Methodology for the Pre Assessment of Suspected Contaminated Sites in Flood Risk Areas in the Danube River Basin

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in the

Berlin, March 5th 2004

Background

Contaminated sites caused by former industrial activities like in figure 1 pose a potential danger for the environment; especially contaminated sites containing hazardous substances which could lead to a significant contamination of water bodies, if the substances will be mobilised (e.g. floods). During the last years the dramatic floods at Elbe, Danube and Oder have shown that the toxic impact of those contaminated sites could cause a significant harm 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.

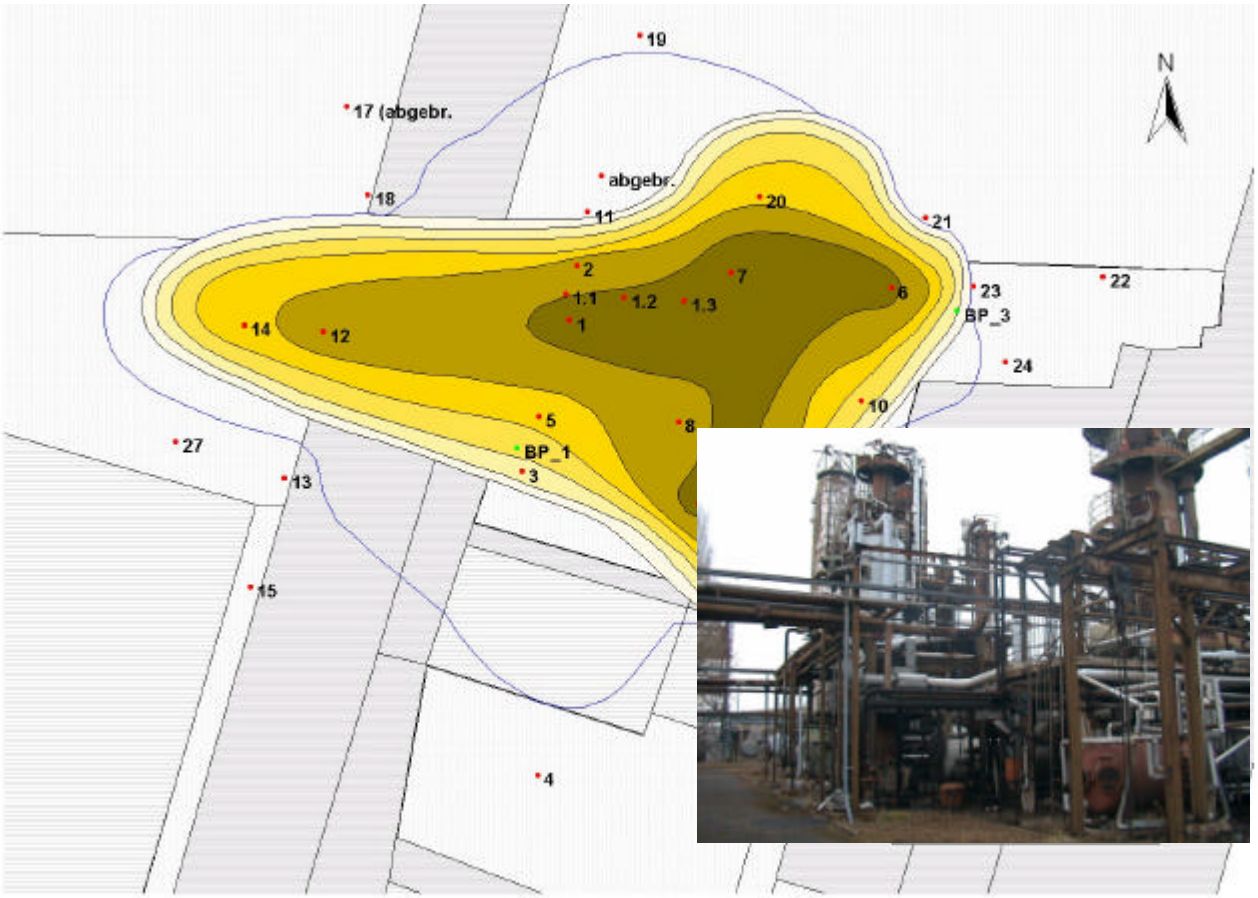

Figure 1: Oil contamination in an industrial area

Problem to be Solved

For the Danube river basin recommendations are necessary, which enable the competent authorities of the riparian countries to maintain 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 recommendations for respective safety measures which could serve as regulatory guidelines.
- Drafting a Measure catalogue for the exemplary implementation of these safety guidelines.

Objective of the Project

The major goal of the project is to develop in a first step a methodology for an initial risk assessment of contaminated sites in flood risk areas, based on the data of the inventory of contaminated sites in the Danube river basin. The reported sites where a high risk potential has to be assumed can be screened by an preliminary assessment.

This methodology will serve as a guide for the elaboration of safety recommendations and a concrete measure catalogue in the next steps. For the assessment an agreed procedure has to be developed in accordance to the inventory of accidental risk spots (ARS inventory).

In the next step the detailed analysis of the exemplary hot spots will lead to the elaboration of safety recommendations for CS. Together with a detailed measure catalogue these recommendations will serve for a checklist which allows the competent authorities to improve the safety of the CS and respectively to reduce the risk of contamination of the Danube.

Selection of Suitable Proceedings as a Basis for the Methodology Development

Assessing the risk of the reported sites based on the existing data is associated with the following difficulties:

- The delivered data vary in quality and are partly incomplete
- The amount of the toxic substances and sometimes even the type of substances in the contaminated soil is often not known.
- Degradation process may have started, so metabolites (some of them toxic) and breakdown products may present.

The estimation of the contaminants is therefore difficult and linked with a high inaccuracy. Because of this, the use of water risk classes was proved to be difficult and didn't show suitable results.

Hence, in a first approach a method was suggested that is based on the practical experience gained by an initial risk assessment of more than 25.000 potentially contaminated sites in the German Federal State of Saxony. This method, simplified and adapted to the needs of the special situation at the Danube, was discussed in the small working group and affirmed by the 27th APC Group. It is explained in the following.

Description of the First Draft of the Methodology

The adapted methodology allows the initial risk assessment of CS by applying the following parameters:

- The toxic potential of soil or waste according to the harmful substances to be expected in a type of waste or in a specific industrial branch is expressed as a risk value.
- The size of the contaminated volume or area.

For each waste type of the EUROPEAN WASTE CATALOGUE (examples given in table 1) and each branch of the BRANCH CATALOGUE OF GERMANY (examples given in table 2) a risk-value r0 was developed in classes from 1 until 5. This risk factor r0 is derived by experience gained in several German Federal States (e.g. Saxony) and takes into account the toxic potential of soil or waste that can be expected from a branch or waste specific contamination.

For some wastes or branches a range of risk is given (e.g r0 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 ("worst case") to be expected. This opens up the possibility for an expert judgement to adjust the r0 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 [m³] or in case of old industrial sites as surface area classes [m²]) to an "initial risk factor" m1, which gives an information about the potential risk of each site (see example in figure 2).

For example:

- A site with a contaminated volume of 200.000 m³ (> 100.001 m³ and < 500.000 m³) with a risk value of 5 receives an m_1-value of 55.
- A site with a contaminated area of > 5.000 m² with a risk value of 4 receives an m_1-value of 49.

Not all of the detected contaminated sites in the Danubian Region could be assessed. So 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 m³ of contaminated volume or cover an area larger than 5.000 m² (see illustration of the exclusion criteria in figure 3).

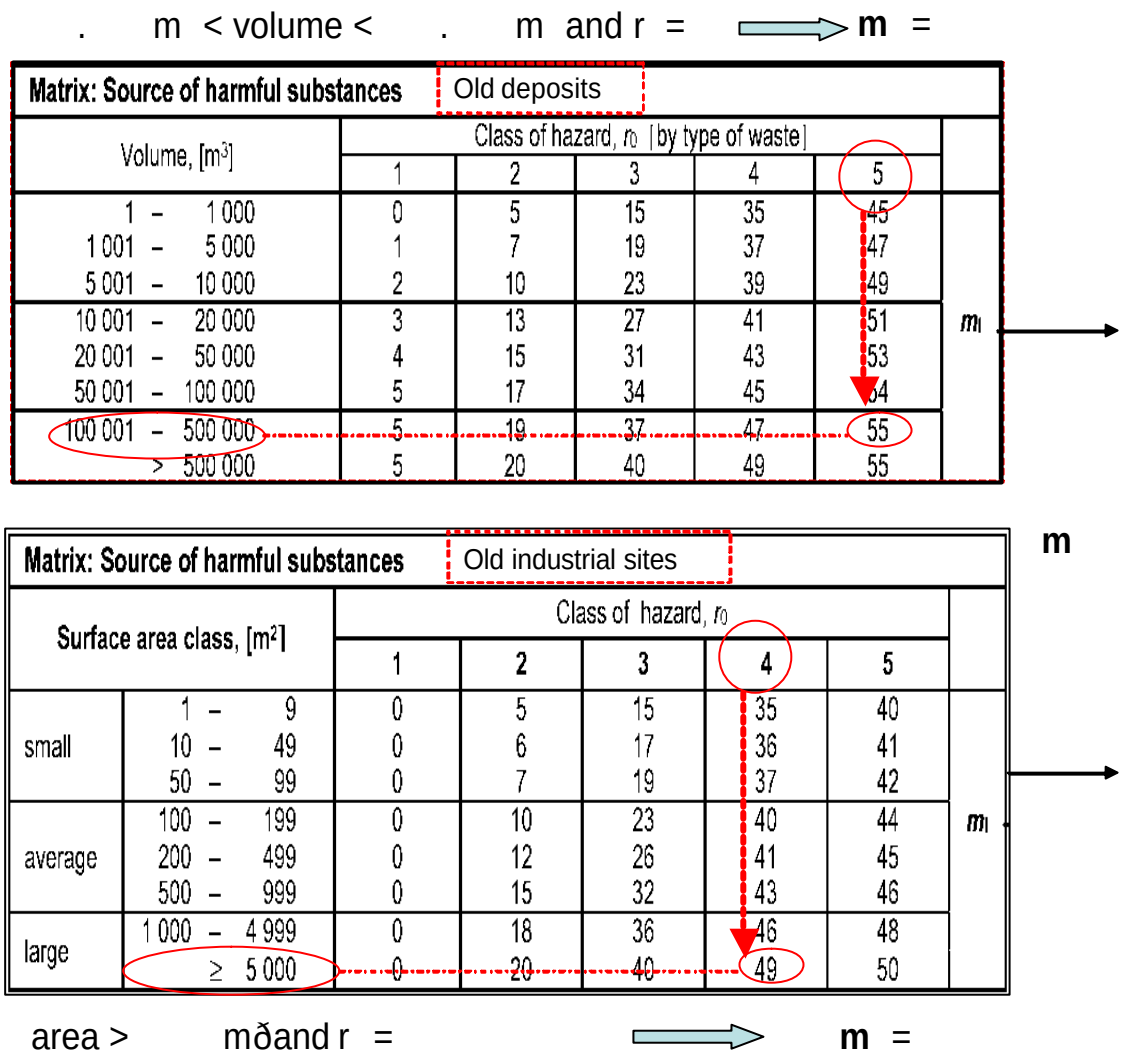

Figure 2 : Illustration of the determination of the m1-value

Table :
List of wastes pursuant to Article (a) of Council Directive / /EEC on waste (EUROPEAN WASTE CATALOGUE).
e.g.
WASTE RESULTING FROM EXPLORATION, MINING, DRESSING AND FURTHER TREATMENT OF MINERALS AND QUARRY

CODE	**WASTE TYPE**	***r* VALUE Average (Min,Max)**
	Waste from mineral excavation	. (-)
	Waste from mineral metalliferous excavation	. (-)
	Waste from mineral non-metalliferous excavation	. (-)
	Waste from mineral dressing	. (-)
	Waste from the dressing of metalliferous minerals	. (-)
	Waste from the dressing of non-metalliferous minerals	. (-)
	Waste from further physical and chemical processing of metalliferous minerals	. (-)

The r values " " and " " are both considered as beeing " "

Table :
Branch related hazard classifying of industries
(Branch catalogue of Germany)
(e.g.)
MANUFACTURING AND PROCESSING INDUSTRIES

BRANCH No	BRANCH NAME	Class of Hazards r Min and Max
	Gas, mining, related products	-
	Gas production (town gas)	-
	Coal mining	-
	Brown coal mining and briquette production	-
	Ferrous ores mining	-
	Production of non-ferrous metals	-
	Potassium and rock salt mining	-
	Petroleum and natural gas extraction	-
	Cocking	-
	Briquettes coal production	-

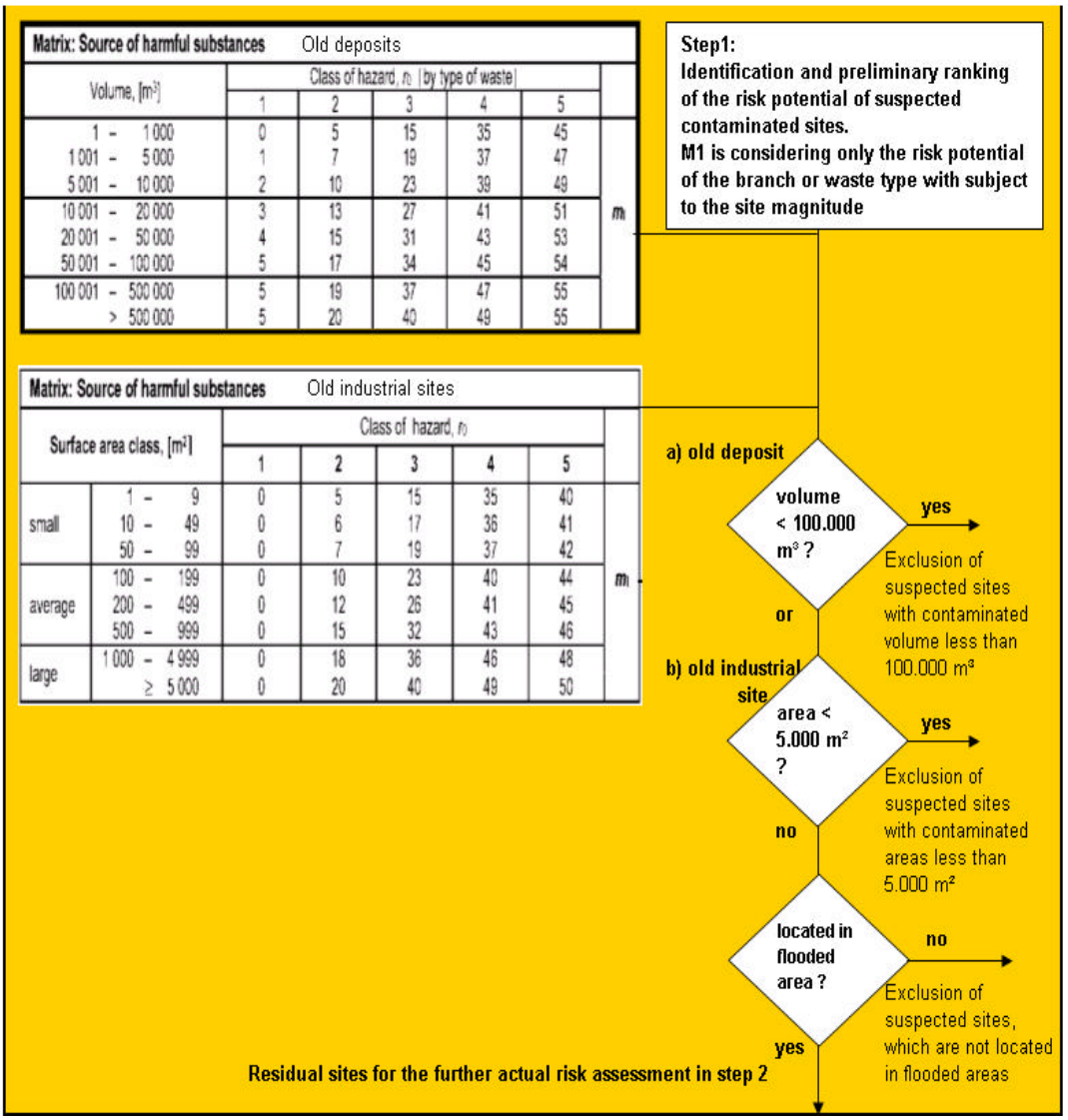

Figure 3: Exclusion criteria used in the first draft of the m1-methodology

On this basis the Danubian countries reported till now 261 CS in potentially flooded areas of the Danube. For these CS a ranking list according to the m1-methodology was drawn up and priority spots of further investigation were detected.

Results of the first Ranking and Interpretation Problems

The inventories of each country, assessed by m1-methodology, as described above resulted to 103 evaluable sites of total 261 sites, which represented a degree of 39,5%.

Nearly 50 sites reached an m1-value of equal or more than 45, corresponding to high risk value and 90 sites have an m1-value of more than 37, which still indicates a relevant risk potential.

The first 67 sites, which were classified by contaminated volume (waste deposits), are shown in the following table:

Country	Number of sites with a contaminated voume of higher than 100.000 m³	Percentage
Austria	5	7,46
Germany	2	2,99
Hungary	29	43,28
Romania	12	17,91
Slovakia	17	25,37
Ukraine	2	2,99
Total	67	100,00

Table 3: Result of the first ranking of CS in the Danube Region*

* The list does not include the 11 contaminated industrial sites, which were additionally listed by the Austrian experts.

At least the use of this methodology for the site assessment led to the following problems as stated by the expert group:

- Because of missing data like the amount of contaminated volume or a missing classification of the risk value the evaluation and interpretation of the data was difficult. So in some cases the risk values were estimated It has to be considered that the estimated data have a high inaccuracy which could lead to a wrong evaluation of the sites, but are sufficient for a screening.
- Waste deposits and abandoned industrial sites: Apart from the Austrian data, the inventories from all other countries did report waste deposits where the size is classified as a volume. Austria also reported properties of abandoned industrial sites (for example mineral oil refinery) classified by surface area. A conversion into contaminated volume is not possible, because contamination is concentrated in hot spots and normally not evenly distributed over the whole site. We therefore decided to leave those sites in a separate table.
- 7 sites (3 sites in Romania and 2 sites in Slovakia and 1 site each inHungary and in the Czech Republic) reached the m1 values higher or equal 47, but with contaminated volumes lower than 100.000 m³.. This emphasises the fact that also smaller sites but with highly toxic substances can represent a hazard for the environment.

A lot of screened sites with a contaminated volume larger than 100.000 m³ could not be further differentiated with the present tables in figure 2. The example of the Austrian sites should be emphasised (see appendix 1), where the pre-selection and screening of the sites made by the Austrian Federal Agency led already to sites with very similar high hazard potentials. A further differentiation of those sites is not possible with the given data and this methodology.

As a result of the expert group meeting in Ljubljana, it was stated the following:

- The “m1-methodology” is the first step of the assessment as shown in figures 2 and 3. It is a tool for a first screening step . For the present methodology the expert group suggested to extend and to divide the categories of the large sites (> 100.000 m³ and > 5.000 m²) to an open score, which allows a better differentiation of the large sites.

The expert group amendments led to the following consequences for the m1-methodology:

- With the demand for an open score for the site categories, maximum values of 55 and 50 like in the first approach of the m1-methodology could not be used any longer. The range of the tables should be extended.
- For improving the assessment, it was also discussed that in the future a parameter concerning the flood probability should be integrated. The attempt to get data concerning the flood probability of each sites did not succeed. It was agreed, that a harmonised approach for the Danubian Countries is needed.

Resulting Methodology according to the Amendments of the Expert Group

New evaluation tables were elaborated according to the formulated requirements of the expert group, where the range of site magnitudes was extended aiming at a better differentiation of the sites which are larger than 1.000.000 m³ or 10.000 m².

At first it was intended to calculate the m1-values of the extended size classes by interpolation based on the value of the old table. The result is shown in figure 4.

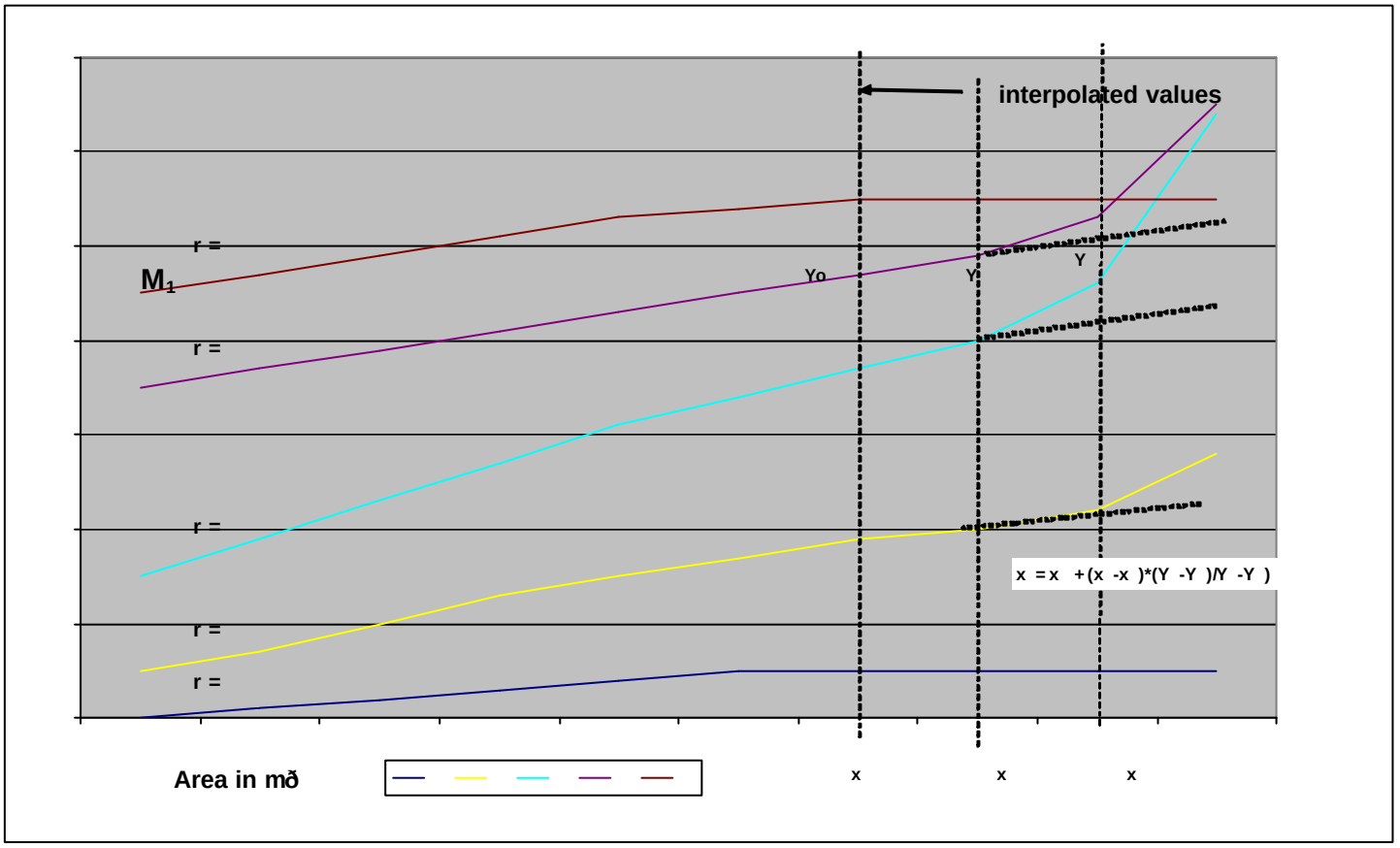

Figure 4: Results of the first attempt to calculate the values according to the extended Range of the evaluation table.

The interpolation led to m1-values, which were not consistent in the different classes of risk values (r_0 = 3 and r_0=4). So this approach failed for the table extension.

Alternatively we fixed the table values in the column of r_0=5 until to the maximum value of 60 and calculated the other values according the rule of proportion or the average value. It led to a better result as to be seen in the next figure 5.

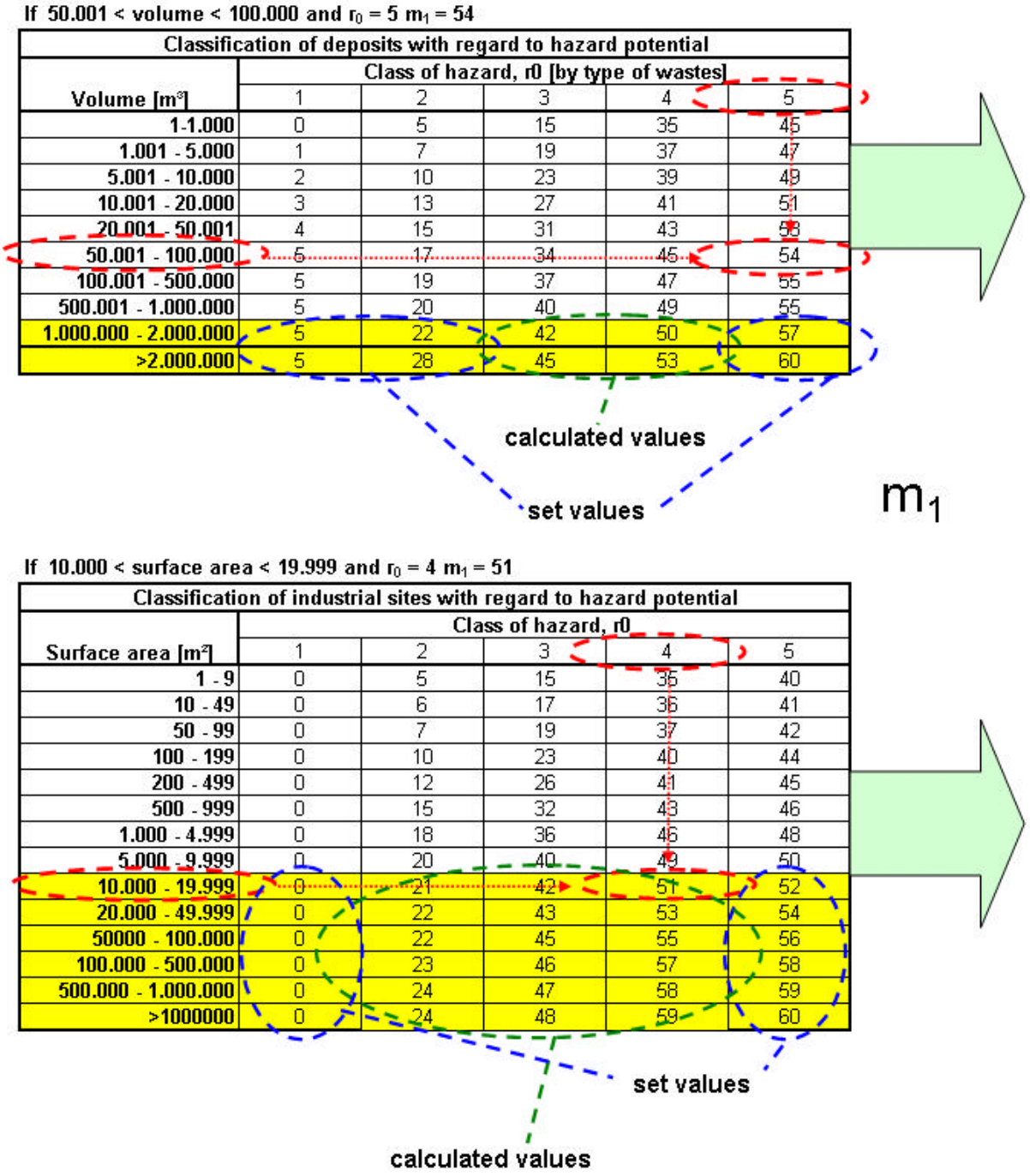

Figure 5: Evaluation table with extended size classes

With the revised evaluation table a new ranking of CS was performed, which led to the following results (see appendicies 3 and 4):

- For sites classified by surface area like the Austrian sites (see appendix 3) it was possible to differentiate between some of the sites which had before the same initial risk value m. A further differentiation is not reasonable with the given data. Only the flood probability could be used as a further criterion, because the Austrian experts defined it for their sites.
- The sites classified by volume could be slightly more differentiated. Additional data and criteria would be necessary for allowing a finer ranking. the table has to be seen as a first screening of those sites, which have to be preferably visited and investigated further. All sites with an initial risk value equal or higher than 50 should be inspected to perform a risk assessment by using the checklist. Also the criterion of flood probability should be discussed for those sites in view to a better differentiation .

The methodology is not an optimised tool for the ranking of CS, but it is a sufficient tool for a site screening which should be the preliminary step. A deeper ranking is not possible at this investigation stage, because the inaccuracy of the data is very high. Therefore the extension of the table score did not achieve a detailed ranking. Such a more detailed ranking is possible after a site visit where data about the contaminated surface/volume and the risk class could be concretised. Based on that secured data base a further ranking of CS can be performed.

Appendix 1: Result of the ranking of the site classified by surface area (Austrian sites)

Country	Region	county	community	location/ nar	or old industrial	branch	in the timeframe	hazardous substances	r0/ estimated risk factor	area in sqm	M1	by Floods, Flood
Austria	Kärnten	Klagenfurt	Klagenfurt	Leather factory I	industrial site	Lederverarbeitung	1922-1989	Chrom	4,5	120.000	50	LOW
Austria	Kärnten	Sankt Veit an der Glan	Brückl	Donau Chemie Brückl	industrial site	Chemische Grundstoffin	1909-1989	CKW, Trichlorethen,	6	50.000	50	MIDDLE
Austria	Niederöstereich	Korneuburg	Korneuburg	refinery Tuttendorfer	industrial site	Mineralöl-Raffinerie	1923-1960/61	Mineralöl, CKW	4,5	180.000	50	LOW
Austria	Niederöstereich	Korneuburg	Korneuburg	Shipyard Korneuburg	industrial site	Schiffbau	1845-1994	Metalle, Mineralöl	4	200.000	50	LARGE
Austria	Niederöstereich	Korneuburg	Korneuburg	Tankfarm Mare	industrial site	Mineralöllager	1930-1990	Mineralöl	4	10.000	50	LARGE
Austria	Niederöstereich	Mödling	Vösendorf	refinery Vösendorf	industrial site	Mineralöl-Raffinerie	1920-1960	Mineralöl, PAK	4,5	145.000	50	LOW
Austria	Wien	11. Simmering	Wien	EBS-BP-TKV	industrial site	Mineralöllagerung,	end of 19th century-1989	Mineralöl, CKW	5	200.000	50	LOW
Austria	Wien	11. Simmering	Wien	Gas works Simmering	industrial site	Gaswerk	1900-1975	PAK, Cyanid, Mineralöl,	5	325.000	50	LOW
Austria	Wien	11. Simmering	Wien	Teerag-Asdag-Simmering	industrial site	Teerverarbeitung	1914-1989	PAK, Phenole, BTX	5	130.000	50	LOW
Austria	Wien	22. Donaustadt	Wien	Tankfarm Lobau	industrial site	Tanklager für Mineralölpro	1934-1989	Mineralöl, Kohlenwasserst	5	1.000.000	50	LOW
Austria	Wien	23. Liesing	Wien	Siebenhirten	industrial site	Chemische Grundstoffin	ca. 1828-1989	Cyanid, Kohlenwasserst	5	150.000	50	LOW

Appendix 2:
Result of the ranking of the sites classified by contaminated volume (All Danubian sites))

Rank	Country	Region	county	communit	location/ name	deposit type	capacity in m³	Risk value n	Risk Potential according old m1
1	Hungary	Central Transdanubian Environmental Iinspectorates Area		Dunaújváros	Dunaferr Inc.	industrial sewage sludge	1.500.000	5	55
2	Germany		Stadt Straubing	Stadt Straubing	Deponie Peterswöhrd		1.450.000	5,0	55
3	Romania		Sibiu		Copsa Mica	industrial waste	1.350.000	5	55
4	Romania		Hunedoara		Calan	slag and ash pond	1.300.000	5	55
5	Romania		Hunedoara		Calan	slag and ash pond	1300000	5	55
6	Slovakia				ZSNP, Ziar n./Hronom	alkaline water	1000000	5	55
7	Slovakia				A.S.A. Zohor	deposit of mixed danger waste	350000	5	55
8	Slovakia				Skladka odpadov OFZ, Siroka	deposit of industrial arsenical waste	600000	5	55
9	Ukraine				The Odessa area Izmail Cellulose cardboard combine		200.000	5	55
10	Ukraine				The Odessa area Izmail Cellulose cardboard combine		23300 per day	4	55
11	Austria	Kärnten	Sankt Veit an der Glan	Althofen	Landfill Roßwiese	Industriemüll	500.000	5,0	50
12	Austria	Kärnten	Sankt Veit an der Glan	Brückl	lime dump site Brückl I/II	Industrieabfälle, Bauschutt, Aushubmaterial	250.000	4,5	50
13	Austria	Tirol	Schwaz	Pill, Weer	Landfill Pill	Hausmüll, Bauschutt, Industrie-/Gewerbemüll	1.000.000	4,0	50
14	Austria	Niederöstereich	Tulln	Tulln	Landfill Tulln	Hausmüll, Bauschutt, Industrie-/Gewerbemüll	200.000	3,5	50

Rank	Country	Region	county	community	location/ name	deposit type	capacity in m³	Risk value r0	Risk Potential according old m1
15	Hungary	Central Transdanubian Environmental Iinspectorates Area		Ajka	Bakonyi Erőmű Inc.	gray sludge	15.000.000	4	49
16	Romania		Bacau		Letea Veche	slag and ash pond	13.150.000	4	49
17	Hungary	Middle Danube Environmental Inspectorates area		Lőrinci	Fixon Bt.-Humiron Ltd.	slag and dust ash	5.000.000	4	49
18	Hungary	North Hungarian Environmental Inspectorate Area		Tiszaújváros	AES borsodi Energetikai Ltd Tiszapalkonyai Hőerőmű		1.400.000	4	49
18	Hungary	Middle Tisa Environmental Inspectorates Area		Szolnok	Béghin-Say Cukorgyár Inc.(technology waste-water thickerer)	waste water sludgein lake	1.300.000	4	49
20	Romania		Teleorman		Tumu Magurele	pyrite ash pond	1.900.000	4	49
21	Romania		Sibiu		Copsa Mica	industrial wastes	1350000	4	49
22	Slovakia				CHEMKO, Strazske	leach out during flood	800000	4	49
23	Slovakia				DUSLO, Šala	sludge bed	750000	4	49
24	Slovakia				CHEMKO, Strazske	leach out during	600000	4	49
25	Romania		Dolj		Calafat	slag and ash pond	655.000	4	49
26	Slovakia				PETROCHEMA, Predajna	overspill by heavy raining	120000	4	47
27	Slovakia				ENO, Zemianske Kostolany	deposit of fly-ash	300000	4	47
28	Slovakia				KOVOHUTY, Krompachy	leach out during flood	285000	4	47
29	Slovakia				BUKOCEL, Vranov n.Toplou	leach out during flood	153000	4	47
30	Germany		Dillingen	Dillingen	Hühnerwörth		470.000	4,0	47

Rank	Country	Region	county	community	location/ name	deposit type	capacity in m³	Risk value r0	Risk Potential according old m1
31	Hungary	Central Transdanubian Environmental Iinspectorates Area		Dunaújváros	Dunapack Inc.	mix sludge	212.000	4	47
32	Hungary	North Hungarian Environmental Inspectorate Area		Tiszaújváros	Tisa Chemical Self-contained plant		211.000	4	47
33	Slovakia				Skladka TKO, Turzovka	leaking tube line	105000	4	47
34	Slovakia				Teplaren, Povazska Bystrica	closed deposit of fly-ash of refuse inicinerating plant	345000	4	47
35	Romania		Dolj		Calafat	industrial waste	435.000	4	47
36	Hungary	North Hungarian Environmental Inspectorate Area		Mezőkövesd Air	Mezőkövesd – „B" area Old Fuel depot		300.000 and 60.000	4	47
37	Hungary	Middle Danube Environmental Inspectorates area			Budapest, Csepel-island Nord	Abandon sewage sludge depots	300.000	4	47
38	Slovakia			A.S.A. Zohor	deposit of danger waste, oil waste		350.000	4	47
39	Slovakia			Predajna	deposit of gudrons PETROCHEMA		120.000	4	47
40	Austria	Kärnten	Villach Land	Ferndorf	Industrial deposit Heraklithwerke Ferndorf	Industrieabfälle	500.000	3,5	42
41	Slovakia				NCHZ, Novaky	deposit of calc-sludge	12000000	3	40
42	Hungary	Upper Danube Environmental Inspectorates area			Almásfüzitő 03/29,30,31	VII. Reservoir for red-dross	3.250.000	3	40
43	Hungary	Central Transdanubian Environmental Iinspectorates Area		Ajka	MAL Inc. I-VIII. store, reclaimed	red dross settlements	29.000.000	3	40
44	Romania		Hunedoara		Mintia	slag and ash pond	9700000	3	40
45	Hungary	Upper Danube Environmental Inspectorates area			Almásfüzitő 06/8	VI. Reservoir for red-dross	1.800.000	3	40

Rank	Country	Region	county	community	location/ name	deposit type	capacity in m³	Risk value r0	Risk Potential according old m1
46	Hungary	Upper Danube Environmental Inspectorates area			Neszmély 0125	VIII. Reservoir for red-dross	5.000.000	3	40
47	Hungary	Upper Danube Environmental Inspectorates area			Almásfüzitő 118	III. Reservoir for red-dross	1.000.000	3	40
48	Hungary	Upper Danube Environmental Inspectorates area			Almásfüzitő 06/10	V. Reservoir for red-dross	800.000	3	40
49	Hungary	Upper Danube Environmental Inspectorates area			Almásfüzitő 06/12	IV. Reservoir for red-dross	600.000	3	40
50	Hungary	Middle Tisa Environmental Inspectorates Area		Szolnok	TVM Inc. (waste of chemical industry)	polluted earth	600.000	3	40,0
51	Hungary	Körös Environmental Inspectorates Area		Békéscsaba	Establishmen organic waste	reclaimed waste storage	780.000	3	40
52	Hungary	Middle Danube Environmental Inspectorates area		Budapest, XXII. Harangozó u.	Metallochemia	metalslag	650.000	3	40
53	Slovakia				DROTOVNE, Hlohovec	Fe- sludge bed	160000	3	37
54	Hungary	Environmental Inspectorates			Almásfüzitő 119/11 Hrsz	I-II Reservoir for red-dross	450.000	3	37
55	Slovakia				TKO, Kysucke Nove Mesto	closed deposit of fouling industrial sludge	150000	3	37
56	Hungary	North Hungarian Environmental Inspectorate Area		Tarnaszentmári	MH – Tarnaszentmária Fuel depot		69.000 and 69.000	4	37
57	Hungary	North Hungarian Environmental Inspectorate Area		Mezőkövesd Hrs	MH – Mezőkövesd Fuel depot „K" area		52.500 and 67.500	4	37
58	Hungary	Middle Danube Environmental Inspectorates area			Tököl		308000 and 209.900	3	37
59	Romania		Dambovita		Doicesti	slag and ash pond	500.000	3	37
60	Romania		Tulcea		Turcoaia	sterile pond	440000	3	37

Rank	Country	Region	county	community	location/ name	deposit type	capacity in m³	Risk value r0	Risk Potential according old m1
61	Romania		Dolj		Calafat	industrial wastes	435000	3	37
62	Hungary	South Transdanubian Environmental Inspectorates Area		Mohács		settlement waste	370.000	3	37
63	Hungary	South Transdanubian Environmental Inspectorates Area		Barcs		settlement waste	300.000	3	37
64	Hungary	Körös Environmental Inspectorates Area		Gyula	Establishmen organic waste		273.773	3	37
65	Hungary	Middle Tisa Environmental Inspectorates Area		Jászberény	ELEKTROLUX - LEHEL Ltd WDS-1 (waste of chemical industry)	polluted earth	155.000	3	37,0
66	Hungary	South Transdanubian Environmental Inspectorates Area		Harkány		settlement waste	114.000	3	37
67	Hungary	South Transdanubian Environmental Inspectorates Area		Siklós		settlement waste	112.000	3	37

Appendix 3: Result of the ranking of the Austrian sites dassified by surface area using the adapted methodology

Rank	Country	Region	county	communit	location/ name	Endangered by Floods, Flood frequency	river	area in s	Risk value r0	Risk Potential according old m1	Risk Potential according new m1
1	Austria	Wien	22. Donaustadt	Wien	Tankform Lobau	1	Danube	1.000.000	5,0	50	59,00
2	Austria	Wien	11. Simmering	Wien	Gas works Simmering	1	Danube	325.000	5,0	50	58,00
3	Austria	Wien	11. Simmering	Wien	EBS-BP-TKV	1	Danube	200.000	5,0	50	58,00
4	Austria	Wien	23. Liesing	Wien	Siebenhirten	1	Liesing	150.000	5,0	50	58,00
5	Austria	Wien	11. Simmering	Wien	Teerag-Asdag-Simmering	1	Danube	130.000	5,0	50	58,00
6	Austria	Niederösterreich	Korneuburg	Korneuburg	refinery Tuttendorfer Breite	1	Danube	180.000	4,5	50	58,00
7	Austria	Niederösterreich	Korneuburg	Korneuburg	Shipyard Korneuburg	3	Danube	200.000	4,0	50	57,00
8	Austria	Niederösterreich	Mödling	Vösendorf	refinery Vösendorf	1	Petersbach	145.000	4,5	50	57,00
9	Austria	Kärnten	Klagenfurt	Klagenfurt	Leather factory Neuner	1	Glan	120.000	4,5	50	57,00
10	Austria	Kärnten	Sankt Veit an der Glan	Brückl	Donau Chemie Brückl	2	Gurk	50.000	5,0	50	56,00
11	Austria	Niederösterreich	Korneuburg	Korneuburg	Tankform Mare	3	Danube	10.000	4,0	50	51,00

Appendix 4: Result of the ranking of the sites classified by volume using the adapted methodology

Rank	Country	Region	county	community	location/ name	deposit type	capacity in m³	Risk value r0	Risk Potential according old m1	Risk Potential according new m1
1	Hungary	Central Transdanubian Environmental Inspectorates Area		Dunaújváros	Dunaferr Inc.	industrial sewage sludge	1.500.000	5	55	57
2	Germany		Stadt Straubing	Stadt Straubing	Deponie Peterswöhrd		1.450.000	5,0	55	57
3	Romania		Sibiu		Copsa Mica	industrial waste	1.350.000	5	55	57
4	Romania		Hunedoara		Calan	slag and ash pond	1.300.000	5	55	57
5	Romania		Hunedoara		Calan	slag and ash pond	1300000	5	55	57
6	Slovakia				ZSNP, Ziar n./Hronom	alkaline water	1000000	5	55	55
7	Slovakia				A.S.A. Zohor	deposit of mixed danger waste	390000	5	55	55
8	Slovakia				Skladka odpadov OFZ, Siroka	deposit of industrial arsenical waste	600000	5	55	55
9	Austria	Kärnten	Sankt Veit an der Glan	Althofen	Landfill Roßwiese	Industrieöl	500.000	5,0	50	55
10	Ukraine				The Odessa area Izmail Cellulose cardboard combine		200.000	5	55	55
11	Hungary	Central Transdanubian Environmental Inspectorates Area		Ajka	Bakonyi Erőmű Inc.	gray sludge	15.000.000	4	49	53
12	Romania		Bacau		Letea Veche	slag and ash pond	13.160.000	4	49	53
13	Hungary	Middle Danube Environmental Inspectorates area		Lőrinci	Fixon Bt.-Humiron Ltd.	slag and dust ash	5.000.000	4	49	53
14	Ukraine				The Odessa area Izmail Cellulose cardboard combine		29300 per day	4	56	53

Rank	Country	Region	county	community	location/ name	deposit type	capacity in m³	Risk value r0	Risk Potential according old m1	Risk Potential according new m1
15	Austria	Kärnten	Sankt Veit an der Glan	Brückl	lime dump site Brückl I/II	Industrieabfälle, Bauschutt, Aushubmaterial	250.000	4,5	50	51
16	Hungary	North Hungarian Environmental Inspectorate Area		Tiszaújváros	AES borsodi Energetikai Ltd Tiszapalkonyai Hőerőmű		1.400.000	4	49	50
17	Hungary	Middle Tisa Environmental Inspectorates Area		Szolnok	Béghin-Say Cukorgyár Inc. (technology waste-water thickener)	waste water sludgein lake	1.300.000	4	49	50
18	Austria	Tirol	Schwaz	Pill, Weer	Landfill Pill	Hausmüll, Bauschutt, Industrie-/Gewerbemüll	1.000.000	4,0	50	50
19	Romania		Teleorman		Turnu Magurele	pyrite ash pond	1.900.000	4	49	50
20	Romania		Sibiu		Copsa Mica	industrial wastes	1350000	4	49	50
21	Slovakia				CHEMKO, Strazske	leach out during flood	800000	4	49	49
22	Slovakia				DUSLO, Šala	sludge bed	750000	4	49	49
23	Slovakia				CHEMKO, Strazske	leach out during	600000	4	49	49
24	Romania		Dolj		Calafat	slag and ash pond	655.000	4	49	49

Rank	Country	Region	county	community	location/ name	deposit type	capacity in m³	Risk value r0	Risk Potential according old m1	Risk Potential according new m1
25	Slovakia				PETROCHEMA, Predajna	overspill by heavy raining	120000	4	47	47
26	Slovakia				ENO, Zemianske Kostolany	deposit of fly-ash	300000	4	47	47
27	Slovakia				KOVOHUTY, Krompachy	leach out during flood	266000	4	47	47
28	Slovakia				BUKOCEL, Vranov n.Toplou	leach out during flood	153000	4	47	47
29	Germany		Dillingen	Dillingen	Höhnerwarth		470.000	4,0	47	47
30	Hungary	Central Transdanubian Environmental Inspectorates Area		Dunaújváros	Dunapack Inc.	mix sludge	212.000	4	47	47
31	Hungary	North Hungarian Environmental Inspectorate Area		Tiszaújváros	Tisa Chemical Self-contained plant		211.000	4	47	47
32	Slovakia				Skladka TKO, Turzovka	leaking tube line	105000	4	47	47
33	Slovakia				Teplaren, Povazska Bystrica	closed deposit of fly-ash of refuse inicinerating plant	346000	4	47	47
34	Romania		Dolj		Calafat	slag and ash pond	656000	4	47	47
35	Hungary	North Hungarian Environmental Inspectorate Area		Mezökövesd Air	Mezökövesd – „B" area Old Fuel depot		300.000 and 60.000	4	47	47
36	Hungary	Middle Danube Environmental Inspectorates area			Budapest, Csepel-island Nord	Abanden sewage sludge depots	300.000	4	47	47
37	Slovakia			A.S.A. Zohor	deposit of danger waste, oil waste		350.000	4	47	47
38	Slovakia			Predajna	deposit of gudrons PETROCHEMA		120.000	4	47	47