in environmental impairment (e.g. additional mobilization of contaminants) nor generate additional potential danger.
- As elevated concentrations of methane and carbon dioxide may occur in the area of deposition, deep construction workings (e.g. subsurface running of pipelines and conduits, construction of cellars) should generally be carried out, taking appropriate safety measures (e.g. use of a gas detector)
- Generally, in the course of construction work, the presence of landfill gas in possibly major concentrations should be considered.
- During the technical design of permanent subsurface installations (e.g. conduits and shafts, cellars) an appropriate gas discharge (e.g. gas drainage) or adequate gas impermeability should be assured.
- Related to possible future construction works and the sealing of surfaces, the mode for run-off of precipitation has to be investigated carefully. An elevated mobilization of contaminants and an elevated entry of contaminants into the groundwater through seepage have to be excluded.
- Waste excavated from deep construction workings has to be treated and deposited according to current legislation.
- Based on investigation results so far, it can be assumed that part of the deposit does not comply with the regulations of the landfill directive for rubble, therefore higher costs have to be anticipated accordingly at the disposal of larger volumes of excavated material.

7 MEETINGS

The Consultant was expected to participate at a site visit by the WGI to test the checklist and to incorporate necessary changes into the checklist, further to attend one WGI meeting and up to two APC EG meetings.

7.1 31st APC-EG meeting in Bratislava (7th and 8th April 2005)

At the 31st APC-EG meeting (7th, 8th April 2005 in Bratislava) all countries were asked to report on the following missing data by the end of May 2005:

- Factor flooding potential (FP);
- Factor safety measures (SM);
- Industrial and abandoned industrial sites

7.2 Meeting in Vienna (29th July 2005)

On the 29th July 2005 a meeting was held in Vienna (UNDP/GEF) with Mr. Peter Whalley, Mr. Aurel Varduca, Mr. Igor Liska, Mr. Gerd Winkelmann-Oei and Mrs. Hermine Weber regarding the next WGI meeting in Romania, to clarify responsibilities.

In this meeting the following points were discussed:

- Next WGI meeting envisaged in Romania
- For the 32nd APC-EG meeting in Berlin (September 2005) the participation of Ms. Hermine Weber is not required.
- Responsibilities WGI meeting (coordinating, organization)

7.3 32nd APC-EG meeting in Berlin (23rd, 24th September 2005)

The 32nd meeting of the APC-Expert Group was held from 23rd to 24th Sept. 2005 in Berlin. The participation of the Umweltbundesamt Vienna was not necessary. A short presentation on the work completed by the Umweltbundesamt Vienna was given by Mr. Peter Whalley (UNDP/GEF).

According to the minutes of the 32nd APC-EG meeting the countries reported problems in collecting the necessary data, the major reason being the missing legislative basis. This "working list" of contaminated sites (deposit sites and industrial and/or abandoned industrial sites) in flood risk areas should continue in its preparation as it will be relevant for the future programme of measures.

The countries Bosnia & Herzegovina, Bulgaria, Moldova and Serbia were asked to send information on plans regarding the collection of data on deposit sites by October 2005.

The Umweltbundesamt Vienna was asked to report on the reasons for missing information on the contaminated sites in flood risk areas and to give an expert judgement and recommendations on future perspectives and activities.

M2 methodology (2nd Progress Report, July 2005) will be discussed at the meeting of the Working Group in Inventories (WGI), which was envisaged February/March 2006.

7.4 Workshop on M2 methodology and refineries pilot project (17. July 2006 and 1st AP Task Group Meeting in Constanta, Rumania (20.-21. July 2006)

From 18. – 21. July 2006 the seminar “Activities for Accident Prevention – Pilot Project – Refineries” was held in Constanta, Rumania. During this seminar the workshop “workshop on M2 methodology and refineries pilot project” was implemented. A working group meeting “1st Task Group Meeting” was held afterwards (20. - 21. July 2006, Constanta, Rumania).

Output of the meeting/workshop:

The checklist “Checklist for the Investigation and Risk Assessment of Contaminated Sites in Flood Risk Areas” was tested on a site visit on 20th July 2006. Contaminated deposit site (see Appendix 1, Table 1, item 97): Rompetrol in Navodari, Constanta, Rumania (see Picture 1, Picture 2, Picture 3 and Picture 4).

The checklist was discussed and agreed by the members of the seminar “workshop on M2 methodology and refineries pilot project”(20th, 21st July 2006). Comments on the tested checklist were incorporated into the checklist by the author.

Picture 1 Map from Rompetrol, Navodari, Rumania, 20th July 2006



Picture 2 Participants of the workshop at Rompetrol (in front of the main-entrance of Rompetrol), 20th July 2006



Short description of the contaminated deposit site:

Picture 3 Contaminated deposit site (oil sludge pond), 20th July 2006



- Oil sludge pond, $r0 = 5$
- Volume: 130.000 m³
- Factor of flooding potential (FP): 3
- Factor of safety measures (SM): 2



M1-value: 55



M2-value: 333

See Table 11 evaluation table for deposit sites (see also Appendix 2, Table 4)

Table 11 Evaluation table for deposit sites

M1-values for deposits with regard to hazard potential					
Volume (m³)	Class of hazard, r0 (by type of wastes)				
	1	2	3	4	5
5.000-9.999	2	10	23	39	49
10.000-19.999	3	13	27	41	51
20.000-49.999	4	15	31	43	53
50.000-99.999	5	17	34	45	54
100.000-499.999	5	19	37	47	55
500.000-999.999	5	20	40	49	56
1.000.000-1.999.999	5	22	42	50	57
≥2.000.000	5	28	45	53	60

(volume of 130.000 m³, r0 = 5 → M1 = 55)

According the M2 methodology further investigations are necessary by taking into account the factor of "flooding potential" (FP) and the factor of "safety measures" (SM).

The M2-value has to be determined as follows:

$$M2 = M1 \times FP \times SM$$

M1 ... M1-value, FP ... flooding potential, SM ... safety measures

→ $M2 = M1 \times FP \times SM = 55 \times 3 \times 2 = 333$

Assessment and classification system for $M2 = 333$ → priority class: 2; need for further measures to be established at the site: high

Priority class for remediation	M2-values	Need for further measures to be established at the site
1	≥1000 – 1.800	Very high
2	≥250 - <1000	High
3	≥50 - <250	Relevant
4	<50	Low

Planned measures at the site within the next 4 years:

- Remove/excavate the hole deposit site and contaminated underground and dispose it secure
- Decontamination of the soil/area
- Decontamination of groundwater

Picture 4 **Participants of the “workshop on M2 methodology” at Rompetrol, 20th July 2006**



8 RECOMMENDED SOLUTIONS

Six countries reported relevant deposit sites in flood risk areas (in total 86 deposit sites within the Danube River Basin). But only four countries submitted additional necessary information about the flooding situation and the safety measures taken at the contaminated site. For 20 contaminated sites (out of 38 reported deposit sites with an M1-value ≥ 47) an M2-value could be calculated.

Regarding contaminated industrial sites and/or abandoned industrial sites the information is limited. Only Austria reported 11 contaminated industrial sites in flood risk areas in their country. Germany reported no relevant industrial and/or abandoned industrial site within the Danube River Basin.

Because of the lack of reported contaminated sites within the Danube River Basin, the Umweltbundesamt Vienna will recommend the following to the ICPDR for future activities (request from the APC-EG, 32nd APC-EG meeting):

- Statistical extrapolation of the estimated number of contaminated sites in flood risk areas (basic data from Austria) to get an idea of how many contaminated sites (deposit sites and industrial sites) can be expected within the Danube River Basin.
- Support for the Danube countries in recording contaminated sites (deposit sites and industrial and/or abandoned industrial sites)
- providing financial funds for the Danube Countries to build up a national recording system of contaminated sites for selected countries;
- support from technical experts, if necessary.
- Continue recording contaminated sites in flood risk areas within the Danube River Basin.
- Take preventative measures and remediation activities (for contaminated sites with an M2-value ≥ 50)

9 LITERATURE

- *ICPDR APC Expert Group*, Recommendation "Safety Requirements for Contaminated Sites in Flood-risk Areas
- *ICPDR*, Methodology for the Pre-Assessment of Suspected Contaminated Sites in the Danube River Basin (M1 methodology), September 2004
- Outputs of the Phase 1 of the DRP are available from the DRP's web site www.undp-drp.org
- Activities of the APC EG (and the WGE) are available from the ICPDR's web site www.icpdr.org

APPENDIXES & ANNEXES

APPENDIX 1

Working list of reported contaminated sites (data set)

Table (a): All reported deposit and industrial/abandoned sites (97 records)

Table (b): All reported deposit and industrial/abandoned sites (97 records) (colored)

Table (c): Reported deposit sites, Slovakia (18 records)

Table (d): Reported deposit sites, Hungary (32 records)

Table (e): Reported deposit sites, Romania (25 records)

Table (f): Reported deposit and industrial sites, Austria (5 deposit sites, 11 industrial sites)

Table (g): Reported deposit sites, Ukraine (3 records)

Table (h): Reported deposit sites, Ukraine (3 records)

Table (i): Reported deposit sites, Czech Republic (1 record)

Table (j): Reported deposit sites (Igor Liska, Version: 13.06.2005) (98 records)

APPENDIX 2

Checklist for the Investigation and Risk Assessment of Contaminated Sites in Flood Risk Areas

Annex 1: Questionnaire of Contaminates Sites in Flood Risk Areas

Annex 2: Branch Catalogue of Germany

Annex 3: European Waste Catalogue

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CHECKLIST FOR THE INVESTIGATION AND RISK ASSESSMENT OF CONTAMINATED SITES IN FLOOD RISK AREAS

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CHECKLIST FOR THE INVESTIGATION AND RISK ASSESSMENT OF CONTAMINATED SITES IN FLOOD RISK AREAS

ANNEX 1: QUESTIONNAIRE OF CONTAMINATED SITES IN FLOOD RISK AREAS

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CHECKLIST FOR THE INVESTIGATION AND RISK ASSESSMENT OF CONTAMINATED SITES IN FLOOD RISK AREAS

ANNEX 2: BRANCH CATALOGUE OF GERMANY

APPENDIX 2

CHECKLIST FOR THE INVESTIGATION AND RISK ASSESSMENT OF CONTAMINATED SITES IN FLOOD RISK AREAS

ANNEX 3: EUROPEAN WASTE CATALOGUE

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