

The European Union's Tacis programme
for Ukraine

CAPACITY BUILDING IN DONETSK OBLAST FOR WASTE MANAGEMENT - UKRAINE

Report

*Choice of the sites for the Regional
Landfill Programme*



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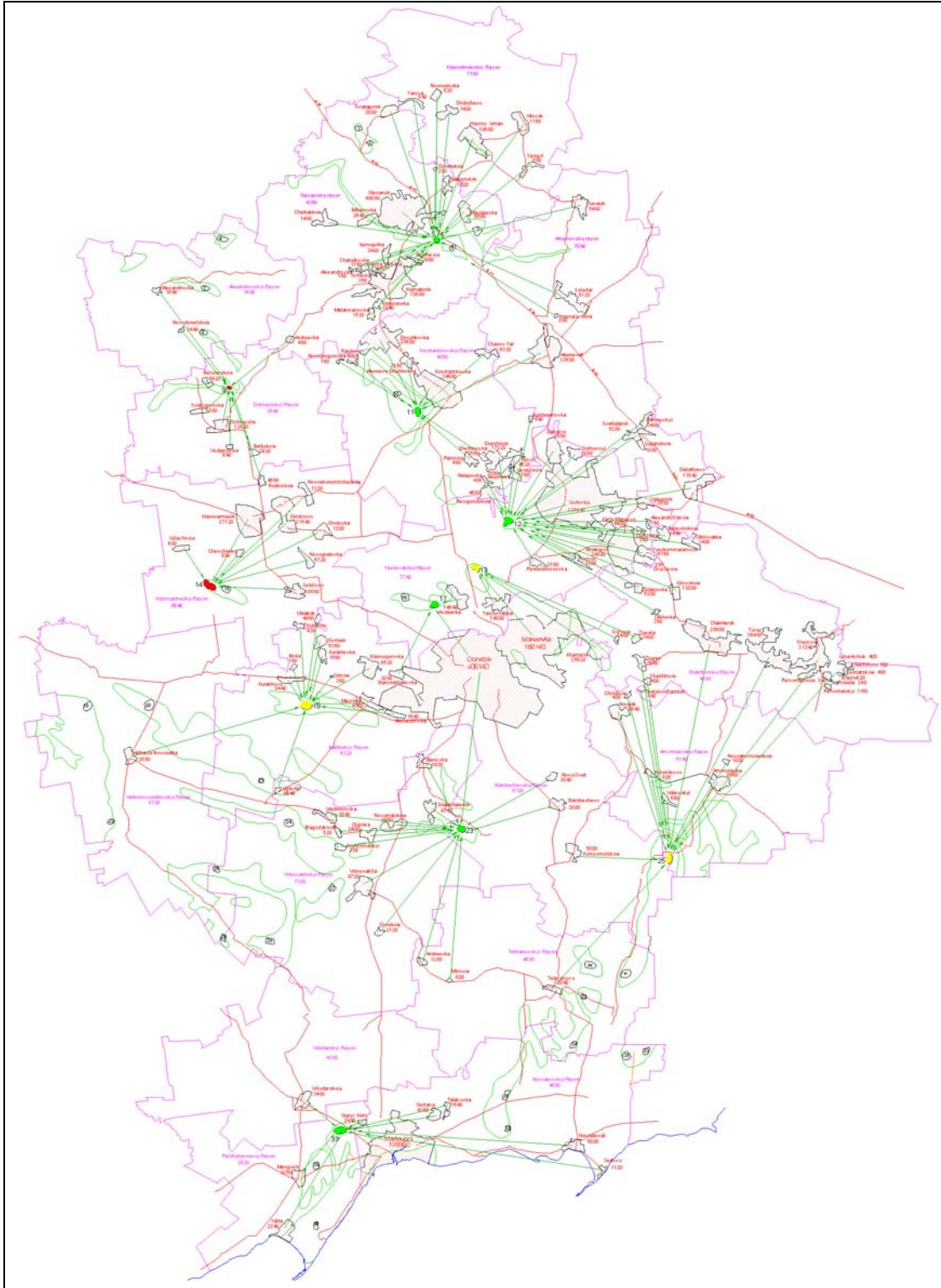
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Summary

The Tacis Project: Capacity building in Donetsk Oblast for Waste Management has studied the location of potential sites for the creation of regional sanitary landfills.

This report develops the used methods and the reasons of the choice of 11 sites able to dispose all the production of municipal waste for the 25 next years in sound and safe conditions. The exact map is printed in A3 at the end of the report.



Context

One of the main strategic tasks of the *Regional Strategic Plan of Solid Household Waste Management for 2005-2009* is the construction of large regional landfills designed for several cities and rayons. The implementation of this task will help achieve **the main goal: to close gradually the numerous dumps heavily polluting the environment (more than 300) used nowadays by cities and rayons of the Oblast and to put into operation large regional sanitary SHW landfills ensuring a maximum protection to the environment.**

Before to proceed with the design documentation and construction regional sanitary landfills, which also will be a key-part of the dossier for the negotiations of the funding, it is necessary to define the large areas of land offering favourable properties, and to breakdown the territory of the Oblast into waste collection zones assigned to a particular landfill. Other questions will further be studied as sources of financing, client of construction, etc. As all these questions are quite complicate, first of all it is necessary to develop a **Programme of construction of SHW regional landfills.**

The first step of all that work programme is: to find potential sites for location of regional landfills.

This report presents the results of activities implemented at this stage aimed at selection of sites for the *Programme of construction of regional landfills.*

The studies for identification of potential zones for selection of preliminary sites for landfills have been carried out with consideration of the following criteria:

1. During the selection of zones the absolute condition has been the sites should meet geological and hydrogeological criteria defined in accordance with European and international standards. That's why the selection of zones **has been limited by the sites** with the subsoil **layer of clay** of 5 m, the permeability ranging from **10^{-6} m/s to $< 10^{-9}$ m/s**, and no sensitive water table. Such sites have been indicated on the map by the state company "Donbass Geology" which was used during the development of the Regional Strategic Plan.
2. Relief: The key-point is **the slope of the site** which is important for the drainage system and leachate collection. It is important that the general slope of the land is 2% hoping it should be the same for the layer of 5 m clay.
3. Availability of roads (there should be an easy access to the site).
4. Distance from housing and national park and natural protected areas.
5. Optimisation of economic parameters: optimisation of landfill capacity: **50000 - 200000 tons/year**; minimum lifetime of the landfill is 25 years; optimisation of transportation between the city/rayon and the landfill calculated in [tons x km].

The studies have been done by steps:

1. Selection of 40 zones which can be interesting for location of landfills based on cartographic data (geological and topographical maps) and the above-mentioned criteria 1,2,3 (sections 1 and 2 of the Report);
2. Visit of 40 potential sites and their visual examination (sections 3 and 4 of the Report).
3. Analysis of data and selection of 11 1st-choice sites with consideration of areas they will service, optimization of transportation routes, the number of inhabitants covered and, thus, the volumes of waste disposed to the landfill (section 5).

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1. Methodology

1.1. Tools and data

1.1.1. Cartographic data

For this study have been used the following maps:

- Geological map established by Donbass Geology for the previous Tacis Project: Improvement of the waste management in Donetsk Oblast

This map locates the areas where there's clay and no sensitive watertable.

The map has been provided on paper at 1/200 000 scale and in electronic files. The working files of Donbass Geology are in the formats .MID and .MIF. These formats are unusual and we could not know which is the software used for that. Donbass Geology provided also an Autocad file [Map_200_Don_TBO.dwg] that our software is unable to open. Donbass Geology provided also Acrobat files corresponding to the paper map and a .jpg file. We have used these last files for the job.

- Topographic maps available on the website www.lib.berkeley.edu

These are the 1/100 000 maps of the former USSR. This maps have been edited in Kiev in 2000 (Aerogeodesia, Novopetcherskyi Bd, B 2, 01042 Kiev) and are available in shops but it remains difficult to find them. Fortunately they have been scanned by the University of Berkeley. The last updates are of 1991. These maps give the topography, the buildings, the roads and paths, the railways, the power lines, the woods and hedges, the rivers, lakes and ponds. They are downloaded in .bmp format. The average size of each one is 18 Mbytes.

These maps are very acute. The only drawbacks are: the scanning is not always perfectly orthogonal; the maps are lightly trapezoidal to take into account the earth curvature.

1.1.2. Software

The "image" maps have been treated with Picture Publisher 7a of Micrografx.

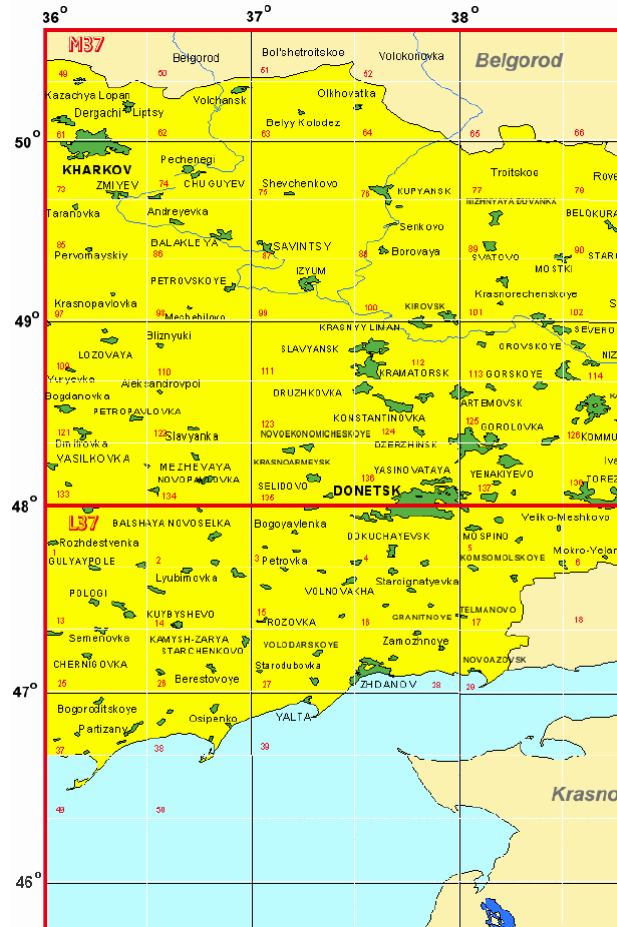
The maps have been worked and made with DesignCAD Pro 5000.

1.2. Working sequence

1.2.1. Preparation of the topographic maps

1.2.1.1. Numbering of the maps

The topographic maps are numbered as X99-999. For the Donetsk Oblast, the numbers are as on Map 1. We have used the maps of the series L37: 002, 003, 004, 005, 006, 007, 014, 015, 016, 017, 018, 026, 027, 029, 029, 039; M37: 099, 100, 101, 110, 111, 112, 113, 122, 123, 124, 125, 134, 135, 136, 137, 138, 139.

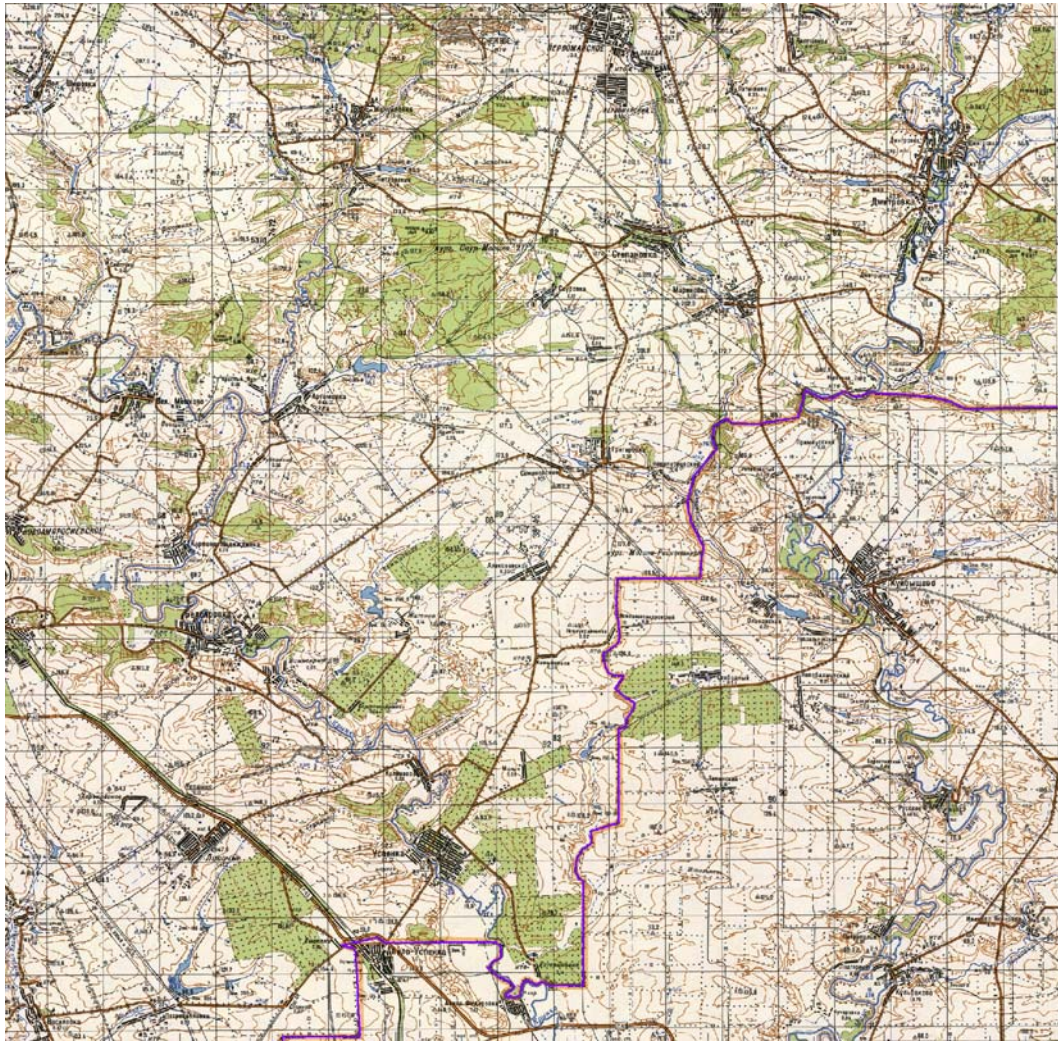


Map 1 Numbering of topographic maps

1.2.1.2. Graphic selection

The maps include a frame and texts as on Map 2. For the superposition with the geological map, all this frame must be trimmed. So the maps are opened with Picture Publisher and trimmed. From several ones, it was necessary to correct the scanning. So the image has been lightly rotated ($<0,2^\circ$) before to be trimmed.

For the following of the job, the border of the Oblast is not very visible. So the border line is plotted with a thick violet line. The result is as on Map 3. The sharp maps are registered with a prefix A as, for instance, AL37-006.

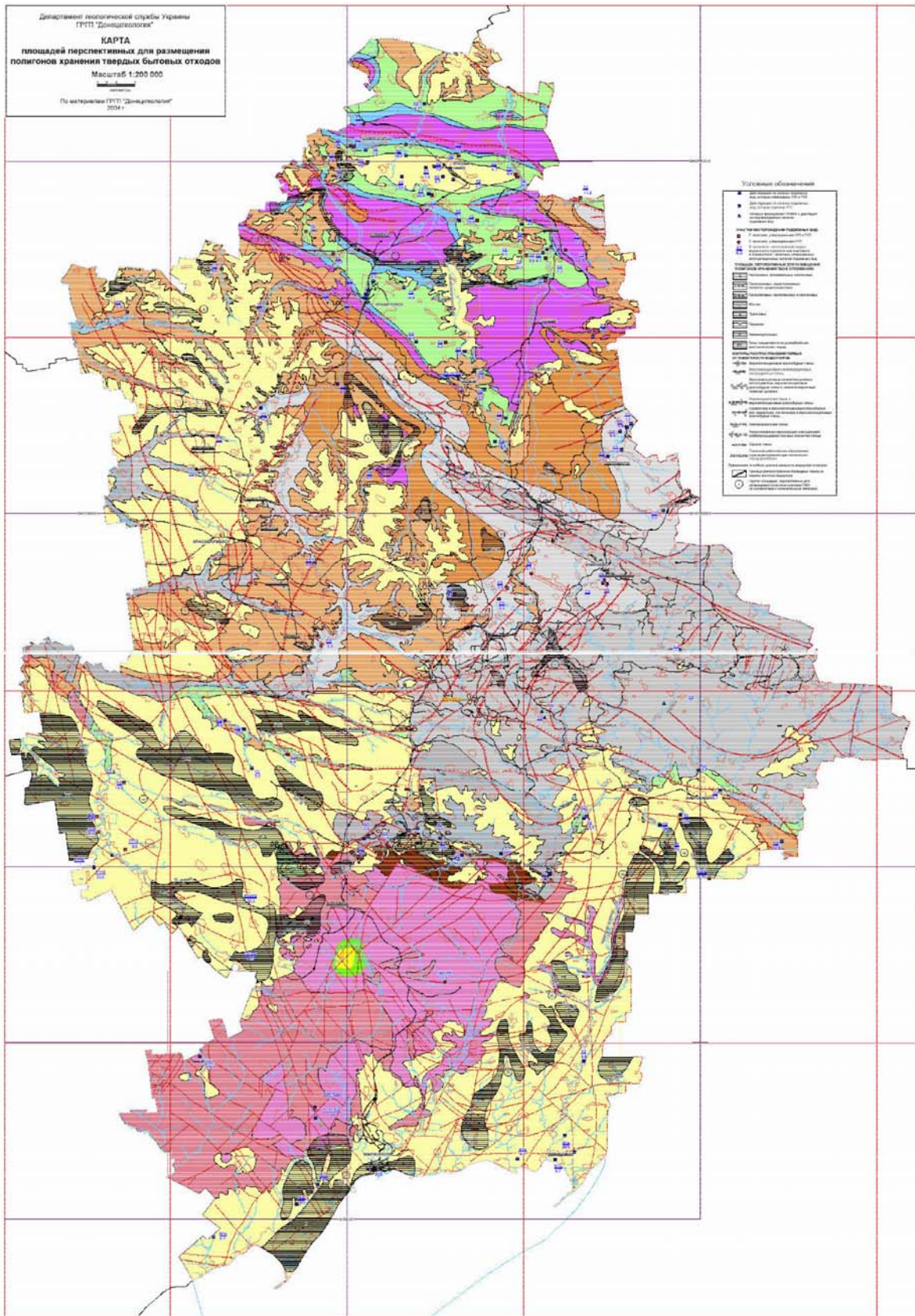


Map 3 Sharp map

1.2.2. Preparation of the geological map

We have used the .JPG file of the map. The map has been opened with Picture Publisher. Fortunately, and it was completely unexpected, the map is cut in squares with the same step that the topographic maps (see Map 4).

So the map has been cut in squares with the same numbering than the topographic maps with the prefix G, as, for instance GL37-006.



Map 4 Geological map

1.3. Superposition

A new file is opened with DesignCAD.

The topographic sharp map is imported. The image is framed with a green orthogonal vector line.

In case there's an Oblast border on the map (or the coast), it is drawn with a pink polygonal line.

Then the geological map is imported. With the scale command, the size of the map is fitted to the topographic map and the maps are superposed.

The favourable areas of the geological map are drawn with a pink curve line. The areas are filled with pink hachures. Then the geological map is deleted.

The areas are studied in aim to detect the zones offering no construction on a wide size (ideally > 2 km). These zones are drawn with a red circle. We have used orange and yellow for interesting locations (proximity of high production of waste) but not so good for the distance from housings.

The maps are registered as DesignCAD files with the number of topographic map.

1.4. Global map

1.4.1. Corrections

All the maps have been assembled in DesignCAD in a global map. This file is not usable as it is 137 Mbytes. The connection from map to map has been checked. It made appear some mistakes or omissions in the drawing of the favourable areas, and some new interesting zones that could not appear on one map for an areas spread on 2 or 3 maps. The corrections have been reported on the relevant unitary maps.

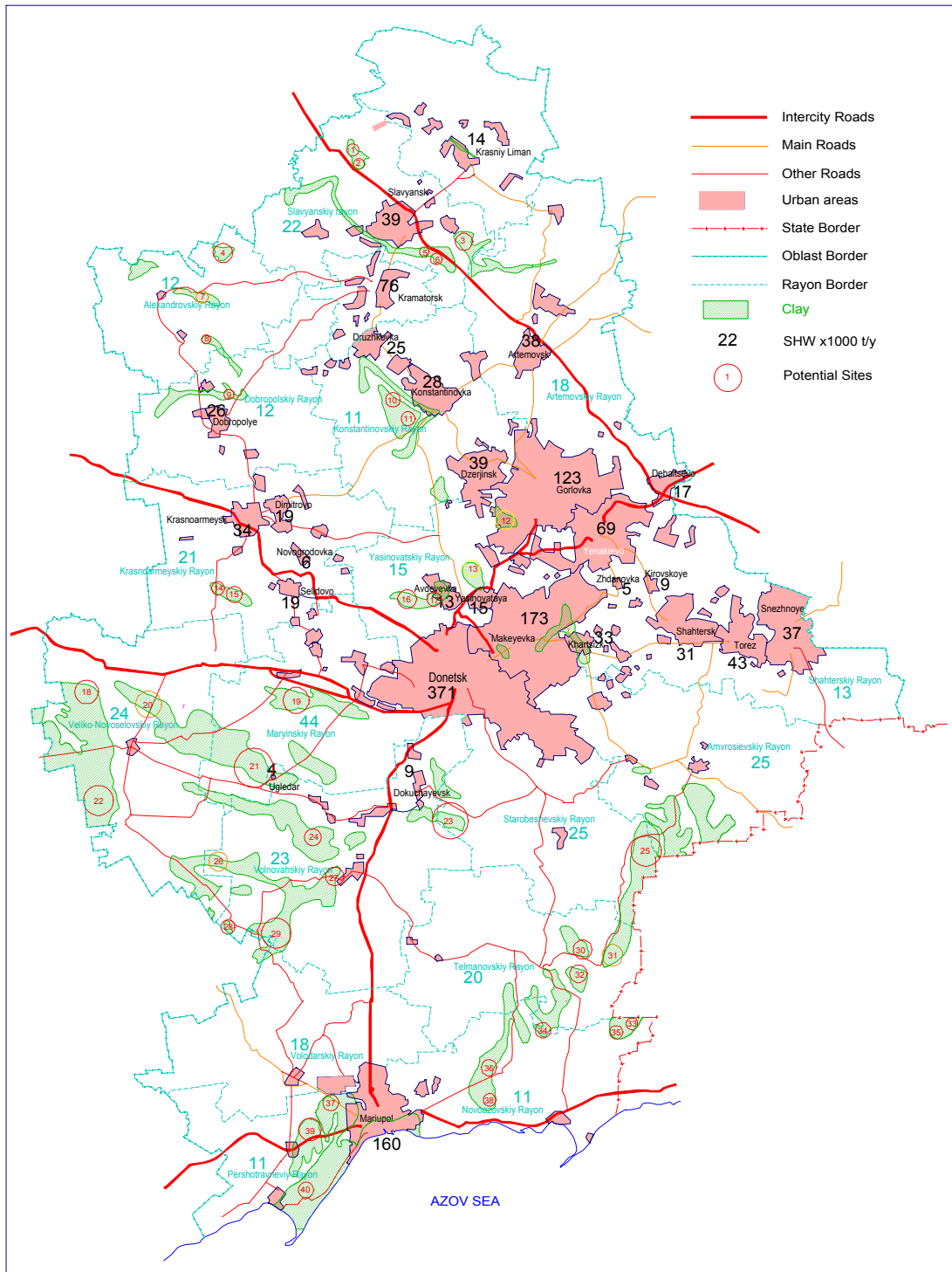
1.4.2. General map of interesting zones

The images of the unitary topographic maps have been deleted in a new DesignCAD file. This map has been superposed with the Oblast geological map already done in the previous Tacis Project as Carte08_Geology_E.dcd. The scales of the 2 maps have been adjusted.

On this map, the favourable areas are drawn and hatched in green. The interesting zones are indicated by red circles (or orange or yellow). They are numbered. The map indicates also the production of solid household waste of each administrative unit.

2. Results

40 interesting zones have been identified (Map 5).



Map 5 General location of the interesting zones

A first general comment is that there's nothing close the group of cities from Yenakievo to Snezhnoye in the Eastern part of the Oblast. The closest interesting zone is in Starobeshevskiy Rayon.

The 40 interesting zones are characterized as:

Zone	Diameter*	Slope	Shape	Comment	Distance from road	Road
	km	%			km	
1	2,0	2,5	Basin		3,0	M19
2	2,4	6,9	Thalweg	Wood	0,0	M19
3	3,6	1,3	Plateau		0,0	
4	2,5	4,4	Thalweg	HT Line	0,6	
5	1,4	4,7	Thalweg		0,5	M19
6	1,7	2,8	Thalweg	Source	0,0	M19
7	1,6	4,3	Hill		0,7	
8	1,9	1,3	Plain	Railway	0,0	
9	2,1	0,0	Plateau		0,4	
10	2,0	2,7	Valley		0,0	
11	2,4	2,8	Valley		0,0	
12	3,1	2,7	Hill	Source	1,8	
13	2,8	2,6	Thalweg	HT Line Source	0,0	P40
14	2,1	1,6	Plain		0,0	
15	2,4	1,4	Plain		0,6	
16	2,9	1,2	Plateau		0,9	
17	2,3	1,3	Plateau		1,7	
18	3,8	1,0	Plain		0,0	
19	3,1	1,3	Plain	HT Line	1,8	
20	3,2	0,9	Plain		0,0	
21	4,2	1,5	Plateau		1,6	
22	5,5	0,0	Plain	Ponds	2,0	
23	3,1	8,0	Plateau		1,1	
24	3,8	1,7	Plateau		0,4	
25	3,7	2,4	Plateau		0,0	
26	2,0	2,6	Thalweg		3,6	
27	2,5	1,1	Plateau		0,0	
28	1,2	2,3	Basin	Railway	2,2	
29	2,1	2,8	Valley	River	0,0	
30	2,9	3,2	Plateau		1,1	
31	3,3	2,2	Plateau		0,7	
32	1,9	0,0	Plateau		0,0	
33	2,6	0,6	Plain		4,2	
34	1,7	2,4	Valley		4,0	
35	2,3	1,8	Plateau		0,0	
36	2,4	3,0	Plateau		0,0	
37	2,3	1,7	Thalweg	Source	0,0	P47
38	2,6	3,5	Plateau		1,5	
39	3,2	2,3	Plateau		0,0	M23
40	3,3	2,1	Hill		1,2	

Diameter: Distance between the closest housings or natural sensitive places

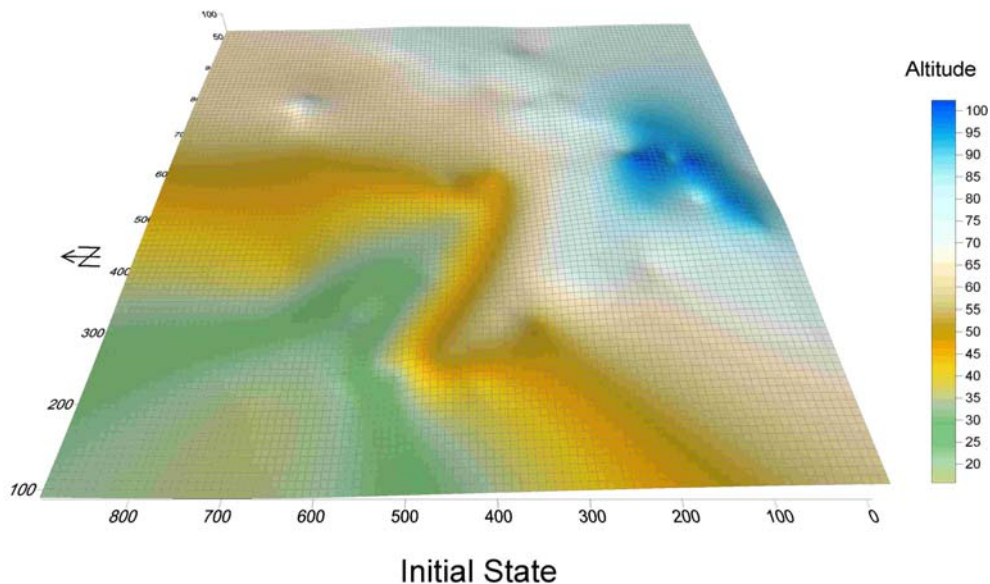
3. Visit of the potential sites

3.1. Principles

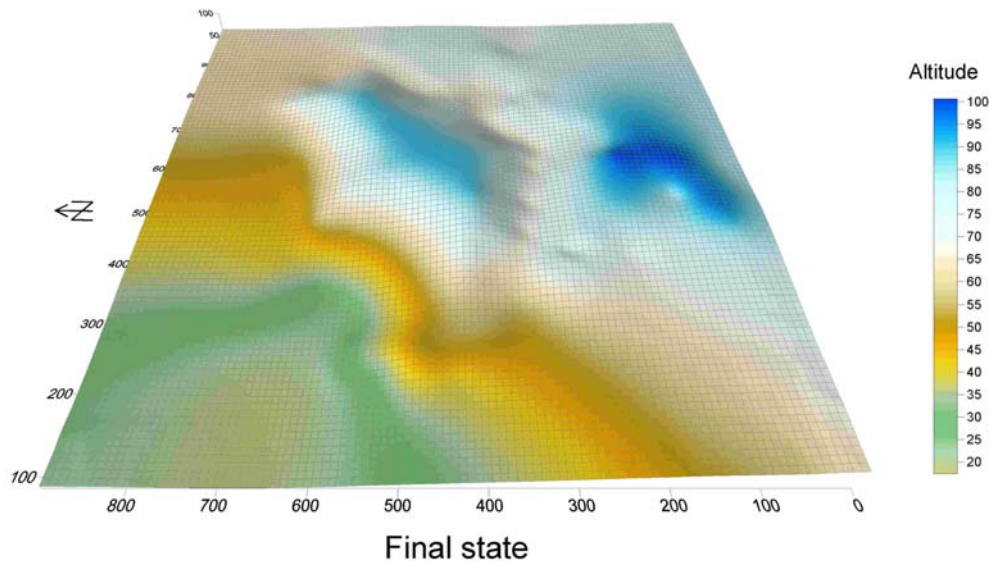
We have limited our investigations to the areas defined by Donbass Geology. The terms of reference we gave them were a subsoil offering a layer of clay with a thickness > 5 m and a permeability < 10^{-6} m/s, if not < 10^{-9} m/s, and the absence of sensitive watertable. We have supposed that the map provided by Donbass Geology respects these criteria and is exhaustive.

A good site for a sanitary landfill must offer several characteristics. It must be easy to access. It must be far from the housings. But the key-point is the slope. The draining complex associating a HDPE geomembrane must have a bottom slope > 2 %, which means for a row of 200 m a difference of level of 4 m. On the other hand, the collection of the leachates all over the landfill must be done by gravity, which is always preferable to any pumping system. It supposes also a slope of 2 %. So we have to obtain a general design with 2 % slopes everywhere always on 5 m clay.

At the end of the operations, the site will be a part of the landscape and must be integrated as well as possible. It's not affordable to let a geometrical pyramid in the plain! The best compromise is to transform a thalweg in a hill (as for instance on the following . A thalweg offers a shape of a natural basin and it will optimise the investment: the cost is roughly proportional to the surface of the landfill and the sale price is proportional to the volume, which means the higher it is the better it is.



Picture 1: Example of design of a landfill



Picture 2: Example of design of a landfill

3.2. Circumstances

The experts were:

Philippe FICHAUX, key-expert of the Project;

Vladislav Nikolaievitch CHUKIN, local expert of the Project.

The experts visited the sites between 06/09/05 and 16/09/05. The weather has been particularly hot and dry, excepted some rain on 14/09/06 in several parts of the Oblast.

The visits have been done as on the following map.

The coordinates have been taken with a GPS Garmin Etrex VISTA C.

The experts used the maps:

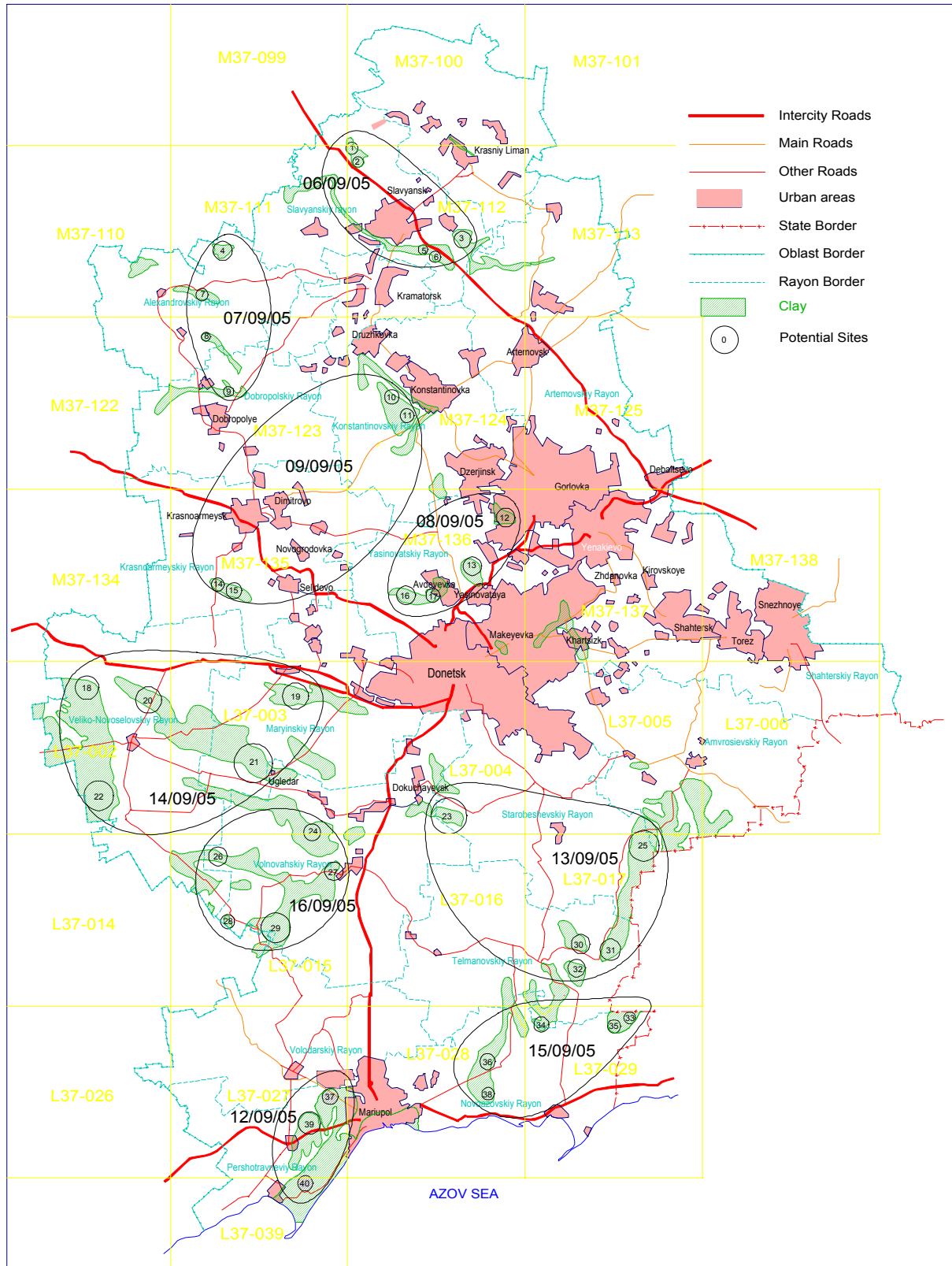
- 1/200,000° map of Donetsk Oblast edited in 2003 by Voenno Kartografitseskaia Fabrika (Kiev);
- 1/100 000° topographic maps of the former USSR available on the website www.lib.berkeley.edu (last updates are of 1991)
- 1/25 000° topographic maps partially covering the territory of the Oblast.

It must be said that the Ukrainian Administration considers always as secret the topographic maps (both 1/100 000° and 1/25 000°). At an era when some of them are downloadable on the net, and when the satellites of several countries have completely mapped the Ukrainian territory with a precision much better than any printed map, and when these maps can be easily provided in Moscow, this secret is still not less than an obstacle to the progress and the economical development.

NOTA

The English names of places are a transcription of the Russian names indicated on the maps.

The codification of the road numbers has been taken on the 1/200,000° map of Donetsk Oblast edited in 2003 by Voenno Kartografitseskaia Fabrika (Kiev).



5. Choice of the sites

5.1. Criteria

In the former part, we have screened the 40 potential sites with ecological criteria: presence of clay, absence of watertable used for human feeding, relief, distance from neighbours, out of ecologically protected areas.

In the following tables, the potential sites are classified by colours as:

	Very interesting
	Interesting
	Not so bad
	Not interesting

Unfortunately, the criterion of the land use cannot be taken into consideration. There's no desert in Donetsk Oblast! More seriously, everywhere it was cultivated land. The only exception should have been to find some former military land but the case didn't happen.

Two main economical criteria must be taken into account.

As it is explained in the "Landfill Manual", there's an optimal size for a landfill that is usually between 50 000 and 200 000 tons per year. Indeed, it's the transportation costs study that will finely determine that. For the moment, we will only eliminate the sites that can receive too little quantities of waste so $< \sim 10\,000$ t/y.

A landfill has at least a 25-year life length. It means that we must pay a particular attention to the transportation costs for 25 years. If we admit that within 10 years, the transportation cost in Donetsk Oblast will be similar to the Western cost, it will be 0.40 UAH/ t.km. So we have calculated the yearly [tons x km] for each relationship [place of production / site].

5.2. Determination of the "best choice" for the potential sites

We must say that we have the number of inhabitants (2004's data) for a list of towns. We have considered that the potential of waste to be landfilled (including non recycled household, commercial and industrial, municipal) will be around 400 kg/inh/y in the towns and 200 kg/inh/y in the rural areas.

We have used the database and software Elektronnaïa Bizness Karta – Donetsk Oblast, of the company Transnavicom - Украина, Киев (бул. Ивана Лепсе, 4), that can be easily purchased in Donetsk. This software allows to calculate the road distance between 2 points, optimizing the trip. So we calculated the distances between each urban area as indicated in the following Table 1 and the closest potential sites.

By this way, we could calculate the [tons x km] for 1 703 400 tons/y on a total of 1 795 880 tons/y, so on 95 % of the tonnage. It's largely enough for the simulations aiming at a choice of several potential sites.

The first calculation takes the lowest figure of [tons x km] whatever is the considered potential site. It minimizes the global cost of transportation.

		2004	t/y	Min	Site
Донецька область	Donetsk oblast	4 720,9	1 795 880		
міські поселення	Urban area	4 258,5	1 703 400		
сільська місцевість	Rural area	462,4	92 480		
Донецьк (міськрада)	Donetsk (city council)	1 021,2	408 140		
міські поселення	Urban area	1 019,5	407 800		
м. Донецьк	Donetsk	1 019,5	407 800	9 665 000	17
сільська місцевість	Rural area	1,7	340		
Авдіївка	Avdeevka	36,6	14 640	211 000	16
Артемівськ (міськрада)	Artiomovsk (city council)	110,8	44 320		
міські поселення	Urban area	110,8	44 320		
м. Артемівськ	Artiomovsk	81,5	32 600	1 105 000	11
м. Соледар	Soledar	12,8	5 120	131 000	3
м. Часів-Яр	Chasov-Yar	15,8	6 320	172 000	11
сmt. Красна Гора	Krasna Gora settlement	0,7	280	9 000	6
Вугледар	Ugledar	16,6	6 640	42 000	21
Горлівка (міськрада)	Gorlovka (City council)	305,2	121 560		
міські поселення	Urban area	302,6	121 040		
м. Горлівка	Gorlovka	283,3	113 320	3 105 000	12
сmt. Гольмівський	Golmivskiy settlement	7,5	3 000	113 000	12
сmt. Зайцеве	Zaitsevo settlement	3,9	1 560	51 000	12
сmt. Пантелеймонівка	Panteleimonovka settlement	7,9	3 160	57 000	12
сільська місцевість	Rural area	2,6	520		
Дебальцеве (міськрада)	Debaltsevo (City council)	50,6	20 240		
міські поселення	Urban area	50,6	20 240		
м. Дебальцеве	Debaltsevo	29,1	11 640	670 000	12
м. Світлодарськ	Svetlodarsk	13,0	5 200	305 000	12
сmt. Миронівський	Mironovskiy settlement	8,5	3 400	216 000	12
Дзержинськ (міськрада)	Dzerzhinsk (City council)	83,3	32 620		
міські поселення	Urban area	79,8	31 920		
м. Дзержинськ	Dzerzhinsk	41,3	16 520	314 000	12
м. Артемове	Artiomovo	6,4	2 560	47 000	12
сmt. Кірове	Kirovo settlement	11,3	4 520	94 000	12
сmt. Курдюмівка	Kurdiumovka settlement	1,1	440	13 000	12
сmt. Ленінське	Leninskoye settlement	1,9	760	15 000	12
сmt. Неліпівка	Nelipovka settlement	1,2	480	7 000	12
сmt. Новгородське	Novgorodskoye settlement	11,5	4 600	45 000	12
сmt. Петрівка	Petrovka settlement	1,2	480	13 000	11
сmt. Щербинівка	Scherbinovka settlement	3,9	1 560	36 000	11
сільська місцевість	Rural area	3,5	700		
Димитров (міськрада)	Dimitrov (City council)	54,6	21 640		
міські поселення	Urban area	53,6	21 440		
м. Димитров	Dimitrov	53,6	21 440	720 000	14
сільська місцевість	Rural area	1,0	200		
Добропілля (міськрада)	Dobropoliye (City council)	69,4	27 740		
міські поселення	Urban area	69,3	27 720		
м. Добропілля	Dobropoliye	34,5	13 800	110 000	9
м. Білицьке	Belitskoye	9,8	3 920	74 000	9
м. Білозерське	Beloziorskoye	17,3	6 920	32 000	9
сmt. Водянське	Vodianskoye	1,6	640	15 000	9
сmt. Новодонецьке	Novodonetskoye settlement	6,1	2 440	47 000	9
сільська місцевість	Rural area	0,1	20		
Докучаєвськ (міськрада)	Dokuchaevsk (City council)	24,8	9 740		
міські поселення	Urban area	23,9	9 560		
м. Докучаєвськ	Dokuchaevsk	23,9	9 560	133 000	23
сільська місцевість	Rural area	0,9	180		
Дружківка (міськрада)	Druzhkovka (City council)	73,7	29 320		
міські поселення	Urban area	72,9	29 160		
м. Дружківка	Druzhkovka	63,5	25 400	526 000	10

		2004	t/y	Min	Site
с.мт.Олексієво-Дружківка	Olekseevo-Druzhkovka settlement	7,9	3 160	31 000	10
с.мт. Новогригорівка	Novogrigorovka settlement	0,4	160	3 000	10
с.мт. Новомиколаївка	Novonikolaevka settlement	0,1	40	1 000	10
с.мт. Райське	Raiskoye settlement	1,0	400	7 000	10
сільська місцевість	Rural area	0,8	160		
Єнакієве (міськрада)	Enakievo (City council)	153,9	60 820		
міські поселення	Urban area	150,2	60 080		
м. Єнакієве	Enakievo	98,8	39 520	1 510 000	12
м. Вуглегірськ	Uglegorsk	9,7	3 880	177 000	12
м. Юнокомунарівськ	Yunokomunarovsk	16,9	6 760	293 000	12
с.мт. Булавинське	Bulavinskoye settlement	3,6	1 440	70 000	12
с.мт. Дружне	Druzhnoye settlement	0,7	280	13 000	12
с.мт. Карло-Марксове	Karlo-Marksovo settlement	11,0	4 400	156 000	12
с.мт. Корсунь	Korsun settlement	3,0	1 200	31 000	12
с.мт. Олександрівське	Oleksandrovskoye settlement	1,9	760	34 000	12
с.мт. Оленівка	Olenovka settlement	0,9	360	15 000	12
с.мт. Ольховатка	Olkhovatka settlement	3,5	1 400	59 000	12
с.мт. Прибережне	Pribrezhnoye settlement	0,2	80	4 000	12
сільська місцевість	Rural area	3,7	740		
Жданівка (міськрада)	Zhdanovka (City council)	14,2	5 660		
міські поселення	Urban area	14,1	5 640		
м. Жданівка	Zhdanovka	13,2	5 280	250 000	12
с.мт. Вільхівка	Olkhovka settlement	0,9	360	20 000	12
сільська місцевість	Rural area	0,1	20		
Кіровське	Kirovskoye	30,0	12 000	658 000	12
Костянтинівка	Konstantinovka	91,0	36 400	262 000	11
Краматорськ (міськрада)	Kramatorsk (City council)	211,2	84 320		
міські поселення	Urban area	210,4	84 160		
м. Краматорськ	Kramatorsk	176,7	70 680	1 286 000	5
с.мт. Біленьке	Belenkoye settlement	9,9	3 960	42 000	5
с.мт. Комишуваха	Komyshvakha settlement	0,5	200	12 000	5
с.мт. Красноторка	Krasnotorka settlement	3,1	1 240	54 000	5
с.мт. Малотаранівка	Malotaranovka settlement	3,8	1 520	54 000	5
с.мт. Олександрівка	Aleksandrovka settlement	0,4	160	3 000	1
с.мт. Софіївка	Sofievka settlement	0,9	360	17 000	5
с.мт. Шабельківка	Shabelevka settlement	4,4	1 760	87 000	5
с.мт. Ясна Поляна	Yasna Poliana settlement	2,2	880	41 000	5
с.мт. Ясногірка	Yasnogorka settlement	8,5	3 400	74 000	5
сільська місцевість	Rural area	0,8	160		
КраснийЛиман(міськрада)	Krasnyy Liman (City council)	28,0	10 940		
міські поселення	Urban area	26,7	10 680		
м. Красний Лиман	Krasnyy Liman	26,7	10 680	300 000	3
сільська місцевість	Rural area	1,3	260		
Красноармійськ (міськрада)	Krasnoarmeisk (City council)	81,5	32 600		
міські поселення	Urban area	81,5	32 600		
м. Красноармійськ	Krasnoarmeisk	67,8	27 120	518 000	14
м. Родинське	Rodinskoye	11,7	4 680	119 000	9
с.мт. Шевченко	Shevchenko settlement	2,0	800	9 000	14
сільська місцевість	Rural area	0,0	0		
Макіївка (міськрада)	Makeevka (City council)	421,5	168 140		
міські поселення	Urban area	419,2	167 680		
м. Макіївка	Makeevka	379,5	151 800	4 402 000	13
с.мт. Велике Оріхове	Velikoye Orekhovo settlement	0,7	280	13 000	13
с.мт. Високе	Vysokoye settlement	0,5	200	10 000	17
с.мт. Вугляр	Vugliar settlement	1,2	480	22 000	13
с.мт Грузько-Зорянське	Gruzsko-Zorianskoye settlement	1,5	600	29 000	25
с.мт Грузько-Ломівка	Gruzsko-Lomovka settlement	0,7	280	14 000	25
с.мт. Гусельське	Guselskoye settlement	0,5	200	10 000	13

		2004	t/y	Min	Site
с.м.т. Землянки	Zemlianki settlement	2,1	840	21 000	13
с.м.т. Колосникове	Kolosnikovoye settlement	0,6	240	10 000	13
с.м.т. Красний Окіябр	Krasnyy Oktiabr settlement	1,0	400	19 000	13
с.м.т. Криничне	Krinichnoye settlement	4,6	1 840	64 000	13
с.м.т. Лісне	Lesnoye settlement	0,2	80	4 000	13
с.м.т. Маяк	Mayak settlement	1,2	480	24 000	17
с.м.т. Межове	Mezhevoye settlement	1,3	520	26 000	25
с.м.т. Ніжня Кринка	Nizhniaya Krynka settlement	14,5	5 800	325 000	13
с.м.т. Пролетарське	Proletarskoye settlement	3,5	1 400	67 000	13
с.м.т. Свердлове	Sverdlovo settlement	1,5	600	27 000	13
с.м.т. Ясинівка	Yasinevka settlement	4,1	1 640	54 000	13
сільська місцевість	Rural area	2,3	460		
Маріуполь (міськрада)	Mariupol (City council)	506,6	202 240		
міські поселення	Urban area	505,6	202 240		
м. Маріуполь	Mariupol	484,5	193 800	2 384 000	37
с.м.т. Сартана	Sartana settlement	10,9	4 360	76 000	38
с.м.т. Старий Крим	Staryy Krym settlement	6,1	2 440	29 000	37
с.м.т. Талаківка	Talakivka settlement	4,1	1 640	28 000	38
сільська місцевість	Rural area	1,0	200		
Новгородівка	Novogradovko	16,8	6 720	216 000	14
Селидове (міськрада)	Selidovo (City council)	59,3	23 720		
міські поселення	Urban area	59,3	23 720		
м. Селидове	Selidovo	25,6	10 240	238 000	14
м. Гірник	Gorniak	13,4	5 360	143 000	19
м. Українськ	Ukrainsk	12,4	4 960	163 000	19
с.м.т. Вишневе	Vishnevoye settlement	0,3	120	2 000	14
с.м.т. Комишівка	Komyshyvka settlement	0,5	200	8 000	14
с.м.т. Курахівка	Kurakhovka settlement	3,9	1 560	37 000	19
с.м.т. Гостре	Ostroye settlement	0,9	360	4 000	19
с.м.т. Цукурине	Tsukurino settlement	2,3	920	26 000	19
Слов`янськ (міськрада)	Slaviansk (City council)	144,1	57 640		
міські поселення	Urban area	144,1	57 640		
м. Слов`янськ	Slaviansk	122,7	49 080	560 000	5
м. Святогірськ	Sviatogorsk	5,0	2 000	15 000	1
м. Миколаївка	Nikolaevka	16,4	6 560	97 000	5
Сніжне (міськрада)	Snezhnoye (City council)	78,8	31 340		
міські поселення	Urban area	77,9	31 160		
м. Сніжне	Snezhnoye	55,2	22 080	1 539 000	25
с.м.т. Андріївка	Andreevka settlement	2,3	920	71 000	25
с.м.т. Бражине	Brazhino settlement	0,3	120	9 000	25
с.м.т. Гірницьке	Gorniatskoye settlement	1,2	480	35 000	25
с.м.т. Залісне	Zalesnoye settlement	2,6	1 040	78 000	25
с.м.т. Лиманчук	Limanchuk settlement	1,0	400	30 000	25
с.м.т. Никифорове	Nikiforovo settlement	0,4	160	12 000	25
с.м.т. Первомайський	Pervomaiskiy settlement	2,9	1 160	81 000	25
с.м.т. Первомайське	Pervomaiskoye settlement	0,6	240	16 000	25
с.м.т. Победа	Pobeda settlement	0,6	240	17 000	25
с.м.т. Северне	Severnoye settlement	10,8	4 320	305 000	25
сільська місцевість	Rural area	0,9	180		
Торез (міськрада)	Torez (City council)	91,2	36 480		
міські поселення	Urban area	91,2	36 480		
м. Торез	Torez	68,3	27 320	1 691 000	25
с.м.т. Пелагіївка	Pelageevka settlement	17,9	7 160	472 000	25
с.м.т. Розсипне	Rozslynoye settlement	5,0	2 000	142 000	25
Харцизьк (міськрада)	Khartsyzsk (City council)	111,2	44 260		
міські поселення	Urban area	110,1	44 040		
м. Харцизьк	Khartsyzsk	63,0	25 200	1 159 000	12
м. Зугрес	Zugres	19,2	7 680	456 000	25

		2004	t/y	Min	Site
м. Іловайськ	Ilovaisk	17,1	6 840	274 000	25
смт. Войкове	Voikovoye settlement	0,1	40	2 000	12
смт. Гірне	Gornoye settlement	3,7	1 480	82 000	13
смт. Зуївка	Zuevka settlement	3,5	1 400	80 000	12
смт. Миколаївка	Nikolaevka settlement	0,2	80	4 000	12
смт. Покровка	Pokrovka settlement	0,2	80	3 000	25
смт. Троїцько-Харцизьк	Troitsko-Khartsyzsk settlement	1,1	440	21 000	25
смт. Шахтне	Shakhtnoye settlement	1,0	400	19 000	25
смт. Широке	Shyrokoye settlement	1,0	400	18 000	25
сільська місцевість	Rural area	1,1	220		
Шахтарськ (міськрада)	Shakhtersk (City council)	68,3	26 900		
міські поселення	Urban area	66,2	26 480		
м. Шахтарськ	Shakhtiorsk	56,9	22 760	1 338 000	25
смт. Контарне	Kontarnoye settlement	1,9	760	49 000	25
смт. Московське	Moskovskoye settlement	0,9	360	25 000	25
смт. Сердите	Serditoye settlement	2,0	800	43 000	25
смт. Стіжківське	Stezhkovskoye settlement	4,5	1 800	123 000	25
сільська місцевість	Rural area	2,1	420		
Ясинувата	Yasinovataya	37,0	14 800	317 000	12
Амвросіївський район	Amvrosievskiy rayon	53,0	16 060		
міські поселення	Urban area	27,3	10 920		
м. Амвросіївка	Amvrosievka	21,4	8 560	221 000	25
смт. Войковський	Voikovskiy settlement	1,4	560	11 000	25
смт. Кутейникове	Kuteinikovo settlement	2,0	800	19 000	25
смт. Новоамвросіївське	Novoamvrosievskoye settlement	2,5	1 000	33 000	25
сільська місцевість	Rural area	25,7	5 140		
Артемівський район	Artiomovskiy rayon	51,4	13 520		
міські поселення	Urban area	16,2	6 480		
м. Сіверськ	Seversk	13,7	5 480	134 000	3
смт. Луганське	Luganskoye settlement	2,5	1 000	61 000	6
сільська місцевість	Rural area	35,2	7 040		
Великоновосілівський р-н	Velikonovoselkovskiy rayon	47,8	11 000		
міські поселення	Urban area	7,2	2 880		
смт Велика Новосілка	Velikaya Novoselka settlement	7,2	2 880	41 000	20
сільська місцевість	Rural area	40,6	8 120		
Волноваський район	Volnovakhskiy rayon	90,7	28 980		
міські поселення	Urban area	54,2	21 680		
м. Волноваха	Volnovakha	24,3	9 720	120 000	27
смт. Благодатне	Blagodatnoye settlement	1,3	520	7 000	27
смт. Володимирівка	Vladimirovka settlement	7,1	2 840	41 000	24
смт. Донське	Donskoye settlement	5,3	2 120	43 000	27
смт. Комсомольський	Komsomolskiy settlement	0,5	200	2 000	27
смт. Новотроїцьке	Novotroitskoye settlement	7,4	2 960	81 000	27
смт. Оленівка	Elenovka settlement	4,8	1 920	86 000	27
смт. Ольгинка	Olginka settlement	3,5	1 400	29 000	27
сільська місцевість	Rural area	36,5	7 300		
Володарський район	Volodarskiy rayon	30,6	3 480		
міські поселення	Urban area	8,7	3 480		
смт. Володарське	Volodarskoye settlement	8,7	3 480	38 000	37
сільська місцевість	Rural area	21,9	4 380		
Добропільський район	Dobropolskiy rayon	19,7	4 340		
міські поселення	Urban area	2,0	800		
смт. Святогорівка	Sviatogorovka settlement	2,0	800	6 000	9
сільська місцевість	Rural area	17,7	3 540		
Костянтинівський р-н	Konstantinovskiy rayon	20,3	4 060		
сільська місцевість	Rural area	20,3	4 060		
Красноармійський р-н	Krasnoarveiskiy rayon	36,2	8 840		
міські поселення	Urban area	8,0	3 200		

		2004	t/y	Min	Site
сmt. Гродівка	Grodovka settlement	3,0	1 200	57 000	9
сmt. Новоекономічне	Novoekonomichnoye settlement	3,3	1 320	48 000	9
сmt. Удачне	Udachnoye settlement	1,7	680	32 000	9
сільська місцевість	Rural area	28,2	5 640		
Краснолиманський р-н	Krasnolimanskiy rayon	23,8	7 160		
міські поселення	Urban area	12,0	4 800		
сmt. Дробишеве	Drobishevo settlement	3,5	1 400	33 000	1
сmt. Кіровськ	Kirovsk settlement	2,9	1 160	32 000	3
сmt. Новоселівка	Novoselovka settlement	1,3	520	10 000	1
сmt. Ямпіль	Yampil settlement	2,2	880	16 000	3
сmt. Ярова	Yarova settlement	2,1	840	13 000	1
сільська місцевість	Rural area	11,8	2 360		
Мар'їнський район	Mariinskiy rayon	88,3	29 160		
міські поселення	Urban area	57,5	23 000		
м. Мар'їнка	Mariynka	10,4	4 160	71 000	19
м. Красногорівка	Krasnogorovka	16,3	6 520	158 000	19
м. Курахово	Kurakhovo	21,1	8 440	106 000	19
сmt. Іллінка	Illinka settlement	0,4	160	3 000	19
сmt. Олександрівка	Aleksandrovka settlement	4,1	1 640	37 000	19
сmt. Старомихайлівка	Staromikhailovka settlement	5,2	2 080	56 000	17
сільська місцевість	Rural area	30,8	6 160		
Новоазовський район	Novoazovskiyy rayon	38,3	10 720		
міські поселення	Urban area	15,3	6 120		
м. Новоазовськ	Novoazovsk	12,5	5 000	115 000	34
сmt. Седове	Sedovo settlement	2,8	1 120	33 000	35
сільська місцевість	Rural area	23,0	4 600		
Олександрівський р-н	Aleksandrovskiy rayon	22,3	5 280		
міські поселення	Urban area	4,1	1 640		
сmt. Олександрівка	Aleksandrovka settlement	4,1	1 640	28 000	7
сільська місцевість	Rural area	18,2	3 640		
Першотравневий район	Pershotravneviy rayon	28,6	8 520		
міські поселення	Urban area	14,0	5 600		
сmt. Мангуш	Mangush settlement	8,4	3 360	18 000	39
сmt. Ялта	Yalta settlement	5,6	2 240	34 000	40
сільська місцевість	Rural area	14,6	2 920		
Слов'янський район	Slavianskiy rayon	37,8	10 760		
міські поселення	Urban area	16,0	6 400		
сmt. Андріївка	Andreevka settlement	1,2	480	15 000	6
сmt. Билбасівка	Bilbasovka settlement	6,6	2 640	53 000	5
сmt. Донецьке	Donetskoye settlement	0,7	280	5 000	5
сmt. Райгородок	Raygorodok settlement	3,8	1 520	35 000	5
сmt. Черкаське	Cherkasskoye settlement	3,7	1 480	35 000	2
сільська місцевість	Rural area	21,8	4 360		
Старобешівський район	Starobeshevskiy rayon	54,6	16 740		
міські поселення	Urban area	29,1	11 640		
м. Комсомольське	Komsomolskoye settlement	12,5	5 000	142 000	25
сmt. Новий Світ	Novyy Svet settlement	9,6	3 840	129 000	23
сmt. Старобешеве	Starobeshevo settlement	7,0	2 800	66 000	23
сільська місцевість	Rural area	25,5	5 100		
Тельманівський район	Telmanovskiy rayon	33,7	8 800		
міські поселення	Urban area	10,3	4 120		
сmt. Тельманове	Telmanovo settlement	5,1	2 040	19 000	32
сmt. Андріївка	Andreevka settlement	3,2	1 280	52 000	32
сmt. Мирне	Mirnoye settlement	2,0	800	27 000	32
сільська місцевість	Rural area	23,4	4 680		
Шахтарський район	Shakhtiorskiy rayon	22,8	4 560		
сільська місцевість	Rural area	22,8	4 560		
Ясинуватський район	Yasinovatskiy rayon	29,6	7 740		

		2004	t/y	Min	Site
міські поселення	Urban area	9,1	3 640		
сmt. Верхньоторецьке	Verhknetoretskoye settlement	3,1	1 240	10 000	12
сmt. Желанне	Zhelannoye settlement	1,6	640	15 000	16
сmt. Керамік	Keramik settlement	0,5	200	3 000	13
сmt. Очеретине	Ocheretino settlement	3,9	1 560	27 000	16
сільська місцевість	Rural area	20,5	4 100	44 487 000	

Table 1: Calculation of the minimal tons.km

We get so 44.487 mln tons.km for 1.7 mln tons, so an average distance of transportation by road of 26 km.

But this scheme uses a lot of landfills: 27 landfills (1, 2, 3, 5, 6, 7, 9, 10, 11, 12, 13, 14, 16, 17, 19, 20, 21, 23, 24, 25, 27, 32, 34, 35, 37, 38, 39, 40) with the relevant yearly tonnage:

Site	Tonnage
1	4920
2	1480
3	23320
5	144080
6	1760
7	1640
9	36400
10	29160
11	77360
12	291640
13	167280
14	66640
16	16840
17	410560
19	34080
20	2880
21	6640
23	16200
24	2840
25	127280
27	18840
32	4120
34	5000
35	1120
37	199720
38	6000
39	3360
40	2240
T	1703400

Table 2: Tonnages of landfills optimizing the transportation

Now we select the main landfills as:

Site	Tonnage
5	144080
9	36400
10	29160
11	77360
12	291640
13	167280
14	66640
17	410560
19	34080
25	127280
37	199720

T	1584200
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Table 3: Tonnage of the 11 landfills optimizing the transportation and the size

These 11 landfills optimize the transportation for 88 % of the tonnage.

Now we report these sites on the map of the oblast. We notice that the 10 is very close to the 11 and could be easily suppressed. But on the other hand, the yearly tonnage of Donetsk is so huge that it could be shared between the 17 at the North and the 23 at the South.

In this case, we obtain the following sharing:

Site	Tonnage
5	173800
9	38520
11	106800
12	292880
13	167680
14	66640
17	220620
19	43600
23	243860
25	127920
37	217440
T	1699760

Table 4: Sharing of the tonnage

If we add the tonnage of the rural areas, we obtain the sharing:

Site	Tonnage
5	187980
9	42520
11	111020
12	294860
13	175880
14	75680
17	220790
19	57880
23	256610
25	143120
37	229540
T	1795880

Table 5: Sharing of the tonnage including the rural areas

In details it gives:

Site	Administrative entities	Pop. 1000 inh.	SHW tons/y
	<i>Site Tcherevkovka (Slavianskiy Rayon)</i>		
5	Artiomovsk (City council)	Soledar	12,8
5	Artiomovskiy Rayon	Seversk	13,7
5	Artiomovskiy Rayon	Rural area	35,2
5	Kramatorsk (City council)		211,2
5	Krasnyy Liman (City council)		51,8
5	Slaviansk (City council)		144,1
5	Slavianskiy Rayon		37,8
	Total site	506,6	187 980

Site	Administrative entities		Pop. 1000 inh.	SHW tons/y
	<i>Site Belozerskoie (Dobropolskiy Rayon)</i>			
9	Aleksandrovskiy Rayon		22,3	5 280
9	Dobropoliye (City council)		69,4	27 740
9	Dobropolskiy Rayon		19,7	4 340
9	Krasnoarmeisk (City council)	Rodinskoye	11,7	4 680
9	Slavianskiy Rayon	Andreevka settlement	1,2	480
	Total site		124,3	42 520
	<i>Site Artema (Konstantinovskiy Rayon)</i>			
11	Artiomovsk (City council)		98,0	39 200
11	Druzhkovka (City council)		73,7	29 320
11	Konstantinovka		91,0	36 400
	Total site		262,7	104 920
	<i>Site Troitskoe (Yasinovatskiy Rayon)</i>			
12	Artiomovskiy Rayon	Luganskoye settlement	2,5	1 000
12	Debaltsevo (City council)		50,6	20 240
12	Dzerzhinsk (City council)		83,3	32 620
12	Enakievo (City council)		153,9	60 820
12	Gorlovka (City council)		305,2	121 560
12	Khartsyzsk (City council)		70,5	28 200
12	Kirovskoye		30,0	12 000
12	Konstantinovskiy Rayon		20,3	4 060
12	Yasinovataya		37,0	14 800
12	Zhdanovka (City council)		14,2	5 660
	Total site		767,5	300 960
	<i>Site Kamenka (Yasinovatskiy Rayon)</i>			
13	Makeevka (City council)		421,5	168 140
13	Yasinovatskiy Rayon		29,6	7 740
	Total site		451,1	175 880
	<i>Site Novoelizabetovka (Krasnoarmeskiy Rayon)</i>			
14	Dimitrov (City council)		54,6	21 640
14	Krasnoarmeisk (City council)		69,8	27 920
14	Krasnoarmeiskiy Rayon		36,2	8 840
14	Novogradovko		16,8	6 720
14	Selidovo (City council)		26,4	10 560
	Total site		203,8	75 680
	<i>Site Severnoe (Yasinovatskiy Rayon)</i>			
17	Avdeevka		36,6	14 640
17	Donetsk (City council)		510,6	204 070
17	Mariinskiy Rayon	Staromikhailovka settlement	5,2	2 080
	Total site		552,4	220 790
	<i>Site Dolneie (Mariinskiy Rayon)</i>			
19	Mariinskiy Rayon		83,1	27 080
19	Selidovo (City council)	Urban area	32,9	13 160
19	Ugledar		16,6	6 640
19	Velikonovoselkovskiy Rayon		47,8	11 000
	Total site		180,4	57 880

Site	Administrative entities	Pop. 1000 inh.	SHW tons/y
	<i>Site Dokutchaievsk (Starobeshevskiy Rayon)</i>		
23	Dokuchaevsk (City council)	24,8	9 740
23	Donetsk City council)	510,6	204 070
23	Starobeshevskiy Rayon	42,1	11 740
23	Telmanovskiy Rayon	Urban area	5,2
23	Volnovakhskiy Rayon	90,7	28 980
	Total site	673,4	256 610
	<i>Site Kumanovo (Amvrosievskiy Rayon)</i>		
25	Amvrosievskiy Rayon	53,0	16 060
25	Khartsyzsk (City council)	40,7	16 060
25	Shakhtersk (City council)	68,3	26 900
25	Shakhtiorskiy Rayon	22,8	4 560
25	Snezhnoye (City council)	78,8	31 340
25	Starobeshevskiy Rayon	Komsomolskoye settlement	12,5
25	Telmanovskiy Rayon	28,5	6 720
25	Torez (City council)	91,2	36 480
	Total site	395,8	143 120
	<i>Site Priazovskoie (Pershotravneviy Rayon)</i>		
37	Mariupol (City council)	506,6	202 440
37	Novoazovskiy Rayon	38,3	10 720
37	Pershotravneviy Rayon	28,6	8 520
37	Volodarskiy Rayon	30,6	7 860
	Total site	604,1	229 540
	Donetsk Oblast	4 722,1	1 795 880

Table 6: Sharing of the tonnage including the rural areas (detailed)

At this step, we must comment that the weak points of the sites were:

- Site 9: flat and far from main roads;
- Site 14: the potential area is very flat (0.5 %) and it's not easy to connect to a main road.

It's not really possible to suppress the site 9 that is necessary to cover the needs of the Northwest of the Oblast. But the tonnage of the site 14 could be shared between the site 9, the site 13 and the site 19.

The transportation for the 11 sites can be evaluated as:

		2004	t/y	5	9	11	12	13	14	17	19	23	25	37
Ясна Поляна	Yasna Poliana	2,2	880	41 000										
Ясногірка	Yasnogorka	8,5	3 400	74 000										
сільська місцевість	Rural area	0,8	160											
Красний Лиман	Krasnyy Liman	28,0	10 940											
міські поселення	Urban area	26,7	10 680											
Красний Лиман	Krasnyy Liman	26,7	10 680	402 000										
сільська місцевість	Rural area	1,3	260											
Красноармійськ	Krasnoarmeisk	81,5	32 600											
міські поселення	Urban area	81,5	32 600											
Красноармійськ	Krasnoarmeisk	67,8	27 120						518 000					
Родинське	Rodinskoye	11,7	4 680		119 000									
Шевченко	Shevchenko	2,0	800						9 000					
сільська місцевість	Rural area	0,0	0											
Макіївка	Makeevka	421,5	168 140											
міські поселення	Urban area	419,2	167 680											
Макіївка	Makeevka	379,5	151 800					4 402 000						
Велике Оріхове	Velikoye Orekhovo	0,7	280					13 000						
Високе	Vysokoye	0,5	200					11 000						
Вугляр	Vugliar	1,2	480					22 000						
Грузько-Зорянське	Gruzsko-Zorianskoye	1,5	600					34 000						
Грузько-Ломівка	Gruzsko-Lomovka	0,7	280					17 000						
Гусельське	Guselskoye	0,5	200					10 000						
Землянки	Zemlianki	2,1	840					21 000						
Колосникове	Kolosnikovoye	0,6	240					10 000						
Красний Октябр	Krasnyy Oktiabr	1,0	400					19 000						
Криничне	Krinichnoye	4,6	1 840					64 000						
Лісне	Lesnoye	0,2	80					4 000						
Маяк	Mayak	1,2	480					25 000						
Межове	Mezhevoye	1,3	520					28 000						
Ніжня Кринка	Nizhniaya Krynka	14,5	5 800					325 000						
Пролетарське	Proletarskoye	3,5	1 400					67 000						
Свердлове	Sverdlovo	1,5	600					27 000						
Ясинівка	Yasinevka	4,1	1 640					54 000						
сільська місцевість	Rural area	2,3	460											
Маріуполь	Mariupol	506,6	202 240											
міські поселення	Urban area	505,6	202 240											
Маріуполь	Mariupol	484,5	193 800											2 384 000
Сартана	Sartana	10,9	4 360											126 000
Старий Крим	Staryy Krym	6,1	2 440											29 000
Талаківка	Talakivka	4,1	1 640											53 000
сільська місцевість	Rural area	1,0	200											
Новгородівка	Novogradovko	16,8	6 720						216 000					
Селидове	Selidovo	59,3	23 720											
міські поселення	Urban area	59,3	23 720											
Селидове	Selidovo	25,6	10 240						238 000					
Гірник	Gorniak	13,4	5 360								143 000			
Українськ	Ukrainsk	12,4	4 960								163 000			

		2004	t/y	5	9	11	12	13	14	17	19	23	25	37
Вишневе	Vishnevoye	0,3	120						2 000					
Комишівка	Komyshyvka	0,5	200						8 000					
Курахівка	Kurakhovka	3,9	1 560								37 000			
Гостре	Ostroye	0,9	360								4 000			
Цукурине	Tsukurino	2,3	920								26 000			
Слов'янськ	Slaviansk	144,1	57 640											
міські поселення	Urban area	144,1	57 640											
Слов'янськ	Slaviansk	122,7	49 080	560 000										
Святогірськ	Sviatogorsk	5,0	2 000	70 000										
Миколаївка	Nikolaevka	16,4	6 560	97 000										
Сніжне	Snezhnoye	78,8	31 340											
міські поселення	Urban area	77,9	31 160											
Сніжне	Snezhnoye	55,2	22 080										1 539 000	
Андріївка	Andreevka	2,3	920										71 000	
Бражине	Brazhino	0,3	120										9 000	
Гірницьке	Gorniatskoye	1,2	480										35 000	
Залісне	Zalesnoye	2,6	1 040										78 000	
Лиманчук	Limanchuk	1,0	400										30 000	
Никифорове	Nikiforovo	0,4	160										12 000	
Первомайський	Pervomaiskiy	2,9	1 160										81 000	
Первомайське	Pervomaiskoye	0,6	240										16 000	
Побєда	Pobeda	0,6	240										17 000	
Северне	Severnoye	10,8	4 320										305 000	
сільська місцевість	Rural area	0,9	180											
Торез	Torez	91,2	36 480											
міські поселення	Urban area	91,2	36 480											
Торез	Torez	68,3	27 320										1 691 000	
Пелагіївка	Pelageevka	17,9	7 160										472 000	
Розсипне	Rozslynoye	5,0	2 000										142 000	
Харцизьк	Khartsyzsk	111,2	44 260											
міські поселення	Urban area	110,1	44 040											
Харцизьк	Khartsyzsk	63,0	25 200				1 159 000							
Зугрес	Zugres	19,2	7 680										456 000	
Іловайськ	Ilovaisk	17,1	6 840										274 000	
Войкове	Voikovoye	0,1	40				2 000							
Гірне	Gornoye	3,7	1 480				116 000							
Зуївка	Zuevka	3,5	1 400				80 000							
Миколаївка	Nikolaevka	0,2	80				4 000							
Покровка	Pokrovka	0,2	80										3 000	
Троїцько-Харцизьк	Troitsko-Khartsyzsk	1,1	440										21 000	
Шахтне	Shakhtnoye	1,0	400										19 000	
Широке	Shyrokoye	1,0	400										18 000	
сільська місцевість	Rural area	1,1	220											
Шахтарськ	Shakhtersk	68,3	26 900											
міські поселення	Urban area	66,2	26 480											
Шахтарськ	Shakhtiorsk	56,9	22 760										1 338 000	
Контарне	Kontarnoye	1,9	760										49 000	

		2004	t/y	5	9	11	12	13	14	17	19	23	25	37
міські поселення	Urban area	10,3	4 120											
Тельманове	Telmanovo	5,1	2 040										103 000	
Андріївка	Andreevka	3,2	1 280									56 000		
Мирне	Mirnoye	2,0	800									41 000		
сільська місцевість	Rural area	23,4	4 680											
Шахтарський р.	Shakhtiorskiy R.	22,8	4 560											
сільська місцевість	Rural area	22,8	4 560											
Ясинуватський р.	Yasinovatskiy R.	29,6	7 740											
міські поселення	Urban area	9,1	3 640											
Верхньоторецьке	Verhknetoretskoye	3,1	1 240							43 000				
Желанне	Zhelannoye	1,6	640							18 000				
Керамік	Keramik	0,5	200							5 000				
Очеретине	Ocheretino	3,9	1 560							32 000				
сільська місцевість	Rural area	20,5	4 100											
	TOTAL			3 571 000	598 000	2 400 000	10 084 000	5 153 000	1 711 000	5 247 000	1 114 000	10 276 000	7 396 000	3 174 000

Table 7: Calculation of the tons x km for the 11 sites

With this choice, we obtain a total of 50.724 mln t.km although with the choice of the 27 closest sites it was 44.487 mln t.km, so an increasing of 14%. This choice brings up the average distance to 30 km by road.

The results are reported on the next A3 map.

5.3. Comments

The choice of 11 potential sites as it has been done is a rationale proposition. We have taken into account a maximum of technical criteria and tried to determine the best compromise. But we can't ignore what remain to us as weak points:

1. We have limited our investigations to the geologically favourable areas determined by a third part. There's no favourable area in the East of the Oblast although it's a very populated area.
2. The 11 potential sites must now be studied in aim to precise the geological and hydrogeological local conditions and to establish a preliminary design of a sanitary landfill on each site.

The method has been exposed in this report. So it can be applied to a new area or new potential sites.

In case the detailed studies would highlight a severe counter-indication for a site, it's possible to look for an other site in the same favourable area or to check the neighbour potential sites.