The European Union's Tacis programme

Black Sea Investment Facility

Solid Household Waste Management of the Donetsk Oblast

Pre-Feasibility

Report

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THALES

SOGREAH CONSULTANTS

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Warning

This programme is implemented by the Consortium Thalès EC – GKW Consult - Sogreah. The views expressed in this report do not necessarily reflect the views of the European Commission.

The concept

The main environmental question of the region is: How to reduce the stream of pollution in the Black Sea?

There are 6 countries bordering the Black Sea: Bulgaria, Romania, Ukraine, Russia, Georgia, and Turkey. Three of them are candidates to the adhesion to European Union; three of them are eligible to the Tacis Programme. The candidate countries and the new member states with the help of the European Union, particularly in the framework of programmes of co-operation in the Danube's catchment, do a lot of efforts. But these efforts should stay insufficient without the same efforts in the NIS.

The European Union estimated it should be useful to push these projects and their financing and launched the BSIF Programme. The Black Sea Investment Facility provides studies in aim to facilitate the funding of projects allowing a reduction of the pollution of the Black Sea by the International Financing Institutions.

The target groups

Beneficiary Countries

The beneficiary countries of this investment facility are the three CIS countries bordering the Black Sea (Georgia, Russia and Ukraine), plus Moldova, which is also connected to the Black Sea via its river basins.

IFIs: International Financing Institutions

IFIs involved in the BSIF programme:
World Bank – International Bank for Reconstruction and Development
EBRD – European Bank for Reconstruction and Development
BSTDB – Black Sea Trade and Development Bank
EIB - European Investment Bank

Organisations of the co-operation already existing

BSC Black Sea Commission
BSEP Black Sea Environmental Programme
DABLAS (Danube & Black Sea) Task Force
JEP (Joint Environment Programme) (TACIS)
2001 Regional Environment Programme (EBRD)
Bangkok Facility (EC & EBRD)
MISP (Municipal Investment Support Programme)
GEF Strategic Partnership on the Danube/Black Sea Basin
BSERP Black Sea Ecosystem Recovery Project

Bilateral Donors

Canada, Denmark, France, Germany, Japan, Switzerland, United Kingdom, USA

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Glossary

IFI	International Financing Institutions
Municipal waste	Waste in charge to the municipalities, of the same nature than household waste, but resulting of specific activities as the street cleansing, the parks and garden maintenance, the open air markets
NGO	Non-Governmental Organizations
Private sector	This denomination is used to name the sub-districts made of individual houses, generally equipped with a private garden
Remediation of landfill	Treatment of hazardous landfill, generally including operations as moving of hazardous waste, waterproofing of the bottom, treatment of leachates, treatment of biogas, etc
Sanitary Landfill	Landfill designed and built in aim to protect the environment, according to international standards and regulations
SHW	Solid Household Waste
SHWM	Solid Household Waste Management
Wastery	Facility where the inhabitants can bring all their exceptional (as which has not to be put or which cannot be put in the bin) waste (construction waste, old furniture, scrap metals, toxic waste, …) and where they are separately collected

We can't solve problems by using the same kind of thinking we used when we created them.

Albert EINSTEIN, physicist, Nobel laureate (1879-1955)

Summary and experts' comments

Preliminarily, we would like to emphasize how BSIF understood its mission.

Every bank is wondering: how to lend money without risks? The next step is usually to find borrowers and then to build a lot of guarantees for the reimbursement. IFIs have been designed for sovereign loans to governments, and by the time it became their culture. When they tackle the local self-government bodies, they maintained that by requiring the guarantee of the state.

A loan is negotiated for a project, supposing that the project will generate incomes and that these incomes will provide enough money for the reimbursement. It's so that usually a lot of studies are done aiming to determine if the borrower is sound and if the project is sound. These studies are progressive and the profession uses to do pre-feasibility, feasibility, etc.

Some projects are simple, for instance a municipality wants to renew its park of tramways. Technically, it's easy to determine how much will cost the tramways. Economically, it's easy to determine a tariffs policy, a business plan, and so, demonstrating that the new incomes will be enough. Financially, it's not too heavy to audit the finances of the municipality and to make up his mind about the officials and elected people in aim to avoid corruption. Anyway, the warranty of the Ministry of Finances will be required. It's not more difficult to study projects of water network, water stations, wastewater treatment plants, thermal power plants and networks, etc.

The specificity of the waste management is that it cannot be done at the municipality level (out of the case of incineration which is far too expensive for the countries we speak about). Big municipalities have waste and some means but they have not the territory for the implementation of the treatment facilities (i.e. landfills). Small municipalities have not enough waste for modern technologies (threshold effect). It's why the European Directive has imposed a regional management of waste.

In the countries of BSIF, this regional management has never existed. It's something completely new in the administrative culture. It's so the first Donetsk Project is pursued with a Donetsk 2 and it's already 3.5 years Thalès-Sogreah-GKW are helping the administration to progress. This fact is reflected in the Ukrainian law. There's vaguely a notion of coordination and programming by the region but for all the rest it's "do it yourself" for the municipalities.

Fortunately, and even very fortunately, the Donetsk Oblast has 3 people passionately involved in the project who are today the president of the regional council, the deputy governor in charge of local utilities, and a top rank of the ministry of ecology in Kiev. It's a very close cooperation. Honestly our experts have understood and described all the problems, including the mechanisms of corruption, and are building solutions with the administration. As they worked also on waste management in other regions, they can witness Donetsk is today an exception and the real pilot for Ukraine and neighbours.

So after these 3.5 years what's the situation? There's a project and a good project. But it's a very complex project. It's why we thought necessary to summarize (several thousands pages) the description of the project. Donetsk 1 concluded that by big financial masses it was not stupid. So the pre-feasibility study developed the costs and incomes of the project. A lot of time has been devoted to the carbon funds which appeared as the key of the funding of the project, even if it's 2 lines in a table of the report, there's apart a 170 pages report on the subject. The conclusion, important for the question "is the project financially sound?" is that it's feasible but not easy. It's why BSIF proposed to develop the question with a finance expert during the next months.

The ToR asked to analyse the landfill projects of Donetsk-Makeyevka and Marioupol. The Regional Administration asked to examine its priority projects for Donetsk and Slaviansk because it has 20 mln UAH (> 3mln€) to spend in 2006 for landfill construction. Our experts studied these projects and developed their conclusion in the pre-feasibility study. Nevertheless, the question of the siting of the landfills is not completely solved. Our experts recommend a technical methodology and the locals are always submitted to the temptation to fill forgotten holes. It's why BSIF proposed to develop the question with a landfill expert during the next months.

The ToR of EIB are detailed in > 40 questions. The pre-feasibility study answers all the questions but it could not be by "yes" or "no". We think that the report will be carefully analysed and the cohesion of all the figures will be checked. We paid attention to deliver a high quality study and it's not fair to qualify it as a "copy and paste" study. It's a synthesis within the scope to procure an understanding of the situation and of the project and to headlight what are the conditions to fulfil to make it bankable.

It's clear that for the Donetsk Oblast SHWM project: the borrower is sound; the project is sound; some technical complements must be urgently done. The notion of "urgent" is linked to: the Region has some

money to invest in 2006 and it's necessary to determine what would be the most clever use of it; to benefit at the maximum of the first tranche 2008-2012 of the carbon fund (JI projects) the facilities must be built in 2007.

We apologize we have not proposed an inception report but with only 1 man.month allocated by EIB to the study, it seemed us difficult to divert some days for that.

1. Context

1.1. Terms of reference of the study

Terms of Reference

UKRAINE

Pre-feasibility studies for solid household waste management in the Donetsk Oblast

The pre-feasibility study is to be carried out on behalf of the European Investment Bank (EIB) in the framework of the Black Sea Investment Support Facility (BISF) financed by the European Commission. Its objective is to assist the EIB in project preparation in the solid household waste sector in the Ukraine. It will focus on the background of the solid household waste sector in the Ukrainian region of Donetsk, addressing the issues described below. In addition to the general sector reports, the landfill section will address at least two specific new landfills in the region, in particular relating to paragraph points (3) to (12) inclusive. The two landfills proposed at this stage are Donetsk-Makeyevka and Marioupol, but this is open to modification if necessary.

According to the studies already done in Donetsk Oblast, some items will ask a specific study of the situation. Specifically, the research of sites for new sanitary landfills has been done and 11 sites have been proposed to the Regional Administration. If it agrees on the propositions for Donetsk-Makeyevka and Marioupol, geological and hydrogeological data (and sometimes investigations) will be necessary, that may need several weeks if not months and can only be provided by the Donetsk Geology Service.

The City of Donetsk could be a major stakeholder for the financing of the new sanitary landfill it needs. The City is already discussing loans with IFIs for major projects of improvement of public services (heating network, sewage network, wastewater treatment plant, public transportation). A specific assistance is required to integrate the specific landfill project in a general strategy of finances management of the City.

The study is to be carried out in February to April 2006 and the work required is expected to require a total of 1 man-months (1 SHWM).

The output will include the relevant reports in draft and final form, to be submitted to the EIB in both paper and electronic format. The contact persons for the studies in the EIB are Axel Hörhager, Economist, and Roland Schulze, Engineer.

List of items to be analysed

1. PROBLEM ANALYSIS – summarised description of potential health and environmental risks caused by the current waste management system

2. SECTOR FRAME CONDITIONS AND DEVELOPMENT OF THE WASTE MANAGEMENT SECTOR

General waste management aspects, Legal framework
Administrative structure of the project area, Public/private bodies responsible for collection of waste, for operation and management of the waste disposal facilities
Licensing procedures for waste storage, treatment and disposal facilities
Status of national/regional waste management plans
Strategies to restore and close local, unauthorised waste dumps
Waste management schemes (to be implemented) in the region of the country

3. PROJECT TARGETS, PROJECT MEASURES AND TARGET GROUPS

Total population living in area covered by the project
Share of total population in area that will be served by the project (household waste services)
Share of the average household income representing the charges for the collection and disposal of household waste

4. DESIGN BASIS AND DESIGN CRITERIA, PROJECT AREA, POPULATION, WASTE QUANTITIES

Total quantity of waste generated in the area per year (in m^3 and in tonnes)
Waste quantities collected (household, public organic, hospital, bulky, industrial) in the region
Forecast future evolution of waste quantities, growth rates (%) of waste volumes (households, industry, recycling) in the region

5. WASTE COLLECTION

Current status of waste collection in urban and rural areas (example)
Measures of source separation in urban areas
Recommendations for the Collection System in Rural Areas
Recommendations for Upgrade of Existing Collection System in Urban Areas

6. CONCEPTUAL APPROACH ON DEALING WITH OTHER WASTES RECYCLING AND WASTE TREATMENT MEASURES

Collection and Treatment of Packaging Waste and Other Non-Organic Recyclable Materials
Composting of Organic Waste, Mechanical Biological Treatment

7. TECHNICAL PLANNING TRANSFER STATIONS

General Information on Major Transfer Stations, Basic Data for Transfer Stations
Operation of the Major Transfer Stations

8. TECHNICAL PLANNING SANITARY LANDFILL

General Information on Sanitary Landfill (site conditions, location, Access for traffic, geological situation, topography, surface water, ownership, etc.)
Basic data (required area, Volume of landfill, size and number of landfill cells, phasing, surface and leachate water volumes, etc.)
Description of the Technical Planning Sanitary Landfill
Infrastructure, Base and top sealing system (type of layers etc.), Surface and leachate water collection & treatment system, Landfill gas collection and treatment system
Operation of the Landfill

9. COST ESTIMATES, FINANCING SCHEMES AND FINANCIAL ANALYSIS

PROJECT COSTS (Investment Costs, Operation and Maintenance (O&M) Costs, Working Capital
REVENUES (Disposal fees, Other revenues)
FINANCIAL ANALYSIS (Profitability Analysis, Cash Flow Analysis)

10. SOCIO-ECONOMICAL AND FINANCIAL ASPECTS

Income of the Population in the Project Area

11.AFFORDABILITY + WILLINGNESS TO PAY

Payment collection systems (communal taxes, door-to-door collection?)
Principles of tariff setting in relation to affordability and waste volumes
Share of population that will not be able to afford even minimal tariff
Estimated share of population unwilling to pay for the service

12. ENVIRONMENTAL IMPACT AND RISKS; PRELIMINARY ASSESSMENT

Site location, site area, geological survey of the proposed landfill site,
Preliminary evaluation of the environmental impacts,
Formal requirements for site selection and environmental impact assessment
Permitting procedure and requirements, Methodology of site selection process site selection
Issues of spatial planning and transportation
Environmental impacts,
Description and evaluation of the current situation and the expected environmental impacts

1.2. Previous works

The experts who make the present study have been involved in these recent previous programmes:

- From January 2003 to November 2004 the Tacis Project: Improvement of the Solid Household Waste Management in Donetsk Oblast has been implemented by the consortium Thalès E&C – GKW Consult (so-called Donetsk 1)
- From October 2003 to November 2004 the Tacis Project (Institutional Building Partnership Programme) Development of a Strategy to Harmonise State and Regional Waste Treatment Legal Basis with the EU Standards has been implemented by the consortium BRGM – Ademe.
- Since May 2004 till November 2006 the Tacis Project Black Sea Investment Facility is implemented by the consortium Thalès E&C – GKW Consult – Sogreah (so-called BSIF)
- Since May 2005 till November 2007 the Tacis Project: Capacity Building in Donetsk Oblast for Solid Waste Management is implemented by the consortium Sogreah – GKW Consult – Ademe (so-called Donetsk 2)

The key-issues of Donetsk 1 were:

- Regional Strategic Plan for Solid Household Waste Management of the Oblast of Donetsk 2004-2009, adopted by the Regional Administration and the Regional Council;
- Pilot-project consisting in: experimentation of selective collection (20,000 inhabitants of Slaviansk); provision of equipments for the sorting plant of Kramatorsk; and help to an inter-city management of recyclable waste between Kramatorsk Slaviansk, Druzhkovka.

The key-issues of Donetsk 2 are:

- Development of new schemes of waste management;
- Implementation of Local Action Plans (5-year at cities and rayons level) realizing the objectives of the Regional Strategic Plan
- Pilot-project consisting in: development of selective collection (20,000 inhabitants of Kramatorsk); provision of equipments for the sorting plant of Kramatorsk; and help to an inter-city management of recyclable waste between Kramatorsk Slaviansk, Druzhkovka.

All along Donetsk 1 and 2, the public awareness has greatly improved.

The goals of the improvement of the solid household waste management (SHWM) are:

- To restore the (municipal) waste collection companies:
  - Renewal and extension of the park of equipments and improvement of the organisation in aim to pass from 30% to 100% waste collected
  - Improvement of the recovery of the fees in aim to pass from 30% to 100% fees paid in time
- To implement a park of 10-12 regional sanitary landfills:
  - Capacity to dispose 100% waste generated in safe conditions for the protection of environment and public health
  - Respect of international standards
  - Network of transfer stations and specialized transfer trucks linking the collection to the landfills
- To develop selective collection, recycling activities, public awareness, in aim to reduce as far as possible the production of waste to dispose in landfills

1.3. Principles of the study

The study is based on the Regional Strategic Plan for Solid Household Waste Management of the Oblast of Donetsk 2004-2009. The Regional Strategic Plan is established on the figures of 2002 and 2003. They are updated with 2004 (and sometimes 2005) data.

The Regional Landfill Programme is to be implemented on the period 2006-2015. The 10 to 12 regional landfills cannot be built at once. The programme will be progressively implemented. Donetsk 2 has selected 11 sites that offer favourable conditions and that can optimise the landfilling for the whole oblast. Donetsk 1 has audited the existing landfills and selected the ones that can be reasonably used for a transition period. The study will detail the projects of the landfills that must be built in priority but it cannot detail the projects of the 11 landfills.

2. Problem analysis

2.1. Relevant Project Context

The State Department of Ecology and Natural Resources of the Donetsk Oblast asked in 1999 for a help from the European Union (EU). In 2002 EU, having implemented a tender, entrusted to the consortium Thales EC & GKW the programme EuropeAid/112554/C/SV/UA “Improvement of Solid Domestic Waste Management in Donetsk Oblast of Ukraine” whose beneficiaries are the Ministry of Environment of Ukraine and Donetsk Regional State Administration and whose main recipients are the State Department of Ecology and Natural Resources in Donetsk Oblast and Department of Housing and Public Utility Services of the Regional State Administration. In 2005 EU, having implemented a tender, entrusted to the consortium Sogreah – GKW - Ademe the programme EuropeAid/118732/C/SV/UA “Capacity Building in Donetsk Oblast for Waste Management” whose beneficiaries are the same.

The Donetsk Oblast asked in 1999 the Tacis assistance in aim to improve the Solid Household Waste Management, so it can be considered as a real policy of the Oblast and a long-term project.

The general purpose of this project is to improve the sanitary and ecological state of the region, considered as highly polluted, mainly due to industrial activities. However, the household refuse, and the lack of care about SHW contributes already to a degradation of the ecological situation.

The main assumption of the expert’s team is that the past deterioration of the situation has been caused by a lack of awareness of the waste situation by the population and the political sphere, which has turned in low priorities in economic and organisational decisions. Population was not conscious of the potential health issues, did not care enough about environment, and was reluctant to pay for what was considered up to now as a useless expense. Budget financing by the local administrations put low priority to upgrade facilities, and to offer decent wages to administration staff and workers involved in this sphere. Low revenues made the business not attractive for the private sector.

2.2. Present state of the SHWM

The system began to experience radical changes. The SHWM formerly based on administrative command methods, state-owned specialised companies and centralised tariff system, is now settled on contractual arrangements. A process of decentralisation has started in the field of decision-making with some decisions being taken on the city level. Collection and landfill service prices are decided at the local level. The resolution of the regional state administration recommends the cities and rayons of the Oblast to take decisions as regards withdrawal of SHW collection and disposal payment from the apartment fee. Nevertheless the recent decentralisation of the solid waste management at the municipality level has not speeded up participation of private initiative.

2.3. Impact on environment and health

The on going situation is that 1,800,000 t of solid household waste are yearly produced on the territory of the Oblast, and that only 600,000 t are regularly collected and disposed in municipal landfills (2002 figures). It means that 2/3 are either burnt in the home gardens or furnaces, or disposed in wild dumpsites. On the other hand, 5 % are collected and recycled, mainly by scavengers. No municipal landfill can pretend to meet the international standards, even the latest. The impact of this situation is:

Pollution of	By	Impact on environment	Impact on health
Atmosphere	Wild burning and also common practice of burning the waste on the landfills	Emission of dioxins, heavy metals, acid gases, and greenhouse effect gases	Absorption of toxics by inhabitants at home, by scavengers on the landfills, by the neighbours of the landfills
Surface water	Leachates of the composting of the dumpsites	Pollution of the surface waters (ending in Black Sea) by heavy metals, organic compounds (hydrocarbons, solvents)	Contamination of the water resource used for drinking water and agriculture

	Leachates of the landfills	Idem	Idem
Watertables	Leachates of the landfills	Pollution of the underground waters by heavy metals, organic compounds (hydrocarbons, solvents)	Contamination of the water resource
	Leachates of the composting of the dumpsites	Idem	Idem
Landscape	Flying waste	Perturbation of ecosystems, diseases of wild species	Dissemination of bacteriological risks
	Infests on landfills and dumpsites	Perturbation of ecosystems	Dissemination of bacteriological risks

The Ukrainian situation is mainly inherited from former USSR as culture of the administrations and the inhabitants, administrative organisation, and even regulation throughout a lot of standards never updated since 1991. In 1994 the Presidential Committee of Environment of Russia made a study about the contamination of the territory by the waste. It inventoried 170 000 unauthorized landfills; in fact, each plant of USSR had its own landfill. The conclusions were that the water resource is contaminated by the waste on 25% of the territory. It's mainly a chemical contamination that cannot be treated by the existing water supply facilities. It provokes 85 000 deceases per year (mainly among old people and new born), and as many genetic diseases. It's realistic to consider that the same problem exists in Ukraine and that the stake is 1/5 of this figure.

3. Sector frame conditions and development of the waste management sector

3.1. General framework

3.1.1. Demography

The Oblast of Donetsk accounts 4,774,400 inhabitants (the data as of 01.01.03).

90% of the population of the Oblast live in urban areas. 29% of the inhabitants of the Oblast house in individual houses.

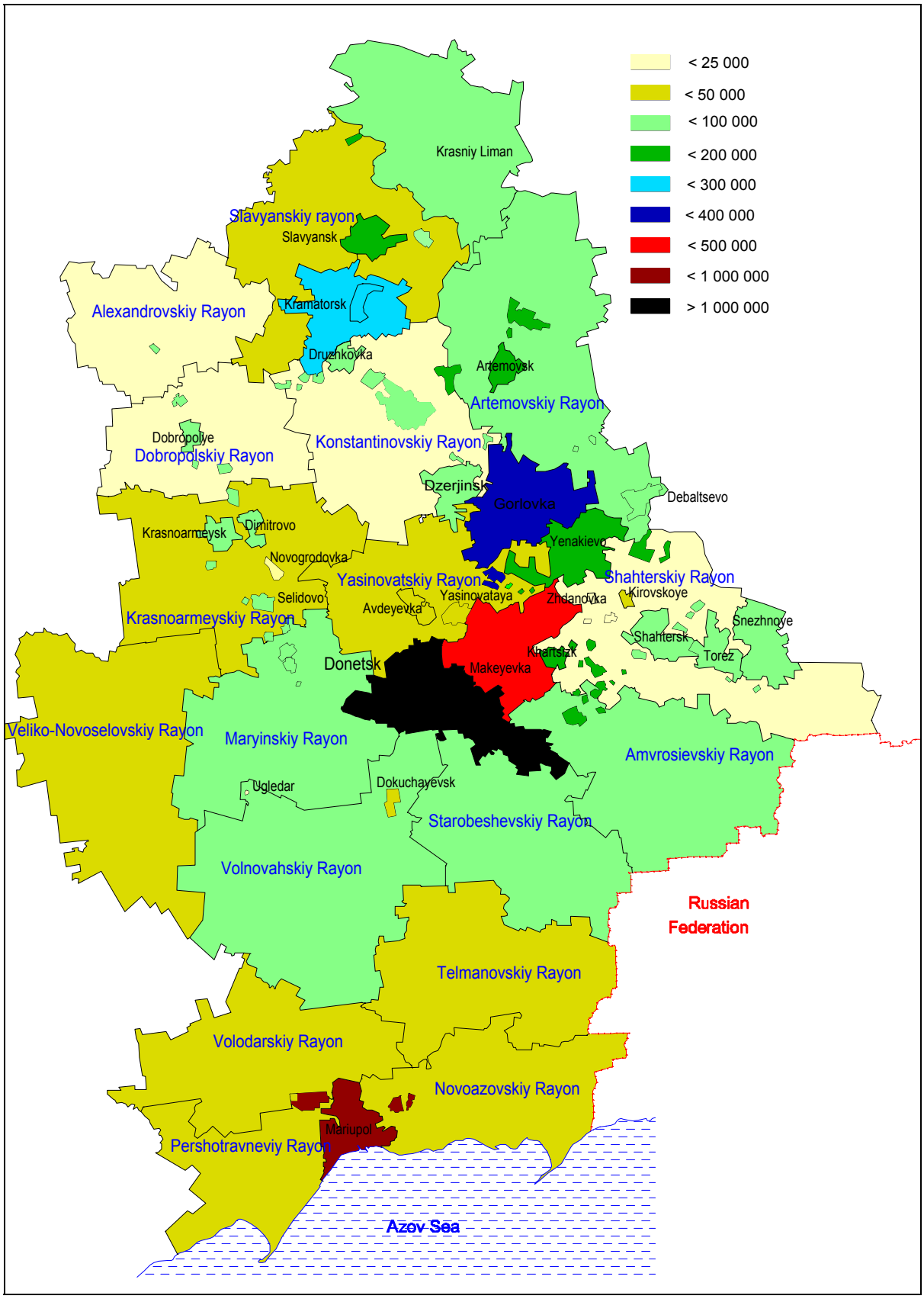
The demographic decreasing of the Oblast is 10.5% between 1989 and 2003. It is mainly due to a relatively weak rate of fertility (1.3 child per woman) although the interior migration rate is unknown. If we examine the rate of variation of population by administrative unit, the bracket is from 77.8% to 104.3%. This last figure (Pershotravneviy Rayon) constitutes an aberration that should be explained. Out of this particular case, the bracket is from 77.8% to 95.1%.

The Oblast accounts 45 administrative units, 28 Cities and 17 Rayons. The population of these administrative units that are in charge of the solid household management within their territory is from 14,500 inhabitants to 1,026,000 inhabitants. These figures are recapped in Table 1.

	Population (1000)		Among which		Variation (%) 2003 /1989	Area (km²)	Density of Population
	1989	**2003**	Urban	Rural			
Oblast	**5 332,4**	**4 774,4**	**4 304,8**	**469,6**	**89,5**	**26 517,5**	**180**
Cities	**4 549,7**	**4 059,0**	**4 022,3**	**36,7**	**89,2**	**4 941,9**	**821**
Donetsk	1 132,4	1 026,0	1 024,4	1,6	90,6	570,7	1798
Avdeyevka	39,8	36,9	36,9		92,7	29,3	1259
Artemovsk	125,4	112,0	112,0		89,3	73,6	1522
Gorlovka	363,1	309,4	306,8	2,6	85,2	422,5	732
Debaltsevo	57,4	51,2	51,2		89,2	37,5	1365
Dzerjinsk	97,1	85,1	81,5	3,6	87,6	61,9	1375
Dimitrovo	64,4	55,1	54,1	1,0	85,6	22,8	2417
Dobropolye	81,6	70,4	70,3	0,1	86,3	19,8	3556
Dokuchaevsk	27,0	25,0	24,1	0,9	92,6	118,9	210
Drujkovka	83,9	74,3	73,5	0,8	88,6	46,5	1598
Yenakievo	190,0	157,8	154,0	3,8	83,1	425,2	371
Zhdanovka	15,6	14,5	14,3	0,2	92,9	2,0	7250
Kirovskoye	32,6	30,4	30,4		93,3	7,0	4343
Konstantinovka	106,0	93,1	93,1		87,8	66,0	1411
Kramatorsk	235,3	213,5	212,6	0,9	90,7	355,7	600
Krasniy Liman	61,1	53,0	39,6	13,4	86,7	1 209,8	44
Krasnoarmeysk	90,2	82,2	82,2		91,1	39,2	2097
Makeyevka	473,5	426,4	423,9	2,5	90,1	425,7	1002
Marioupol	540,9	509,8	508,8	1,0	94,3	243,9	2090
Novogrodovka	19,4	17,1	17,1		88,1	5,5	3109
Selidovo	72,4	60,9	60,9		84,1	108,2	563
Slaviansk	157,3	145,2	145,2		92,3	74,2	1957
Snejnoye	96,6	80,5	79,6	0,9	83,3	188,8	426
Torez	112,5	93,1	93,1		82,8	104,8	888
Ugledar	18,7	16,9	16,9		90,4	5,3	3189
Khartsizsk	127,3	112,3	111,2	1,1	88,2	206,9	543
Shahtersk	88,8	69,7	67,4	2,3	78,5	51,0	1367
Yasinovataya	39,4	37,2	37,2		94,4	19,2	1938
Rayons	**782,7**	**715,4**	**282,5**	**432,9**	**91,4**	**21 575,6**	**33**

	Population (1000)		Among which		Variation (%) 2003 /1989	Area (km²)	Density of Population
	1989	**2003**	Urban	Rural			
Alexandrovsky D.	24,5	22,5	4,1	18,4	91,8	1 010,1	22
Amvrosievskiy D.	61,2	54,0	27,7	26,3	88,2	1 455,5	37
Artemovskiy D.	58,3	52,6	16,7	35,9	90,2	1 686,8	31
Velikonovoselkovskiy D	53,7	48,5	7,3	41,2	90,3	1 901,3	26
Volnovahskiy D.	101,0	91,8	54,8	37,0	90,9	1 848,2	50
Volodarskiy D.	32,2	30,9	8,7	22,2	96,0	1 221,5	25
Dobropolskiy D.	22,4	20,2	2,1	18,1	90,2	949,3	21
Konstantinovskiy D.	23,4	20,5		20,5	87,6	1 171,7	17
Krasnoarmmeyskiy D.	40,6	36,8	8,2	28,6	90,6	1 315,7	28
Maryinskiy D.	97,6	89,1	58,0	31,1	91,3	1 350,4	66
Novoazovskiy D.	40,6	38,6	15,4	23,2	95,1	1 000,4	39
Pershotravneviy D.	27,6	28,8	14,1	14,7	104,3	792,1	36
Slavianskiy D.	42,1	38,4	16,2	22,2	91,2	1 273,7	30
Starobeshevskiy D.	60,3	55,3	29,4	25,9	91,7	1 254,9	44
Telmanovskiy D.	37,2	34,4	10,6	23,8	92,5	1 340,1	26
Shahterskiy D.	26,0	23,2		23,2	89,2	1 194,4	19
Yasinovatskiy D.	34,0	29,8	9,2	20,6	87,6	809,5	37

Table 1 Population of the administrative units of Donetsk Oblast



Map 1 Population of administrative units

3.1.2. Geography and equipment

The surface of the Oblast is around 26 500 km^2. The density of 180 inhabitants per km² is relatively important.

The general arrangement of the Oblast show the existence of urban corridors in a space little occupied and little populated.

From Donetsk toward the Northeast, a hardly urbanized area is issued from the industrialization of the 19^{th} century.

To the North, a corridor joins Konstantinovka, Drujkovka, Kramatorsk, Slaviansk, and Krasniy Liman.

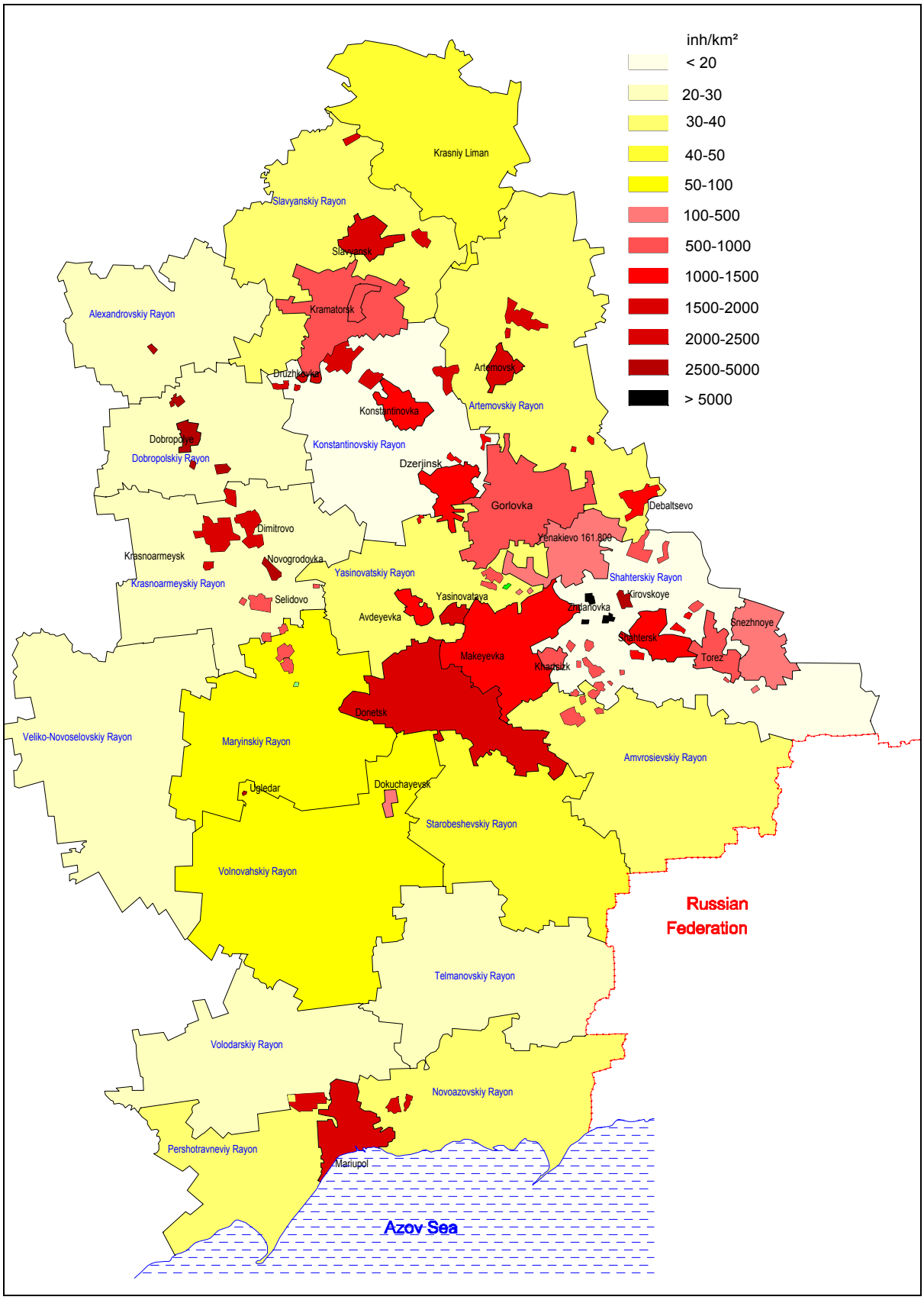
To the Northwest, a North-South corridor joins small cities from Belozerskoye to Gorniak.

At the South of the Oblast, Marioupol is an important urban centre.

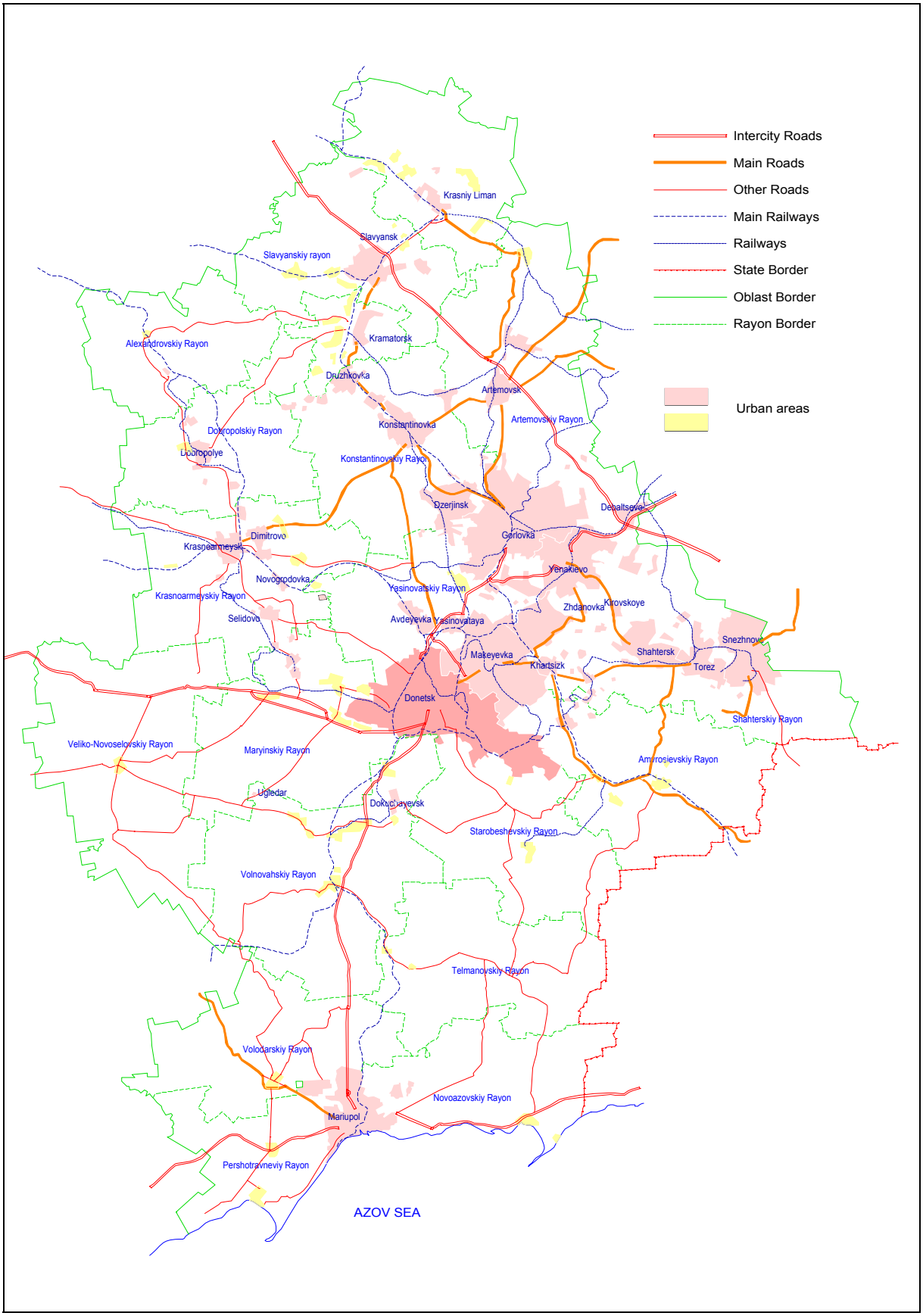
These urban zones appear on the map of densities of population (Map 2).

The Oblast is equipped with a network of main roads relatively dense. Nevertheless, secondary roads joining villages are only fitted for a limited traffic.

The railway network is particularly dense, mainly in industrial zones (mine catchments) and for that reason highly populated.



Map 2 Density of Population of Administrative Units



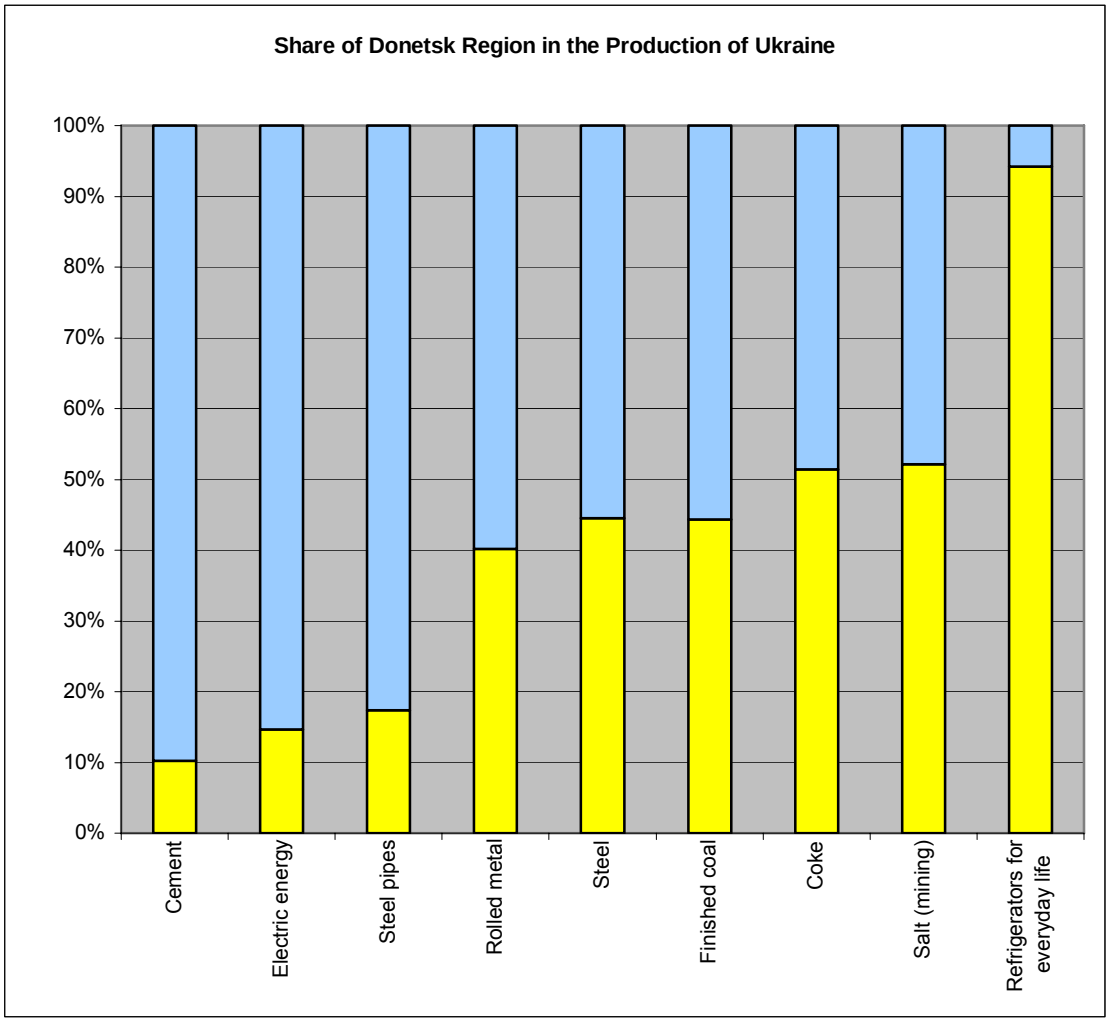
Map 3 Communication Ways

3.1.3. Economy

Donetsk Oblast is rich with mineral resources providing for the demands not only of the region but of Ukraine as a whole (altogether 36 types, the main ones being coal, rare metals, mercury, table salt, chalk, kaolin, lime, gypsum, etc.).

3.1.3.1. Industrial Production

- Part in regional GDP: 66.2%
- Part of the Oblast in the national industrial production: 20%



Graph 1 Share of Donetsk Region in the production of Ukraine

- Main specialities of the industrial production of the Donetsk Oblast: heavy industry (> 50% of the production), mining industry, metallurgical industry, chemical industry.

At the 1st January 2003, there were in the Oblast:

- 848 industrial companies
- 431 construction companies.

	1995	2000	2001	2002
Industrial goods (factual prices) of all industries, mln. UAH	12,047.5	27,493.5	35,489.4	38,593.8

3.1.3.2. Agriculture Production

- Part in regional GDP: 5.4%
- Part of the Oblast in the national agricultural production: 4.7%
- Part of the private sector: 53.2%
- Main specialities: fruits and vegetables, cereals, sunflower, potatoes, breeding

At the 1st January 2003, there were in the Oblast:

- 143 state agricultural companies, including 13 collective farms
- 847 non-state agricultural companies
- 2168 farms.

	1995	2000	2001	2002
Agricultural goods (expressed in prices of 2000), mln. UAH	3,415.1	2,943.1	3,562.4	3,570.0
- Cultivation of plants	1,915.0	1,773.7	2,264.9	2,095.0
- Animal breeding	1,500.1	1,169.4	1,297.5	1,475.0

3.2. Legal framework of waste management

The environmental legislation regulating waste management relies on the regulations of the Law of Ukraine "On Environment Protection" (1991) and the Law of Ukraine "On Waste" which was adopted in 1998, creating necessary conditions for establishment of waste management system.

The Law "On Waste" *"defines legal, organisational and economic framework for the activities dealing with prevention or reduction of waste generation, collection, transportation, storage, recycling, utilisation and removal, neutralisation and disposal, as well as with prevention of a negative impact of waste on the environment and people's health at the territory of Ukraine".*

3.2.1. Policy of the State

In accordance with Article 5 of the Law of Ukraine "On Waste":

"The main principles of the state policy in the field of waste treatment refer first of all to protection of environment and people's health from the negative impact of waste, assurance of rational use of raw materials and power resources, scientifically justifiable consideration of ecological, economic and social waste generation and utilisation interests of the society to ensure its sustainable development.

The main directions of the state policy for implementation of the indicated principles are the following:

a) assurance of collection of all of the waste, timely neutralisation and removal of waste, observance of ecological safety rules during waste treatment;

b) minimisation of waste generation, reduction of hazard presented by it;

c) assurance of a multipurpose utilisation of raw resources;

d) promotion of a maximum utilisation of waste through direct re-utilisation or alternative utilisation of waste presenting a resource value;

e) assurance of safe removal of waste, not subject to utilisation through development of relevant technologies, ecologically safe methods and tools of waste treatment;

f) organisation of control over the places or objects of waste disposal to prevent from a negative impact on the environment and people's health;

g) implementation of a set of scientific, technical and marketing research to identify and define a resource value of waste to ensure its efficient utilisation;

h) assistance in construction of waste treatment facilities;

i) social protection of people, working in the field of waste treatment;

j) compulsory record-keeping of waste based on waste classification and passportization."

The main tasks dealing with implementation of the state policy in the field of solid household waste management and the **main directions aiming at solution of these tasks have been defined in the "Programme of Household Waste Management"** approved by the resolution of the Cabinet of Ministers of Ukraine N° 256 as of March 4, 2004 and are **provided below.**

Section 2. Goal and Main Objectives

The goal of the programme is to create the conditions that will help to ensure a collection, transportation, utilisation, neutralisation and disposal of all household waste and to limit the harmful impact on the environment and human health.

To reach this goal it is planned to fulfil such main tasks as:

- *To reduce the quantities of household waste disposed to the landfills by introducing new modern highly efficient techniques for their collection, transportation, storage, recycling, utilisation and neutralisation;*
- *To develop and introduce new equipment in the field of solid household waste management;*
- *To reform the system of sanitary cleaning;*
- *To ensure organisation of control over the functioning and closed household waste landfills to prevent from the negative impact on the environment and human health as well as recultivation of land after the closure of landfills;*
- *To create conditions for an efficient use of household waste as a power resource and introduction of a complex recycling and utilisation of their valuable components on a scientific and production basis;*
- *To ensure introduction of mechanic household waste sorting with retrieval of valuable components and their recycling in aim to produce new materials and goods.*

The problems that arise in the field of household waste management are to be urgently solved and the measures to solve them are to be financed both at the state and local levels. The question of investments into this field should be settled in a comprehensive way at the expense of all possible sources of financing (state and local budgets, funds of enterprises (upon their agreement) which ensure sanitary cleaning of populated areas). For this purpose ***it is necessary to develop and ratify local programmes of solid household waste treatment*** *as well as* ***schemes of sanitary cleaning of populated areas in accordance with the defined procedures.***

Section 3. Main directions for solving the tasks

The defined tasks are planned to be solved as follows:

- *To organise selective collection of separate components of household waste;*
- *To ensure the use of modern highly efficient waste collection lorries;*
- *To create a system of a two-stage transportation of household waste (with construction of waste transfer stations);*
- *To employ composting techniques for the organic part of household waste as well as pyrolysis, incineration and other ways of utilisation or disposal of waste components in the places of waste generation;*
- *To construct modern landfills for household waste with leachate collection and biogas utilization;*
- *To reduce a harmful impact of household waste on the environment and human health".*

3.2.2. Strategic planning

The 1998 law of Ukraine «On Waste» shifts the responsibility for SHW collection and removal as well as for creation of landfills and other waste treatment facilities to local self-government bodies and state administrations. This has caused a splitting of the responsibilities between areas, a multiplicity of local facilities. Each municipality tries to solve the waste issues by itself, and rejecting assistance to neighbour (typical of the NIMBY syndrome). This approach deprives the region from a co-ordinated policy, makes difficult the construction of a lesser number of larger regional sites, more efficient and easier to control, do

not allow to minimise the risks. The only way for the Region administration to have a control on the process relies on the distribution of budget funds for new investments.

Although long-term planning is well developed in Ukraine, as shows a structure and concept of the new Development Plan for the Region to 2020, one of the main issues to address in the SHWM was the lack of a long-term strategy involving all actors, with proper forecasts of waste fluxes and investments needs, based on well experimented and modern technologies.

A particularly severe aspect of the problem lays in the liquidation of old landfills, not complying with the European standards, linked with the difficulties to create new facilities, accepted by the population. New facilities, respecting modern ways of exploitation, minimise drawbacks for neighbours.

3.2.3. Institutional framework of waste management

The activities in the field of waste treatment are managed through a system of state bodies: central bodies of state and executive power, regional governing bodies, local self-government bodies and their executive committees. The functions of organisational structures exercising the management at the regional level are determined by the laws of Ukraine: “On Waste”, “On Local Self-Government”, “On Local State Administration”, etc.

3.2.3.1. Competence of local state administrations and self-government bodies

In accordance with Article 20 of the Law of Ukraine “On Waste” the competence of state administrations as regards waste treatment includes:

*c) **organisation of development and implementation of regional and local waste management programmes** as well as assurance of implementation of national programmes;*

*g) **development of schemes for sanitary cleaning of populated areas;***

h) organisation and assistance in creation of specialised companies of all forms of ownership for collection, treatment, utilisation and disposal of waste as well as for production, installation and maintenance of the relevant equipment;

*j) **organisation of collection and disposal of household and other types of waste,** including the waste of small manufacturers, construction of landfills for waste disposal as well as implementation of selective collection of useful components of waste;*

*m) **assurance of liquidation of unauthorised and uncontrolled dumps** either by itself or upon the decision of the relevant authorised bodies, etc.*

During preparation of local budget drafts local state administrations are to submit proposals as regards the attraction of money necessary for implementation of waste treatment activities”.

Thus, the development and implementation of the Regional SHWM Plan is within the competence of the regional state administration.

In accordance with Article 30 of the Law of Ukraine “About Local Self-Government” such issues as collection, transportation, utilisation and neutralisation of household waste are within **the competence of local self-government bodies.**

According to Article 21 of the Law “On Waste” the local self-government bodies are to ensure:

b) development and approval of schemes of sanitary cleaning of populated areas;

c) organisation of household waste collection and removal, including waste of small businesses, creation of landfills for waste disposal, organisation of selective collection of useful components of waste;

d) approval of local and regional waste treatment programmes and control over their implementation;

e) introduction of measures stimulating subjects of economic activities, working in the field of waste treatment;

f) solution of questions dealing with location of waste treatment sites at their territory;

j) liquidation of non-authorised and not controlled dumps;

k) promotion of waste legislation among population, stimulation of involvement of population to collection and storage of waste as secondary raw materials;

l) issue of permissions as regards allocation of sites or facilities for waste storage and disposal at the territory of a village, settlement, city…

etc.

Local authorities take decisions about allocation of land for waste disposal and construction of waste treatment sites".

Thus, the adoption of the developed Regional SHW Management Plan for the Donetsk Oblast is within the competence of the Regional Council.

3.2.3.2. Competence of specially authorized bodies of executive power as regards waste treatment

3.2.3.2.1. State Department of Ecology and Natural Resources

In accordance with Article 23 of the Law of Ukraine "On Waste", **the competence** of the Ministry of Environment Protection of Ukraine and its local bodies, i.e. the **State Department of Ecology and Natural Resources in Donetsk Oblast** includes:

"*a) co-ordination of activities of other specially authorized executive bodies referring to waste treatment and control over implementation of requirements of ecological safety*",

b) implementation of state control over the observance of environment safety requirements,

"*f) creation of information and analytical systems and data bases about volumes of waste generation and waste treatment*",

g) issue of permissions for implementations of waste treatment operations in accordance with the legislation,

"*j) approval of locations of waste treatment sites*", etc.

So for the preparation of the underneath Regional SHWM Plan of the Donetsk Oblast, the State Department of Ecology and Natural Resources of the Donetsk Oblast is in charge of creating the database as regards household waste treatment and volumes of waste production.

3.2.3.2.2. Sanitary and Epidemiological Service

In accordance of Article 24 of the Law of Ukraine "On Waste", **the competence of sanitary and epidemiological service of Ukraine and its local bodies includes:**

"a) implementation of state sanitary and epidemiological supervision over implementation of state sanitary norms, rules, hygienic norms during waste generation, collection, transportation, storage, processing, utilisation, removal, neutralisation, disposal;

c) implementation of state sanitary and epidemiological expertise of design and estimate documentation for identification of location and technical and economical justification of projects dealing with construction, extension and reconstruction of waste treatment facilities;

d) issuing expert conclusions of the state sanitary and hygienic expertise as regards waste treatment facilities;

e) setting sanitary and hygienic requirements for products produced from or including waste and issuing hygienic certificates for the same; etc.

At the regional level the functions dealing with state supervision over observance of sanitary norms and rules in the process of sanitary cleaning of the territory of the Oblast are exercised by the **Donetsk Regional Sanitary and Epidemiological Station.**

3.2.3.3. State Company (SC) "UkrEkoKomResurcy"

The state company "UkrEkoKomResurcy" created in accordance with the resolution of the Cabinet of Ministers of Ukraine as of 26.07.2001 N° 915 "On Implementation of the System of Collection, Sorting, Transportation, Recycling and Utilisation of Waste of Secondary Raw Materials" is to carry out ecological activities throughout the territory of Ukraine aiming at collection, sorting, recycling and utilisation of solid household waste as secondary raw materials. It is also supposed to contribute to decrease the volumes of solid household waste generated as well as to reduce the negative impact of waste on the environment. The company has its own production capacities as well as material and technical resources necessary for

introduction of a system of collection, recycling and utilisation of solid household waste as secondary raw materials (it has its own plants for production of equipment and the possibilities to create waste sorting facilities and containers for collection and recycling of secondary raw materials).

By series of resolutions, including the ones as of November 26, 2003 N°1844 and N°324 as of 17.03.2004, the Cabinet of Ministers of Ukraine has practically created a legal and economic framework for organisation of the systems of collection, sorting, transportation, recycling and utilisation of waste as secondary raw materials.

By now the state company “UkrEkoKomResurcy” has almost solved the issues of:

1. Creation of a state structure for development and organisation of the system of collection, sorting, transportation, recycling and utilisation of waste, including containers (packages) of domestic production, as secondary raw materials by delegating the corresponding functions of the state company “UkrEkoKomResurcy” to its structural sub-divisions represented by regional directorates and production sites in cities and districts.

2. Use of single state tariffs for delivery of services dealing with collection, transportation, recycling and utilisation of used containers (packages) by all economic operators not depending on their forms of ownership.

3. Licensing of activities for collection, sorting, transportation, recycling and utilisation of waste.

4. Utilisation or withdrawal from Ukraine of containers (packages), brought by importers of goods at the expense of these importers by application of fixed state tariffs.

5. Utilisation of containers (packages) at the expense of economic operators that use such containers (packages) for their goods at the whole territory of Ukraine where these goods are produced.

6. Distribution of incomes, accumulated at the account of the state company “UkrEkoKomResurcy” for delivery of services as regards collection and utilization of containers (packages) and transfer of 90% of these resources to regions in order to finance investment projects and create a material and technical base for implementation of selective collection, sorting, recycling and utilization of waste.

The structural subdivision of the State Company “UkrEkoKomResurcy” for the territory of Donetsk Oblast is represented by the Donetsk regional directorate “DonetskEkoKomResurcy”.

The state company “UkrEkoKomResurcy” and its structural subdivisions together with directorates and departments of the Donetsk regional state administration, regional council, executive committees of city and district councils develop and implement Comprehensive programmes for organization of selective collection, recycling and utilization of waste.

3.2.4. Entities involved in waste treatment

The law «On Waste» specifies the subjects of waste treatment activities. These are the citizens of Ukraine, foreigners, companies, institutions and organizations involved in waste treatment. All types of organization so can be involved in the treatment of household waste.

However, we should take into account unauthorised activities of certain categories of low-income citizens which can be observed nowadays in the field of waste treatment. These activities cover collection, sorting and storage of secondary raw materials (waste paper, glass, polymers) but cannot be officially registered.

The rights and obligations of actors involved in waste treatment are stated in Section III of the Law of Ukraine “On Waste” and covers the field of household waste treatment as well. Some of the obligations are worth mentioning.

In accordance with Article 15 of the Law the citizens are obliged to pay in the established order for waste collection services delivered by public utilities.

In accordance with Article 17 economic operators involved in the field of waste treatment are obliged to collect all the waste; to introduce the measures ensuring maximum utilisation of waste; to avoid waste disposal at unauthorised places; to exercise control over the conditions of waste disposal and treatment sites, etc.

3.3. Permitting procedure for the waste disposal facilities

3.3.1. Situation

There are practically no acting landfills for solid domestic waste (SDW) disposal that would fully comply with the Ukrainian environmental legislation. The available SDW landfills do not comply with the sanitary-ecological norms and are almost exhausted. Environmental monitoring is not carried out.

Within some conditions a facility has to ask an authorization from the administration. It's usually called a "permit", in Ukraine it's called a "passport". The company has to provide a study and a description of the means it will use in aim to control its emissions of pollution.

The level of these studies is largely weak for two causes: good studies are expensive and good studies require highly qualified study offices. The IPPC Directive can inspire a reform of the procedure of passportization and of the content of the files submitted to the administration.

An other factor must be taken into account. The protection of underground water requires geological and hydrogeological studies. The necessary data are belonging to the Geology Administration and are considered as Defence Secret. It must be decided to free the part of this information which is necessary for the studies of local impact on underground water.

At least, everywhere the permitting procedure includes a consultancy of the neighbours: inhabitants, local authorities. Such a disposition must be progressively included in the procedure. Progressively because it supposes to improve the public awareness about these questions.

3.3.2. Order of Keeping of the Waste Disposal Sites Register

On 3 August 1998 Decree by Cabinet Ministers of Ukraine #1216 established "The Order of Keeping of the Waste Disposal Sites Register" in order to enhance the control over the ecological conditions of these sites and to estimate their influence on the environment and human health.

This Order, developed in compliance with Clause 28 of Law of Ukraine "On Waste" stipulates the rules of keeping of the waste disposal sites register.

The Waste Disposal Sites Register (further - the Register) is a system of data, obtained as a result of accounting and description of the objects and specially allocated sites, where waste is being handled (the for of the Register is given below).

All the waste disposal sites (either operating, or closed, or suspended) are subject to registration.

Every waste disposal site (WDS) is supplied with a passport that contains the waste name and code, its amount and quality, origin, as well as technical characteristics and the information on the methods of management and safety operation. The owner of WDS in compliance with *Instructions on Contents and Conditioning of Waste Disposal Sites* issues the special passport.

The works on Register keeping are financed at the expense of Oblast Fund for Environmental Protection.

The control over the completeness and quality of the Register is put upon State Department of Ecology and Natural Resources in Donetsk Oblast of Ukraine.

The Register contains the general information concerning every WDS (location, technical and ecological characteristics, information about the owner, etc.). The data stored in the Register are revised and updated annually.

The Register is created and kept basing on the passports of WDSs and the data from reports submitted by the waste owners.

Urban and rayon administrations jointly with the regional ecological inspectorates produce the list of WDSs subject for registration (the list is set out below).

The WDS owners or special organisations, delegated by them, make up the inventory of WDSs and produce draft passports.

(Special permits or licenses to produce passports are not required, though such works as geological prospecting is subject for licensing by Ministry of Natural Resources. Soil, air and water samples are analysed in an accredited laboratory. The certificate of accreditation is issued by Donetsk Centre of Standardisation and Metrology.)

The WDS owners or special organisations, delegated by them, submit draft passports for approval to the following organisations:

a. Municipal, rayon, and oblast sanitary-epidemiological services;
b. State Labour Protection Inspectorate;
c. Donetsk Department of Water Resources;
d. Donetsk Regional Geological Company "DonetskGeologia"

Having approved the draft passports, the WDS owners submit them for consideration to Sate Department of Ecology and Natural Resources in Donetsk Oblast of Ukraine.

The draft passports are considered within 2 weeks. In case of dismissal the WDS owner is informed by a letter explaining the causes of dismissal and indicating the term of submitting of the revised draft passport.

The approved passports of WDS's are submitted by State Department to Oblast State Administration for further approval and entering into the register.

The creation and keeping of the Register in Donetsk oblast is assigned to State Department of Ecology and Natural Resources (Decree of Head of Donetsk Oblast State Administration of 05.06.2002, #258). On the instruction of State Department the works are currently done by Regional Centre of Hazardous Waste Management.

State Department assigns Registration Number to every WDS. The date of registration is entered into the Register.

The original passport is returned to the WDS owner, while the copies are stored at State Department of Ecology and Natural Resources.

The passports are reviewed and updated annually on the basis of surveys, sampling, and additional works and are approved with State Department. In case of necessity, following the decision of local state administrations, extraordinary revision of passport data is possible.

Basing on the WDS passport data State Department assigns to each WDS the category of ecological hazard to the environment and human health. The WDS owner is informed of the category in order to take proper measures to ensure ecological safety of operation.

3.3.3. Drafting of WDS Passport

(in compliance with *Instructions on Contents and Conditioning of Waste Disposal Sites*, (Order by Ministry for Environmental Protection and Nuclear Safety of Ukraine #12 of 14.01.1999).

3.3.3.1. General Provisions

Instructions on Contents and Conditioning of Waste Disposal Sites (further - the Instructions) was developed by Ministry of Environmental Protection and Nuclear Safety of Ukraine (presently - Ministry of Ecological Resources) in accord with Decree of Cabinet Ministers of Ukraine of 3 August 1998 #1216 "On Establishment of the Order of Keeping the Register of Waste Disposal Sites". The term *waste disposal sites* (WDS) refers to the sites of long-term (over 2 years) storage of waste.

The passport is produced on the basis of the WDS inventory data and all the information available, including: the initial project data, the data on industrial conditioning of waste (generated and disposed), the details of delivery documents, the data of monitoring and special works, the information submitted by specially authorized executive bodies in the sphere of waste management, as well as the reports of permanent commissions on abandoned waste management at the levels of local state administrations and local self-governance.

In case the data on WDS required for the passport are unavailable the WDS owner, at the request of the local state administration, shall carry out the corresponding survey in order to obtain the missing data. The amount and terms of works shall be approved with State Department.

As for the abandoned waste, the required surveys shall be carried following the order of local state administration.

The WDS owners are fully responsible for the reliability and completeness of the information quoted in the passport.

The process of development of each section of the passport is described as follows:

- **drafting of passport by the WDS owner without involvement of special organisations, using the available basic information; cost; completeness and reliability;**
- **drafting of passport by a specialised organisation, acting on the instruction and at the expense of the WDS owner, charged to carry out the works and produce the draft passport.**

3.3.3.2. Order of Drafting of Passports

The cover page of the passport contains the indication of the place (location) of the WDS according to the existing documents. Along with the title the cover page also contains: the information concerning the establishment of the site, the approvals of the corresponding bodies (as described above), the order of record-keeping, the signature of the owner, the registration number and date.

The information in the passport is grouped into twelve sections, each having its own cover page signed by the WDS owner.

3.3.3.2.1. Section I: "WDS Essential Data"

Points 1-11 consecutively present the following information:

- the WDS owner's full name and identification code (**EDRPOU**);
- the administrative body the WDS is subject to and its code (**SPODU**);
- the WDS owner's legal address and code (**KOATUU**);
- location of the WDS with the indication of the distances and directions to the nearest localities (or other landmarks - river, lake, etc.);
- telephone (fax) number;
- date of issue of the passport;
- full name of the organisation that developed the passport;
- the surname of the person responsible for the drafting of the passport, his/her position and telephone number.

The following registers and classifiers are used while drafting the passport:

EDRPOU - universal state register of companies and organizations of Ukraine;

SPODU - system of notation of state administrative bodies (for the code of central executive bodies);

KOATUU - classifier of administrative-territorial objects of Ukraine.

3.3.3.2.2. Section II: "General Characteristics of WDS"

- Point 1: code and type of waste disposal procedure.
- Point 2: mode of WDS operation (marked off with a tick).
- Point 3: year of putting into operation or closing (if suspended) of WDS.
- Point 4: the total amount of waste, accumulated from the beginning of operation and by the date of drafting of the passport. The amount is indicated in tons (in case the estimation is made in cubic metres, the amount in tons is supplied in brackets). The latter is calculated separately basing on the available data on specific gravity of waste.
- Point 5: the amount of waste disposed of during the previous year (if the WDS is operating), expressed in the same units as is Point 4.
- Point 6: the designer (name, address) of the WDS, if the industrial project was developed. In case the waste disposal is underground, the availability of the corresponding claim is indicated in Point 6.1.

- Point 7: the designed waste disposal capacity, i.e. based on the rated maximum (in case the project was developed) or the calculated value, based on the geometry of the site.
- Point 8: the designed period of operation (in years till repletion) at the current annual disposal rate. This parameter may not coincide with the designed figures.
- Point 9: the area of the site (in ha). In case there is a sanitary belt around the site, two figures are indicated: the total area and the designed area of the disposal site itself.

Taking into consideration the fact that the waste disposal sites were not monitored earlier and the disposal rates are unknown, this section of the passport may be a self-administered questionnaire, completed by the WDS owner using the estimated (approximate) figures, based on the information on the number of population, total period of operation, and the assumed per capita SDW accumulation rate.

Another option, producing more reliable data, is carrying out of this task by a specialised organization. In this case on-site survey is required. The overall cost of works is determined on the basis of the following documents: Price List (1982) of geological prospecting works in capital construction; Resolutions of the USSR State Department of Construction of 01.03.90 #22; Building Code 1.1-7-2000 of State Department of Construction of Ukraine #7.

The estimation of capacity takes 2-3 days (the average salary of an engineer of the Regional Centre is UAH 450-550). The period of operation of WDS is estimated basing on the capacity and industrial and domestic waste generation rates. The potential capacity of the landfill is calculated using the currently available values on waste accumulated and the requirement concerning the maintaining the geometry of the site. The geometry of the site is stipulated by the requirements to the outer slopes (1:4) and the area of the platform providing for reliable operation of the refuse collectors and bulldozers.

3.3.3.2.3. Section III: "Natural and Geological Features of WDS"

- Point 1: remoteness of the WDS from the nearest locality (Point 1.1), water body (Point 1.2) or water abstraction facilities (Point 1.3) with indication of the names of the latter. Other protected objects (nature reserves, game reserves, parks, recreation areas) can also be mentioned.
- Point 1.4: specific geomorphologic features of the WDS associated with the ecological hazard (marked off with a tick).
- Points 2 and 3: the absolute altitude of the WDS and the aquifer depth (the first artesian aquifer).
- Point 4: the quality estimate of the aquifer protection (marked off with a tick).
    - The information is to be taken from "The Map of Natural Protection of Underground Waters of the Ukrainian SSR". In case accurate estimation is impossible corresponding comments should be provided.
- Point 5: the thickness of the aeration layer (the distance from the surface to the top of the first aquifer).
- Point 6: the list of rocks forming the aeration layer, thickness of the strata and other features.
- Point 7: the information on availability (permanent or seasonal) of groundwater, depth of the aquifers, seasonal fluctuation of depth, and the features of the confining bed.
- Point 8: the WDS territory geological structure being the basis for estimation of the natural protection rate.

This section of the passport may be a self-administered questionnaire, completed by the WDS owner on the basis of visual observation, the reports of Donetsk Regional Geological Company "DonetskGeologia", and the resolution of Donetsk Department of Water Resources.

To produce the Conclusion on the geological characteristics and groundwater DRGC "DonetskGeologia" uses the following data:

- geological maps, scale 1:25,000 and 1:50,000;
- the complex estimate of the regional technological changes of hydro-geological conditions in Donetsk oblast of Ukraine, Stage 1, scale 1:200,000;
- the map of natural protection of ground waters of the Ukrainian SSR.

The conclusions made by the named organizations actually form the approval of the draft passport.

According to the State Sanitary Rules and Norms 2.2.7.0290-99 the Regional Centre and other specialized organizations, though the contractors, should drill at least three test pits on the territory of the WDS (it should be noted that actually not all specialized organizations carry out own land and geological surveys, but like the WDS owners, prefer using the services of the mentioned organizations without individual localization of the conditioned WDS).

The overall cost of works is determined on the basis of the following documents: Price List (1982) of geological prospecting works in capital construction; Resolutions of the USSR State Department of Construction of 01.03.90 #22; Building Code 1.1-7-2000 of State Department of Construction of Ukraine #7.

The sampling of ground waters for completing of this section of the passport was made at the laboratory of Regional Centre.

3.3.3.2.4. Section IV: "Technical Characteristics of WDS"

- Point 1: types of WDS (corresponds to Points 1.4.3, 1.5.4, 1.6.2).
- Point 2: availability of the natural drainage at the WDS; Point 2.4 (if drainage is available) contains information concerning the specific features of the object in terms of drainage (quality, direction of discharge, etc.).
- Point 3: availability and characteristics of environmental protection facilities at the WDS.
- Point 4: technology used for waste discharge (Point 4.8).
- Point 5: waste treatment procedures (deactivation, detoxification) if any; drainage treatment procedures, if any, are described separately.
- Point 6: on-site waste sorting (if any).
- Point 7: availability of paved access roads.

This section of the passport may be a self-administered questionnaire, completed by the WDS owner basing on the experience of operation.

Regional Centre uses the results of geological surveys, visual observation, and the information obtained from the WDS owners.

3.3.3.2.5. Section V: "General Characteristics of Waste"

- Point 1: code, name and group of waste (according to State Classifier of Waste of Ukraine DK 005-96 "Classifier of Waste"), class of hazard to human health, amounts of disposal (the units of measure are the same as in Point 4 of Section II) for the time being and for the previous year. In case the data on waste disposal are unavailable the estimated (approximate) values are indicated. Solid domestics waste is assigned Group 77 and name "Public Catering Waste, technological waste, other waste, communal and similar non-specific industrial waste".
- Point 2: state of aggregation of waste.
- Point 3: name (names) of the major components of waste (potential pollutants), their codes are given in accord with Annex C to "Reference Guide to 'Waste Classifies'".
- Point 4: availability of gaseous emission; quantitative or semi quantitative data (e.g.: high, medium, low, sporadic emission).

This section of the passport may be a self-administered questionnaire, completed by the WDS owner. Mandatory Points are 1 and 2; the rest may be blank (dash).

Regional Centre uses the historical data and visual observation.

3.3.3.2.6. Section VI: "Information about Water, Soil and Air Monitoring Systems Available in the Vicinity of WDS"

- Points 1-4: monitoring activities (if any) carried out in the vicinity of WDS and the quality of data obtained.

There are no monitoring systems at the WDSs. The fields are left blank (dash).

Regional Centre reports about the observation carried out while drafting the passport.

3.3.3.2.7. Section VII: "Information on Environmental Pollution in the Vicinity of WDS"

Point 1: averaged data of the latest observation (if any) of the ground and surface water quality in the vicinity of WDS.

- Column 1 of the table: parameter measures (e.g.: dry residue, chlorides, phenol).
- Column 2 of the table: maximum admissible value (MAV) for the ground water, expressed in the corresponding units with the indication of the corresponding normative documents.
- Column 3 of the table: measured (actual) value, expressed in the same units as in Column 2.
- Column 4 of the table: degree of exceeding (in case the MAV is exceeded).
- Columns 5, 6, 7 of the table are filled in a similar way, but for the surface water.
    - If necessary, the results of ground and surface water observation are supplied in a separate table.

Point 2: averaged results of the latest soil sampling (if any). The columns of the table are filled in like in Point 1.

Point 2.1: the extent and dislocation of contaminants, if determined.

Point 3: averaged results of the latest air sampling (if any). The columns of the table are filled in like in Point 1.

The WDS owner leaves this section blank.

Regional Centre carries out observations and laboratory analyses of the ground and surface waters, soil, atmospheric air, and radiation.

3.3.3.2.8. Section VIII: "Unconformity to of the WDS Operation Requirements"

Points 1-9: the list of revealed unconformities in the operation of WDS.

Point 10: other unconformities observed.

This section of the passport is a self-administered questionnaire, completed by the WDS owner, basing on the available reports of the controlling bodies.

Regional Centre uses the results of geological surveys and visual observation.

3.3.3.2.9. Section IX: "Buffer zone"

Points 1 and 2: the availability of the buffer zone around the WDS; in case it is available, the details are indicated (width in metres, class, conditions).

This section of the passport is a self-administered questionnaire, completed by the WDS owner, basing on the available reports of the sanitary inspectorate.

Regional Centre uses the results of flame analysis (under the contract with the sanitary-epidemiological service).

3.3.3.2.10. Section X: "Documentation"

Point 1: indication whether the inflow/outflow of waste is registered by the WDS owner, and in what form.

3.3.3.2.11. Section XI: "Category of Ecological Hazard of WDS"

- Indication of the category of ecological hazard of WDS.
- The category of hazard to environment and human health is determined by State Department of Ecology and Natural Resources in Donetsk oblast of Ukraine, basing on the WDS passport data on the amount and hazard class of the waste, water, soil or air pollution and extent (if any), on the conditions of the protecting structures (confining bed, artificial protection, etc.), on the level of monitoring of water, soil, and atmospheric air in the vicinity of WDS, on the specific features of location, on the monitoring equipment used on site, on the revealed unconformities in the operation (if any), etc.
- The WDS cannot be assigned Category A or B, if at least one of the following features is present:
  - Absence of at least one means of environmental protection listed in Point 3, Section IV of Passport (this concerns only the WDSs, mentioned in Points 1.1-1.3).
  - Exceeding of the maximum admissible values of pollution more than two times (Section VII of Passport).
  - Any unconformities mentioned in Points 1 and 3, Section 3 of Passport.

3.3.3.2.12. Section XII: "Passport Revision and Update"

According to Clause 19 of "Order of Keeping the Register of Waste Disposal Sites" the information contained in passports is regularly updated. The updates are tabulated.

As it has already been mentioned, the draft passport is submitted for approval to five controlling organization. It should also be noted that some organizations charge fee for the approval of the draft passport (like for the delivery of information services).

The WDS owner produces the passport, using incomplete data, at own expense. This work requires one paraprofessional and takes about three months0.

Specialised organisations, including Regional Centre, provided all the requirement are observed, are able to produce the draft passport within 3-4 month. The work is done by three experts.

3.3.3.3. Passportization

Summing up the above information, we can state that the purpose of the register is to take account of all the waste disposal sites (operating, closed or suspended), of their quality and quantity characteristics, as well as to monitor their influence on the environment and human health.

The WDS register is based on the data of special reports, produced by the WDS owners or specially delegated organisations in accord with the Instructions, approved by Ministry of Ecological Resources.

The passport comprises 12 Sections and contains the following information: the geographical referencing of the WDS, relatively to the stationary landmarks; the mode of operation and type of WDS; the distance from the nearest localities, water bodies, water abstraction facilities; the depth of aquifers and other geological features of the territory; the designed and actual areas and capacities of the WDS; the list of waste disposed; the availability of protecting and monitoring facilities; the data on sampling, etc.

After the passport is approved and entered in the register of WDS it is assigned a registration number and ecological safety category. Any of the following: the absence of project, exceeding of the designed capacity or normative values of pollution (at least one parameter), the absence of at least one environmental protection facility (filtration shield, side walls, embankment, or drainage trenches) is able to increase the ecological hazard of the WDS.

The companies are to update passports annually basing on the results of activity.

3.3.4. Current Situation in the Sphere of Conditioning of Waste Disposal Sites

Keeping of registers, according to Clause 20 of Law of Ukraine "On Waste", is within the scope of the state administrations.

The creation and keeping of the Register in Donetsk oblast is assigned to State Department of Ecology and Natural Resources (Decree of Head of Donetsk Oblast State Administration of 05.06.2002, #258). On the instruction of State Department the works are currently done by Regional Centre of Hazardous Waste Management.

At the time being the WDS Register is being developed. However, the process is retarded by municipal and rayon administrations, charged with the organization of works on site (Clause 11, "Order of Keeping the Register of Waste Disposal Sites"). For this purpose the local administrations jointly with the state ecological inspectorates were supposed to carry out the following activities:

1. To conduct the inventory of existing WDSs; to draw up the list of WDSs to be included into the register; to submit the list to State Department of Ecology and Natural Resources.
2. To inform the WDS owners (those that are on the list) to develop passports in 2002.

Unfortunately, the executive committees of some municipalities refused to organize such works on their territories, because they do not belong to the local state administrations. That is why in order to accelerate the works it is necessary to prepare corresponding order from the Head of Oblast State Administration to local execute councils.

By the time being the lists of WDSs have been submitted by the towns of Dzerjinsk, Dimitrovo, Zhdanovka, Konstantinovka, Yasinovataya, Kramatorsk, Kirovskoye, Novogrodovka, Druzhkovka, Avdeyevka, and rayons: Slavianskiy, Konstantinovskiy, Telmanovskiy. Other administrations stayed inert.

According to the information available at the State Department and to the data submitted by the mentioned administrations and executive committees, the WDSs that are subject for conditioning belong to 161 companies.

3.3.5. Current Methods Used While Producing WDS Passports In Donetsk Oblast of Ukraine

In accord with the normative and legal documents the passports are produced by the WDS owners of by specially delegated organisations.

Ministry of Ecological Resources does not require special documents (permits or licenses) to produce passports, however some works like geological and geodetic survey, and environmental monitoring are to be carried out by the organisations and laboratories having corresponding licenses.

Due to lack of financing the majority of WDS owners try to produce passports themselves, avoiding the laboratory tests and surveys stated above.

Taking into consideration the fact that environmental monitoring is not carries out (except on occasions) it is especially important to conduct sampling of air, water, soil, and radioactive background by an accredited laboratory and estimate the environmental impact of waste disposal sites.

Such a survey is expected to help local bodies of self-governance in making decisions concerning each WDS.

Another important point is the developing of a proper explanatory note (thought not envisaged by the instruction) to the WDS passport, covering all the aspects of operation and estimating all the aspects of influent of the WDS on the environment.

Taking into consideration the importance of the process all the produced passports are appended with the explanatory note on environmental impact.

As there is no historical data on the existing landfills (including also the suspended, closed and abandoned ones) and the current situation with waste management (after the Law "On Waste" was issued) the geodetic survey needs to be carried out. The obtained results will provide sufficient data:

- to map the landfills and their borders;

- to measure the distance to the surface, ground water, localities; to check if the buffer zone is observed;
- to estimate the actual amounts of accumulated waste;
- to estimate the capacity of land plots assigned for landfills; to estimate the potential and the term of operation till closing;
- to calculate the surface runoff from the landfill to the adjacent territory, and the routes (following the relief) to the nearest water body.

In Donetsk oblast there are many enterprises and organizations that have licenses to carry out geodetic surveys, however only two of them have enough information on mapping:

- State Company "Donetsk Regional Land Cadastre Centre" and
- State Company "Donetsk Oblast Geodetic Centre", State Geodetic, Mapping and Cadastre Services, Ministry of Ecology and Natural Resources of Ukraine.

The organisations (NPC OOO "EcoGeoProject", OOO "VostokEcoProm") that co-operate with the Regional Centre provided in their reports the topographic maps of the waste disposal sites with the indication of relief in scales 1:5000, 1:10000 and 1:25000 without coordinate grid. Map scales 1:10000 and 1:25000 are considered top secret and the access to them is available only to those having special permits. The passport developers do not use them; moreover, such scales are not necessary.

For instance, the subcontractors (NPC OOO "EcoGeoProject", OOO "VostokEcoProm") working with the Regional Centre carry out geological and hydro-geological surveys in the place of location of landfills. Along with the geodetic and geological data the reports also contain the following information:

- physiographical characteristics of the landfill;
- general characteristics of the object;
- environmental characteristics:
  - the geological environment and tectonic load;
  - water: ground waters, distances to the nearest surface and underground water sources;
  - estimated amount of the accumulated waste.

The report contains the description of the landfill, the adjacent territory, the distances to the locality (details of the buffer zone), the data on water bodies.

The geological and hydro-geological surveys provide sufficient information to estimate the degree of hazard of the landfill to the ground waters, as the report contains the data on the level and quality of ground waters, the infiltration rates, the courses of discharge. One of the possible sources of pollution is the filtrate from the accumulated solid domestic waste. It is formed as a result of leakage of the precipitation though the waste. The reliability of data on chemical and biological composition of ground waters and possible pollution with filtrate depends on the correctness of drilling.

Along with the geodetic and geological surveys the following samples are taken:

- water (from underground and surface sources);
- soil (around the landfill);
- air (flame analysis);
- radiation test.

The site itself is also examined carefully to obtain additional information on the surface and underground sources, morphometric features of rivers, hydraulic structures on them (ponds, reservoirs, etc.), qualitative and quantitative parameters of the river water.

The data are entered into the passport in accord with the Instructions. The produced passport is appended with the explanatory note on environmental impact assessment. The approval of the passport may be done by a delegated executor. The Regional Centre approves passports itself.

Developer	Head	Address, telephone number
UHIN	Vasilyev Yu.S., Deputy Director of Scientific Work	Kharkov, 61023. Phone: 433045
NII "TeploElectroProject"	Golovko V.V., Chief Engineer	8-b Pr. Titova, Donetsk, 83048. Phone: 3813490
UkrNTEC	Kulchenko V.V., General Director	25 Shevchenko, Donetsk.
PES "Donbass-Azovye, XXI Century"	Pavelko A.I., General Director	8-b Pr. Titova, Donetsk, 83048. Phone: 556492
DonPKTBMestProm	Kovalchuk I.I., Director	Donetsk. Phone: 510179
Private Company "Ecological Centre"	Kosolap G.I., Director	Gorlovka. Phone: 53964
Private Company PB "EcoServis"	Shevchenko _._., Director	Donetsk. Phone: 510114
OOO NPP "DonEcoServis"	Mayor V.I., Director	Donetsk. Phone: 950636
Regional Centre of Waste Management	Zadorozhnaya M.G., Head	2-b Pr. Mira, Donetsk, 83050.
Donetsk Chamber of Commerce	Chizhikov G.D., President	Donetsk, 83000 Phone: 928060
OOO NPO "Rotor"		7 Pr. Pavshikh Kommunarov, Donetsk, 83036.
NPKF "Alliance"	Kuzmichyova V.S., Director	82 Universitetskaya Str., Donetsk. Phone: 553136
"DonEcoFiltrServis"	Kazyuta V.I., Director	Donetsk.
OOO "Eliss"	Levadny V.F., Director	Yasinovataya.

Table 2 Major passport developers

(data by Sate Department of Ecology and Natural Resources)

The analysis of quality of the produced passports shows the following weak points: neither passport, develop by commercial enterprises, was approved by the State Department in the first draft. This indicates that approach to the process is too formal.

3.3.6. Main Weak Points of the Produced Passports

- incompleteness of the geographic information (no geodetic data);
- inaccurate data on the designed and actual areas and the composition of waste;
- approximate data on the amount of waste accumulated;
- harmful components of waste are not determined;
- no laboratory tests while assessing the environmental impact;
- no explanatory note with the history of the WDS;
- no map of the WDS.

Currently the State Department is considering 15 passports. Among which only two were developed by the owners, the rest - by the appointed developers.

The best passports were developed by:

- Regional Centre of Hazardous Waste Management;

- PES "Donbass-Azovye, XXI Century".

At present the **registry of waste disposal sites** contains only the data of 6 passports of SDW dumpsites, two of which have been prepared by the Regional Centre.

While auditing SDW dumpsites with the objective of passport preparation passport developers often find out that landfill operation does not meet the norms and legislation:

- Instead of using clay for landfill construction it is domestic and construction waste which is used;
- Landfills are not protected by fence which results in pollution of area adjacent to them with polyethylene waste, paper, etc. which are easily carried over by wind;
- There are no gutters for collection of filtration and surface water;
- There are no observation wells at landfills;
- The floor of landfills is not screened;
- Landfills do not have clear visible borders, border marks are absent.

Insufficient or lack of data about a land site allocated for a SDW landfill does not allow to make realistic forecasts concerning the period of its further operation.

- There are no soil reserves that would ensure a regular landfill operation;
- There are no specific maps;
- In most of the cases there is no sewerage system;
- Waste collection vehicles are not washed at the landfill site;
- The landfills are not equipped with telephone lines;
- There is no electricity supply at landfills.

That's why identification of danger presented by a SDW landfill to the environment, development of activities for its further operation, implementation of studies during preparation of a landfill passport not only become very important for creation of a registry of waste disposal sites but present sort of an audit.

At present there are the following penalties to be applied to landfill owners for the violation of environment legislation regulating operation of SDW landfills:

The Code of Ukraine "On Administrative Violations"

Article 82^6 – fine in the amount of 5 - 8 minimal tax-free incomes of citizens (UAH 17), i.e. from UAH 85 to UAH 136.

As far as contamination of land resources by waste is concerned, there is a fine for material damage to be calculated in accordance with the "Methodology of Definition of the Amount of Damage Caused by Pollution and Clogging of Land Resources Resulting from Violation of the Environmental Legislation (Ministry of Ecology and Natural Resources, Central State Ecological Inspection, 1988).

3.3.7. Regional Environmental Monitoring

To speak about a potential danger presented by SDW landfills on a regional level it is necessary to pay attention to organisations responsible for implementation of a regional monitoring, bearing in mind that some of them are to approve passports for waste disposal sites.

The regional (oblast) environmental monitoring is carried out by:

3.3.7.1. State Department of Ecology and Natural Resources

- Sources of industrial air emissions (concentration of pollutants (hereinafter referred to as CP), including radionucleides);
- Sources of waste water discharge (concentration of CP, including radionucleides);
- Surface water (concentration CP, including radionucleides);
- Water bodies within environment protection areas (background quantity of CP, including radionucleides);
- Surface and sea ecological systems (background quantity of CP, including radionucleides); industrial and domestic waste landfills (waste composition, concentration of CP, including radionucleides);
- Soils used for different purposes, including the ones of environment protection areas (residues of pesticides, agricultural chemicals and heavy metals, natural and artificial radioactivity).

3.3.7.2. Donetsk Regional Hydro-meteorological Centre

- Ambient air and rainfalls (concentration of pollutants, including radionucleides, trans-boundary transfer of pollutants);
- Surface and sea water (hydro-chemical and hydro-biological characteristics, concentration of pollutants, including radionucleides) at basic points of an observation network;
- Natural and dangerous hydro-meteorological phenomena: floods, stream rises (within the area of observation stations);
- Radioactive situation (at control points of a stationary network).

3.3.7.3. Donetsk State Regional Geological Company “Donetskgeology”

- Surface water (hydro-geological and hydro-chemical definition of composition and properties, including residues of pesticides and agricultural chemicals, evaluation of resources);
- Geo-chemical conditions of landscapes (contents and spread of natural and man-created chemical elements and their compounds);
- Natural and dangerous phenomena: endogenous and exogenous geological processes (their generic and space characteristics, manifestation).

3.3.7.4. Regional Sanitary and Epidemiological Station

(in populated areas and recreational zones, including natural areas of resorts)

- Ambient air (concentration of harmful chemical particles);
- Surface water of land and drinking water (chemical, bacteriological, radiological and virology analyses);
- Sea water (chemical, bacteriological, radiological and virology analyses);
- Underground water used for household water supply (chemical, bacteriological, radiological and virology analyses);
- Medical mud, brine of coastal lakes and lakes;
- Soils (concentration of pesticides, heavy metals, bacteriological, virology analyses, presence of geogelmint ovum);
- Physical factors (noise, electromagnetic fields, radiation, vibration, etc.).

3.3.7.5. Regional National Design and Technological Centre for Protection of Soil Fertility

- Soils that can be used for agricultural purposes (radiological, agrochemical and toxicological analyses, residues of pesticides, agricultural chemicals and heavy metals);
- Surface water that can be used for agricultural purposes (toxicological and radiological analyses, residues of pesticides, agricultural chemicals and heavy metals);

- Agricultural plants and products made on their basis (toxicological and radiological analyses, residues of pesticides, agricultural chemicals and heavy metals).

3.3.7.6. Regional National Station of Plants Protection in the Donetsk Oblast

- Application of chemical and biological methods of protection of agricultural plants.

3.3.7.7. National Forestry Association "Donetskles"

- Soils of lands of forests (radiological analyses, residues of pesticides, agricultural chemicals and heavy metals);
- Forest vegetation (damages caused by biotic and abiotic factors, bio-mass, biological diversity, radiological analyses, concentration of pollutants);
- Hunters' fauna (generic, quantitative and space characteristics, radiological analyses).

3.3.7.8. Donetsk Hydro-Geological and Land-reclamation Service

- Depth and mineralization of underground water of irrigated and drained lands;
- Concentration of salt in soils of irrigated and drained lands;
- Under-flooding of rural populated areas of coastal zones of water reservoirs (re-structuring of shores and underflooding of areas).

3.3.7.9. Severo-Donetsk (Northern Donetsk) Department of Water Resources

- Rivers, water reservoirs, channels, irrigation systems and water bodies of the overall water-management system, systems of inter-branch and agricultural water supply (concentration of 3P, including radionucleides);
- Surface water in cross-border zones and areas of its intensive use for industrial and household purposes (concentration of 3P, including radionucleides);

3.3.7.10. Donetsk Subsidiary of the Institute of Land Management

- **-** Qualitative description of lands used for agricultural purposes

3.3.7.11. Regional Department of Land Resources

- Land conditions (concentration of pollutants, manifestation of erosion and other exogenous processes, structure of land use and transformation of lands; vegetative layer of lands (generic composition, indicators of plants growth and damage).

3.3.7.12. Department of Housing and Public Utility Services

- Green plants in towns and town-like settlements

3.3.7.13. Donetsk Regional Public Utility "Donetskoblvodokanal", town water utilities of the Donetsk Oblast populated areas

- Waste water of town sewerage network and waste treatment facilities (concentration of pollutants, volumes of pollutants)

3.3.7.14. State Production Company of Centralised Water Supply "Ukrpromvodchermet"

- Drinking water of centralised water-supply systems (concentration of pollutants, volumes of consumption)

3.3.7.15. State Company "Donbassburrazvedka"

- Processes of under-flooding of towns and town-like settlements (dangerous increase of the level of underground waters).

3.3.8. Registry of Information to Assess Danger Presented by SDW Landfills

As it is stated that only 4% of SDW disposal sites have been registered and about 10% of landfill passports out of the total number of landfills claiming for passportization (the number of those claiming for passportization should be considerably higher) are under consideration of the State Department of Ecology, we are to find the ways to speed up this process.

The analysis of the situation describing passportization of waste disposal sites and maintenance of their registry shows that within hard economical conditions typical for most of the companies, especially public utilities, the process of passports development can take years.

In connection with this, it is necessary to consider the possibility for a step-by-step passport development.

At the first stage to create a SDW landfill registry it is sufficient to have information which would be easy to get and which wouldn't cost much, still this information should allow to define the danger presented by the object and to take necessary measures. At later stages a SDW landfill owner should submit a more detailed information concerning the object, including there the assessment of impact produced by it on the environment. Based on that, there will be prepared a registry of the second level with more complete data.

To proceed this way it is very important to create a list of information necessary for assessment of a potential danger presented by a waste disposal site, to identify the sources it can be obtained from and to find out the cost.

There is a description of an option below allowing you to receive a low-cost information for preparation of a passport enabling to assess a danger (without implementation of relevant studies) to a maximum extent possible.

3.4. Analysis of on-going regional programmes in the field of household waste management

Nowadays in the Oblast there are no Programmes or Plans focused exclusively on the management of solid household waste. Nevertheless, there are a number of regional programmes that include measures in the field of SHW management. Among them:

- Programme of industrial and household waste utilisation in the Donetsk Oblast for the period by 2005, approved by Decision of the Donetsk Regional Council as of 24.03.2000 N° 23/12-275 (hereinafter referred to as Programme 1).
- Programme of environmental protection and assurance of ecological safety in the Donetsk Oblast for 2001-2005 N° 3/22-551 (hereinafter referred to as Programme 2).
- Programme of development of housing sector of the Donetsk Oblast for 2000 and for a period by 2005, approved at the session of the Regional Council as of 29.02.2000 N° 23/11-236 (hereinafter referred to as program 3).
- Comprehensive programme on organization of collection, storage and recycling of solid and liquid household waste in Donetsk Oblast for a period between 1996 and 2005, approved by the Chief State Sanitary Inspector of Donetsk Oblast and ratified in 1995 by the Deputy Executive Chairman of the Regional Council (further referred to as Programme 4).

Activities, envisaged in these programmes, are later on included into annual programmes of social and economic development of Donetsk Oblast in accordance with which budget financing is implemented. It should be noted that Programme 2 was accepted later than others and incorporated practically all activities of Programmes 1 and 3 as well as additional activities, and specified amounts of financing, necessary for their implementation.

SHW management activities in regional programmes can be conventionally divided in accordance with certain directions:

- Preparation of design documentation and construction of SHW landfills;
- Preparation of design documentation and construction of waste recycling plants (facilities);
- Preparation of design documentation, putting to order and reconstruction of existing landfills;
- Activities on introduction of selective collection of SHW;
- Activities on recycling of certain types of secondary raw materials.

Development of regional programmes is based on programmes and proposals of cities and districts. That is why the activities of regional programmes are structured in accordance with administrative units of the Oblast and include activities of city and district programmes.

According to Programme 2 by the year 2005 in cities and districts of the Oblast the following measures are planned: construction of 23 new landfills, reconstruction of existing landfills in 25 cities and districts of the Oblast. In fact, by now 5 new landfills are built, construction of 6 more has started, and design documentation for 8 landfills is under preparation. Besides, reconstruction of 2 landfills has started, projects for reconstruction of 7 existing landfills are developed. Corresponding information is presented on Map 4.

As far as development of feasibility studies and construction of waste recycling plants (including thermal treatment and pyrolysis) are concerned, from 7 activities that have been planned only 1 is under implementation (waste recycling plant is being built in Kramatorsk). Feasibility studies for two waste incineration plants in Makeyevka and Dimitrovo have been developed, but have failed to pass the state ecological expertise.

Implementation of all the activities of Programme 2 should result in ecologically safe storage and utilization of 1625 thousands tons of solid household waste per year that is 93% of theoretically calculated annual amount of SHW in the Oblast (1750 thousand tons per year). Besides, these activities cover the territory with population of 3618 thousand people that is 76% of all the population of the Oblast.

For fulfilment of all the activities in the field of solid household waste management Programme 2 envisages financing in the amount of 125 million UAH, 91 millions of which are to be allocated for construction and reconstruction of landfills, and 34 millions - for preparation of feasibility studies and construction of waste recycling plants. However, it should be taken into account that factual cost of many activities will be higher than the planned estimates. Often only conventional or approximate costs are indicated in the programme that can be explained by the lack of experience and standardised approach to design and construction of landfills during preparation of the Programme in the year 2000.

This is especially conspicuous at the analysis of planned costs for implementation of construction of SHW landfills (the amount varies from 140 thousand UAH in Avdeyevka to 5 million UAH in Svetlodarsk and to 49 million UAH in Marioupol). In fact, development of a design documentation and the first stage of construction of the landfill in Svetlodarsk required 3 millions while the capacity of the landfill is 6 thousand tons per year.

The activities can be financed either from one or from several sources simultaneously. The following sources of financing are envisaged in the programmes:

- State budget
- Local budget
- Regional environmental protection fund
- City environment protection fund
- Means of companies
- Other sources (including grants).

Construction of landfills within the existing situation is a costly activity that requires huge investments. However, the investors and private capital are practically not involved in this sphere due to absence of guarantees securing the pay-back (return) of investments. This, in its turn, is connected with the current system of tariffs that does not allow to set long-term tariffs with a necessary profit margin. Beside that, taking into account large costs and absence of means in public utilities and in budgets of cities and districts the Regional fund of environmental protection becomes the main source of financing of construction of these facilities. Thus, in the year 2002 for construction and reconstruction of landfills 9,3 million UAH was taken from this fund, 1,6 million - from the state fund of environmental protection and 3,9 million UAH from local budgets altogether. In 2003 1,6 million UAH was allocated from the regional fund, while from local budgets it was only 0,5 million UAH. Besides, practically all cities and districts send their requests for receiving financing from the regional budget.

Attention should be paid to the fact that sometimes landfills planned for construction are supposed to be too close to each other. Thus, in the Yasinovatskiy rayon two neighbouring land plots were allocated for construction of the landfill of Yasinovataya city and the regional landfill of "Social Renaissance of Donbass" Ltd.

Thus, we may conclude that the approaches to planning the landfill construction should be changed. It is important to optimise their location based on the necessity to render waste collection services to several cities or districts and to concentrate all sources of financing on them.

3.5. Financing, realization and follow-up of the plan

3.5.1. Role of the elected persons

3.5.1.1. Implementation of the Plan at the local level

The local self-government bodies, cities, rayons and associations of them, in charge of the SHW management, have to dress a local programme detailing how they will implement the decisions of the Plan and the relevant yearly objectives.

The same will publish a yearly report on the SHW management on their territory.

3.5.1.2. Reform

Following the reforms initiated in the Oblast in the sector of housing and public utility services and the transition to a new model of functioning local self-government bodies introduce new forms of housing maintenance through creation of associations of co-owners of multi-storied buildings and transfer residential buildings for the maintenance by private companies. They improve the tariff policy, create Services for Communal Payments Collection, implement computerization.

3.5.2. Role of the second Tacis project

It is expected, at the date of the present document, a favourable decision for a second Tacis project in Donetsk (the tender has already been announced) aiming at the implementation of the recommendations of the first Tacis Programme for SHW management improvement.

The contractor of the Tacis 2 Programme will establish with the beneficiaries (the State Department of Ecology and the Department of Housing and Public Utility Services) an action programme sustaining the implementation of the Regional Strategic Plan.

3.5.3. Role of the Steering Committee

In order to ensure the implementation of the Regional Strategic Plan of SHW Management it is necessary to create a special permanent structure that will be responsible for organisation of co-operation and co-ordination of work of regional and local authorities, companies and organisations.

The National Programme of SHW Management (section 5) previews the following mechanism of the Programme implementation:

"In accordance with the relevant competences the implementation of the programme is to be ensured by:

- *At the national level – central body of executive power responsible for the issues of housing and public utility services*
- *At the local level – Republican Committee for Public Utility Services of the Autonomous Republic of Crimea,* ***Departments (Central Departments) of housing and public utility services of local state administrations.***

There ***can be created a Steering Committee for organisation of cooperation and coordination of activities of central and local bodies of executive power, local self-government bodies,*** *companies, institutions and organisations, not depending on their forms of ownership, which are involved into the Programme implementation as well as for correction of the measures defined by the programme by the Cabinet of Ministers of Ukraine in accordance with the available financial, material and organisational means".*

Considering the mentioned above as well as the fact that there has been created a Working Group in the oblast for development the Regional Strategic SHW Management Plan it would be advisable **to create a Steering Committee on its basis at the regional level.** It would be appropriate to study the possibility for the Steering Committee to be in charge of the Waste Monitoring Centre with permanent employees.

The Steering Committee is consulted about each project of investment (public or private) in the field of the household waste disposal facilities as sanitary landfills, sorting plants, transfer stations, incineration plant, (non limited list). It has to verify the conformity of the project with the Regional Strategic Plan. It votes an advice that is transmitted to the Authority in charge of the permitting of the projected facility.

The Steering Committee votes each year the adoption of the annual report about SHW Management in the Oblast of Donetsk. The Steering Committee actualises the on going Strategic Plan if necessary and prepares the next Strategic Plan.

3.5.4. Update of the plan

At the end of the period of the on going Plan (2009), a report will be made and published about the execution of the Plan. This report will expose the comparison between the forecast and what has happened.

In parallel, the next Plan will be prepared in 2009 in aim to be adopted before the end of the year.

3.6. Global action programme of the Regional Strategic SHW Management Plan

The Oblast Administration has established the following programme of funding of the equipments of SHWM.

Activity	Organisation in charge	Approximate implementation costs, thous. UAH	Years of implementation	Expected results
Measures for improvement of the waste collection system and storage of secondary raw materials				
Purchase of specialised vehicles for SHW collection with an annual renewal of 1/5 of the existing vehicle fleet	City executive committees, district state administrations	91,600	2005-2009	Assurance of 100% SHW collection
Purchase of tractors and trailers for SHW collection with an annual renewal of 1/5 of the existing vehicle fleet	City executive committees, district state administrations	41,340	2005-2009	Assurance of 100% SHW collection
Purchase of containers for SHW selective collection and replacement of old containers	City executive committees, district state administrations	21,300	2005-2009	Assurance of 100% SHW collection
Purchase and installation of weighing equipment at SHW landfills/dumps which will be used during the transition period	City executive committees, district state administrations	3,750	2005-2006	Improvement of the system of registration of SHW generation and transfer
Creation of an experimental site for collection and sorting of bulky and toxic waste	Donetsk city executive committee	50	2006	Introduction of the system of collection of bulky and toxic household waste
Construction of an experimental plan for SHW recycling (1st stage - a waste sorting facility)	Regional council, city executive committees of Kramatorsk, Slaviansk, Drujkovka	13,175 (12,000 spent)	2002-2005	Recycling of 100 thous. tons of SHW/ year with retrieval of 15 thous. tons of secondary raw materials

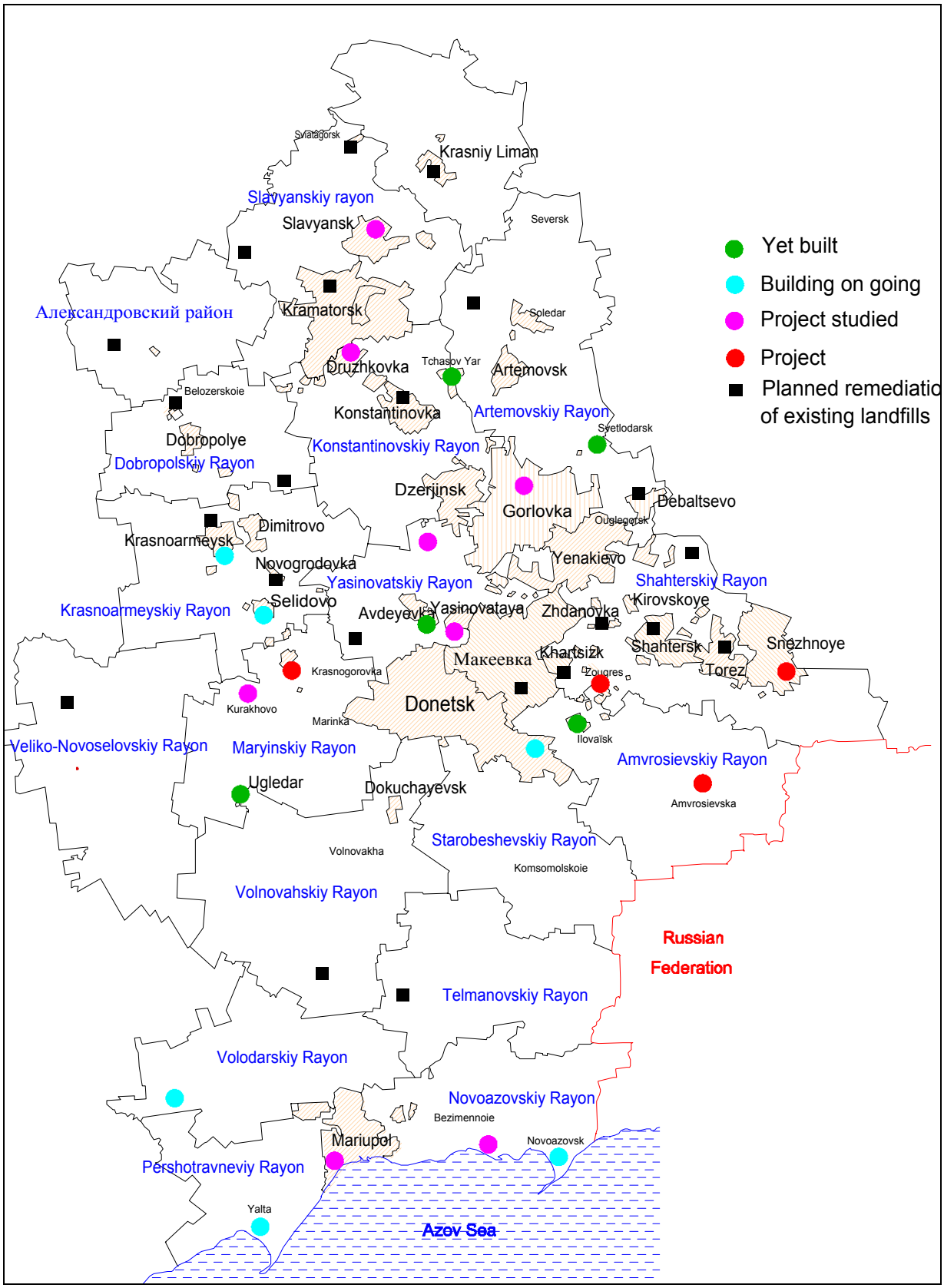
Construction of waste sorting facilities	City executive council of Donetsk, scientific and production company “Istok” Ltd.	15,000	2005	Recycling of 500 thous. tons of SHW with retrieval of 90 thous. tons of secondary raw materials
	Makeyevka city executive council	15,000	2007	
	Marioupol city executive council	15,000	2006	
	Khartsizsk city executive council, «UkrEkologia» Ltd.	15,000	2004-2005	
Extension of the network for collection and storage of secondary raw materials in the cities of Avdeyevka, Gorlovka, Donetsk, Yenakievo, Marioupol, Makeyevka, Slaviansk, Torez, Snejnoye, Shahtersk	City executive committees, Donetsk Regional Directorate “DonetskEkoKomResurcy”	200	2005-2009	Storage of 10.5 thous. tons of secondary raw materials
Development and commissioning of the pilot plant for composting of SHW with the help of the Californian worms	Svetlodarsk city executive council	500	2005	Utilisation of 5 thous. tons of waste
Development and step-by-step implementation of individual compost technologies for organic waste in the pilot zones of the private sector	Department of Housing and Public Utility Services of the Regional State Administration, Regional Centre of Hazardous Waste Management, city executive committees, district state administrations	20	2005-2009	Utilisation of 50 000 tons of organic waste
Development and commissioning of the pilot unit for biogas collection and utilisation at SHW dumps	Donetsk city executive council	Grant	2005-2006	Utilisation of the biogas
Measures for improvement of waste disposal				
Reconstruction of existing landfills	City executive committees, district state administrations	10,000	2005-2009	Disposal of 1080 thous. tons of SHW
Construction of regional landfills	Donetsk city executive council	30,000	2006	Ecologically safe disposal of 640 thous. tons of SHW
	Kramatorsk city executive council	30,000	2007	
	Marioupol city executive council	30,000	2008	
	Makeyevka city executive council	30,000	2009	
Construction of transfer stations and purchase of semi-trailers for waste transfer	Donetsk city executive council	19,600	2006	Improvement of SHW collection
	Slaviansk city executive council	9,600	2007	
	Marioupol city executive council	16,400	2008	
	Makeyevka city executive council	19,600	2009	

Closure of official dumps of increased hazard	City executive councils, district state administrations	5,000	2005-2009	Improvement of the ecological situation in the region
Liquidation of illegal dumps	City executive councils, district state administrations		2005-2009	Improvement of the ecological situation in the region
Measures for recycling of secondary raw materials				
Construction of a unit for utilisation of SHW and waste generated by human activities during the production of clinker	Kramatorsk city executive council, open joint-stock company «KTSHK-PUSHKA»	10,615	2005	Utilisation of up to 50 thous. tons/year of fuel SHW briquettes and up to 20 thous. tons/year of waste generated as a result of human activities
Construction of an experimental plant for SHW recycling (2nd stage - recycling plant)	Regional Council, city executive committees of Kramatorsk, Slaviansk, Drujkovka	3,000	2006-2007	Production of goods from secondary raw materials
Construction of a unit for recycling of used-up tyres	Donetsk city executive committee, “Donbasskhim-resurcy”	1,290	2006-2007	Recycling of 3000 tyres per year
Construction of a unit for recycling accumulator batteries with an electrolyte	Gorlovka city executive council, Donetsk regional directorate “DonetskEkoKomResurcy”	4,700	2006	Prevention of environment pollution by lead compounds and sulphuric acid in the amount of 5 thous. tons
Construction of facility for thermal processing of solid organic waste including used tyres	Debaltsevo city executive council, Donetsk regional directorate “DonetskEkoKomResurcy”, public utility “Pyrolysis”	4,300	2005	Recycling of 12000 tons of solid organic waste
Construction of a plant for recycling used-up PET bottles	Slaviansk city executive council, Donetsk regional directorate “DonetskEkoKomResurcy”	17,500	2005-2006	Utilisation of 5000 tons/year of used PET bottles
Construction of a unit for production of a foam glass from cullet	Slaviansk city executive committee, Donetsk regional directorate "DonetskEkoKomResurcy"	1,800	2005-2006	Utilisation of 5 thous. tons of cullet
Measures for ensuring the implementation of the Plan				
Study of the question and establishment of a Steering Committee for implementation of the regional plans of SHW management in order to organise co-operation and co-ordination of the work	Regional Council, Regional State Administration		2005	Efficient implementation of the Regional Strategic Plan

Creation of the permanent structure - the centre of waste monitoring for collection and creation of SHW management database	Regional State Administration, Department of Housing and Public Utility Services	15	2005	Creation of the SHW management database
Computerisation of the system of registration of SHW collection as well as of payment collection, introduction of a uniform software	Department of Housing and Public Utility Services, district state administrations	1,000	2005	Assurance of a reliable registration of SHW flows and payments for the services delivered
Development of programmes for optimisation of the tariff policy in the field of SHW management, withdrawal of the tariff for SHW collection from the apartment fee	City executive committees, district state administrations	10	2005	Optimisation of the system of payments for SHW removal
Organisation and implementation of the pilot project for introduction of waste taxes in Dimitrovo	Dimitrovo city executive committee	10		Optimisation of payment system for SHW collection service
Development of general schemes of sanitary cleaning of cities and districts	City executive committees, district state administrations, regional sanitary and epidemiological services	300	2005-2008	
Study of a question about the creation of a leasing company in order to finance purchases of waste collection trucks and other vehicles	Regional State Administration, city executive committees, district state administrations		2005	Creation of conditions for companies to purchase specialised vehicles by reasonable terms
Preparation of proposals for creation of a Regional Guarantee Fund for loans provided for the field of waste management	Regional State Administration, Department of Housing and Public Utility Services, State Department of Ecology		2005	
Training (re-training) of specialists in the field of SHW management	Centre of Human Resources Professional Development of the Regional State Administration, Donetsk Subsidiary of GIPK of the Ministry of Environment and Natural Resources, Department of Housing and Public Utility Services, State Department of Ecology		Each year	Professional development of specialists in the field of SHW management
Development of training programmes for teachers and schoolchildren and their implementation	Central directorate of science and education of the regional state administration, Institute of post-graduate education	15	2005-2006	Raising public awareness about the problem of SHW

Development of the programme of ecological culture for the population, teaching the basics of the communal sanitary rules and propaganda of the cultural SHW management and its implementation	Regional State Administration, State Department of Ecology in the Donetsk oblast, Regional sanitary and epidemiological service	15	2005-2008	Raising public awareness about the problem of SHW
Development of the methodology of organisation of selective collection of solid domestic waste in the residential sector and at companies	Department of the Housing and Public Utility Services of the Regional State Administration, Department of Ecology, Regional Centre of Hazardous Waste Management CSD «Wind Rose»	15	2005	Implementation of SHW selective collection and making SHW management profitable
Development and implementation of measures aimed at raising the efficiency of state and public control as regards illegal SHW removal, strengthening of functions	Regional State Administration, State Department of Ecology, Regional Epidemiological and Sanitary Service, city executive committees, district state administrations		2005-2006	
Inventory, creation of the relevant database, cartography	City executive committees, district state administrations	20	2005	
Creation of the inventory of official SHW dumps with indication of their hazard	State Department of Ecology	10	2005	
To consider the question of creation of a leasing company for construction of regional SHW landfills	Regional State Administration		2005	

Table 3 Programme of funding of the equipments



Map 4 Construction and reconstruction of SHW landfills planned by the existing Programme by 2005

3.7. Long-term political objectives

3.7.1. To reduce the risks while controlling the costs

The household waste provoke in the whole Oblast heavy attempts to the environment. Some are transitory but others are irreversible, as the pollution of watertables and the emission of dioxins. But it's well about to bequeath to the future generations a territory where it will be still possible to drink the tap water and to eat food produced on place without to fear for health.

From a strictly financial point of view, a long-term management must also avoid future repair costs. The protection of our environment is so also an affair of economical rationality. It requires to use the best available technologies, i.e. the technologies the most performing at a reasonable cost and at a reasonable level of complexity.

To protect environment is a target by itself, but a preserved environment is also an unavoidable element of the development of the Oblast.

For this objective, it's indispensable to get a better knowledge of the problem, in aim that in future the subject should be better controlled, the management more efficient, and the results quantifiable.

3.7.2. To control the quantity of waste to be disposed

The cheapest and the most easy to dispose waste is the one which is not produced. This evidence brings naturally the public authorities to look for to limit at the minimum the quantities of waste they are in charge. That passes throughout a well fitted regulation, encouraging the keeping of the good habits as the purchase of loose goods (although the westernisation of Ukraine makes to fear that the packaging multiplies), establishing manufacturing standards respecting environment, and so, which overpasses the frame of the present Plan.

At the regional level, an effort of responsibilitization of the whole population will be done, by, for example, the education of the children, the sensitisation of the teachers, the encouragement of exemplary actions, in aim to sharpen the civic sense of anybody on this subject.

3.7.3. To reduce the quantity of ultimate waste

An ultimate waste is a waste that cannot be valued within the technical and economical conditions of the moment. It's so only possible to incinerate it (which eventually produces other ultimate waste) or to store it, which doubtlessly constitutes a cost, an environmental nuisance, as wall as a wasting of matter and energy. So it's about to reduce at the minimum the quantity of ultimate waste, by applying various solutions in the following order of priorities:

1. Reduce production of waste
2. Reduce toxicity of waste
3. Re-use or recycle materials
4. Re-use the matter by composting
5. Value the energetic content by the biogas
6. Store or incinerate

3.7.4. To encourage the intercity co-operation

A waste management respectful of the environment requires competencies, technical means, investments, etc, that a small or medium municipality cannot take in charge alone. So it's necessary to encourage the municipalities to gather, first in aim to organize an efficient collection. On other hand, technical and costly facilities as sorting centres and sanitary landfills have an optimal economical size largely exceeding the needs of one municipality or of one rayon. This co-operation could pass trough the creation of multi-municipal enterprises, i.e. by the put in common of technical and financial means, even by the "autonomization" of the existing municipal utilities, which with the municipalities could pass contracts.

3.8. Strategic objectives

3.8.1. Awareness of the importance of waste problems

In the first phase during until 2009 it's about that the population of the Oblast raise awareness of the importance of the problem of waste. Education, sensitisation, and information, even the repression for example, must aware each of the 4,774,400 inhabitants that to throw waste anywhere constitutes an act un-civic and reprehensible, and that to burn household waste is a hard attempt to environment and makes run sanitary risks important in term.

3.8.2. 100% waste collection services paid by inhabitants in 2009

The local utilities are missing financial assets to realize the indispensable investments to carry out their mission. But a rigorous management of the problem of household waste requires that the collection becomes a universal service within the Oblast, because every homes produce waste.

In that aim it is indispensable that each home pays its contribution to this service of general interest. The recovery of the amounts due by the homes and the JEKs is so a first importance mission for the local utilities. Facing the emergency of this problem, a volunteer action is necessary which expresses by to target **100% recovery of the amounts due by the homes and the JEKs in 2009.**

Quite an important role should be played by reforms initiated in the housing and public utility sector and accompanied by introduction of new forms of housing maintenance. There operate in the Oblast 300 associations of co-owners of multi-storied residential buildings, specialised housing operation services have been created in such cities as Avdeyevka, Dimitrovo, Kramatorsk, Donetsk, Kurakhovo. On a tender basis 42 private companies have won the right to provide maintenance services for 7.6 mln. m^2 of dwelling (13% of the total surface of multi-storied buildings).

3.8.3. 100% of household waste collected in 2009

In parallel, it is indispensable to justify the claimed amounts by an improving service. It's also to end quickly the two hardest consequences, on an environmental point of view, of the insufficiencies of the on going management of the waste, that are fires and dumpsites. This objective must be realized in concomitance with the first, i.e. in 2009. It will require investments for containers, trucks, even in transfer stations, but lighter solutions must also be explored as the enlargement of the timetable of the use of the trucks. However, one should bear in mind that in this case the trucks will be worn out quicker.

3.8.4. 100% of ultimate waste in sanitary landfills in 2014

Incineration with smoke treatment requires very huge investments and produces by itself ultimate waste: bottom ash that must be inerted before landfilling, and very toxic dust which for no solution of storage is foreseen within the Oblast.

The storage will stay the only one solution for the ultimate waste in mid term. But the modern technology of sanitary landfills makes of them reactors of production of biogas, so bringing an energetic recovery of waste. So it's to settle sufficient capacities of sanitary landfills instead of existing landfills and dumpsites, more secure in matter of environment and health. It will constitute huge investments, but relying on a first sanitary landfill quickly built help with international financing bankable on the base of the economical recovery and the decrease of the interest rates, this objective must be realized within 10 years, so in 2014.

Once the objectives "100% fees recovered", 100% waste collected" and "100% ultimate waste disposed in sanitary landfills", then it could be considered that public authorities took under control the household waste in the Donetsk Oblast.

3.8.5. Development of recycling capacities

The State Programme of Solid Household Waste Treatment envisages up to 2011 an implementation in Ukraine of a system of recycling and utilisation of valuable components of household waste, introduction of technologies allowing to efficiently use household waste as power resources as well as production of new domestic equipment for household waste treatment.

Taking into account a complicated ecological situation in the Donetsk Oblast as well as a heavy load on the atmosphere caused by human activities (the density of emissions of pollutants into the air is 9 times higher than the average value for Ukraine) the priority in solid household waste treatment in Donetsk Oblast should be given not to waste incineration but to retrieval of valuable SHW components, storage of secondary raw materials and their utilisation.

That's why before 2009 it is planned to start in the Oblast the activities aimed at selective collection of valuable components of SHW, to extend the network of secondary raw materials collection and storage centres, to build waste sorting facilities, to construct secondary raw materials recycling capacities that have already been planned by the active programmes and to create additional ones. At the same time it will help to gradually solve the problem of "ultimate waste" disposal at landfills, i.e. of waste not subject to utilisation and to reduce the volumes of disposed waste. It is also necessary to start the production of machines and equipment in order to create an industry of solid household waste utilisation.

In this respect, some particular aspects have to be kept in mind.

1. The regional scale cannot be considered as exclusive. Most of the facilities for recycling the secondary raw materials must be planned as a rule at the national level. A glass factory or paper mill for instance must be designed with a capacity, which exceeds the amount of glasses or paper able to be recovered in one single Oblast. This is not the same situation for other recyclables as plastics. Small workshops for plastics can compete easily with bigger facilities.
2. Market driven-mechanisms must play as largely as possible. The Regional budget as well as the local city budgets have not to be used for competing with private entrepreneurs, and to risk money of tax-payers in uncertain business. The Regional authorities have to create a climate able to attract investors, by simplifying procedures, organising direct connections with waste sorting facilities and securing quantities and price level of sorted waste materials through control and contractual relationships. Mechanisms as tender and concession should be compulsory before using direct public investment, which can happen only in case of market failure.
3. Information about waste recyclables must be largely publicized and cannot be under secret as today, preventing new investors to enter the business. The Region authorities must publish information and can facilitate the meeting of the supply and demand by creating a website of secondary raw materials exchange.
4. The specialisation of the region in mechanic works give a strong base for development of sorting and recycling facility construction industry. The region authorities must help existing companies to turn their activities towards these new areas of business, through training of new specialists, developing information and research centres, organisation of tenders for the future sorting plants (instead of construction by city departments), reduction of taxes for investment in these branches.

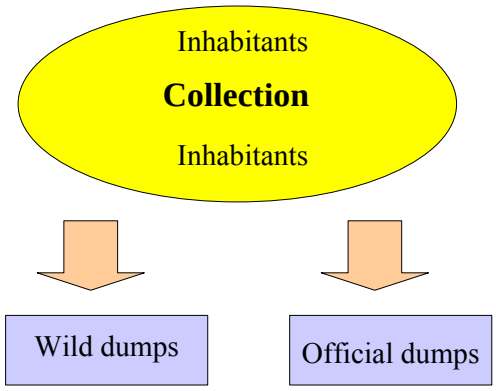
3.8.6. Experimentations of alternative management

In parallel to these objectives of control of the channel from a global point of view, it will be useful to launch experiments of innovating collection, of separation of toxics, of sorting, of recycling, of composting. Starting from an actual rate of recycling of 7%, it will be agreed to aim at an effective recycling rate of 12% in 2009. it will be to improve the collection rate of glass and paper and to launch experiments aiming to determine if the separate collection is preferable to the sorting of rough waste, to verify the economical viability of these processes, etc.

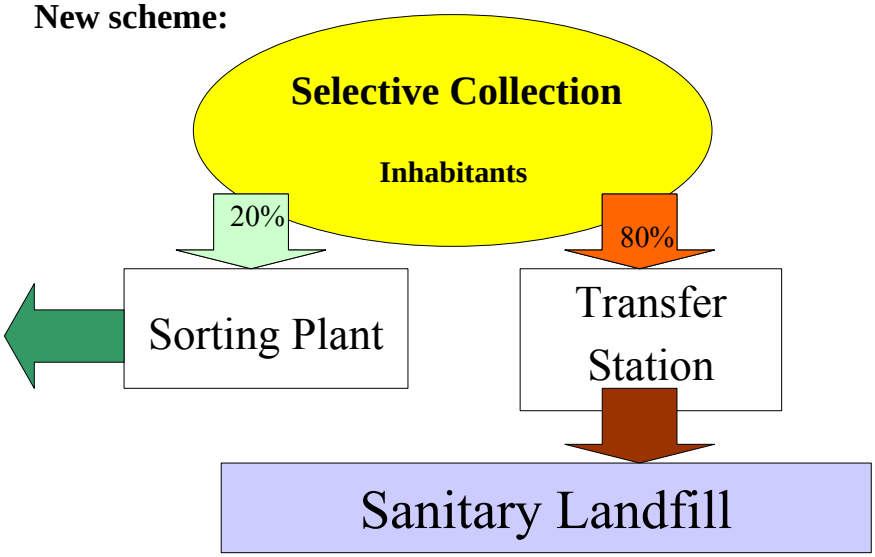
3.8.7. General assessments and forecasts

In accordance with the strategic tasks aiming at improvement of the existing system of SHW management the general scheme of SHW management must gradually change due to 100% coverage of the population with a mechanised system of SHW collection and waste disposal at official dumps (and in the future – at sanitary regional landfills), introduction of selective collection of SHW by the population, creation of waste sorting facilities with retrieval of valuable components, extension of the network of waste collection, storage and recycling centres, composting of waste.

Existing scheme

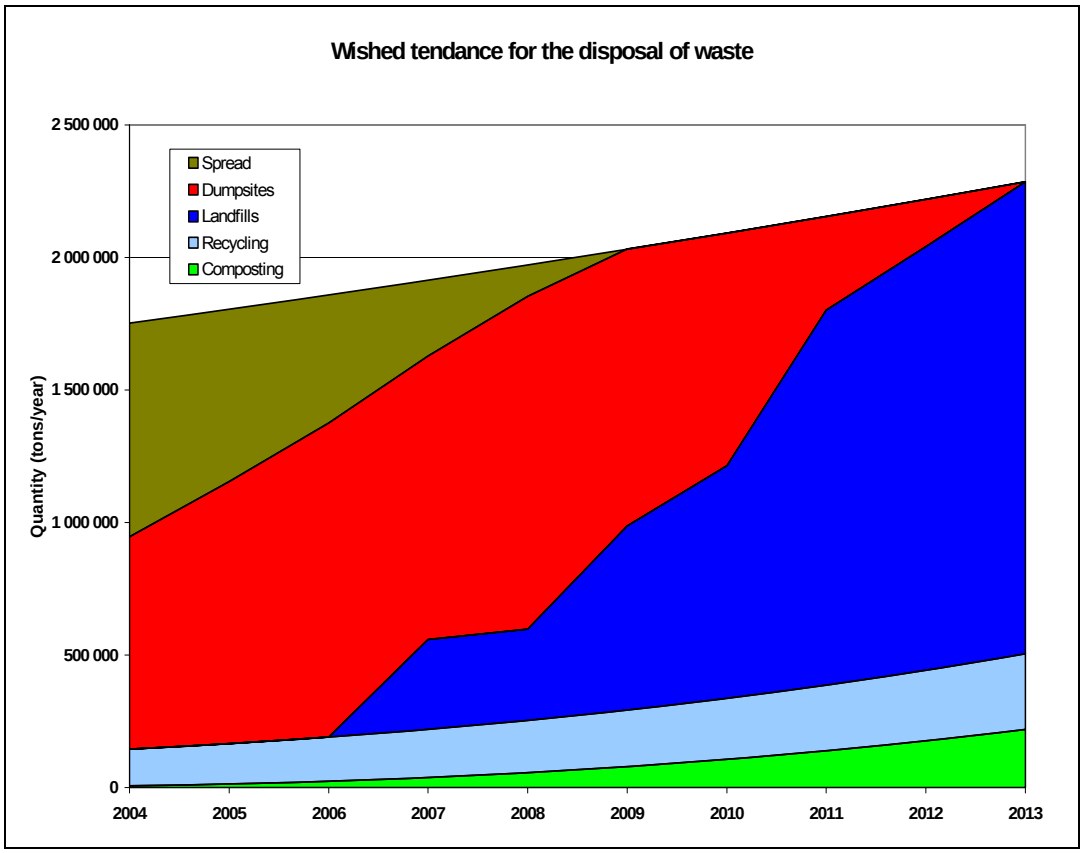


New scheme:



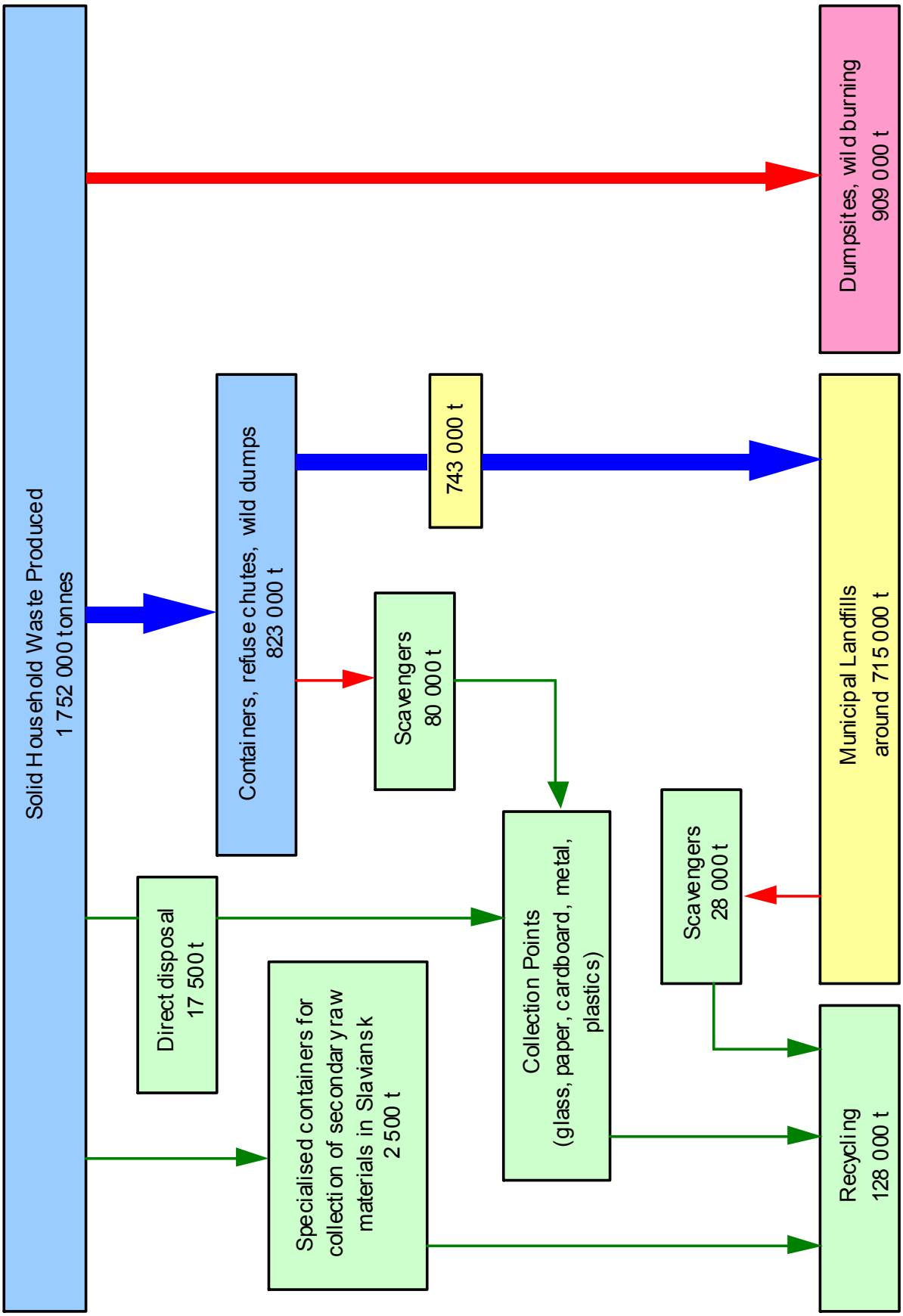
The following Graph 2 shows the tendencies of development of household waste treatment techniques:

- at the base, a development of composting and recycling;
- at the top (white segment), a foreseen growth of the production of household waste;
- between both, the sharing between existing landfills (red) and dumpsites and fires (brown), then the rise of capacity of the sanitary landfills (blue).

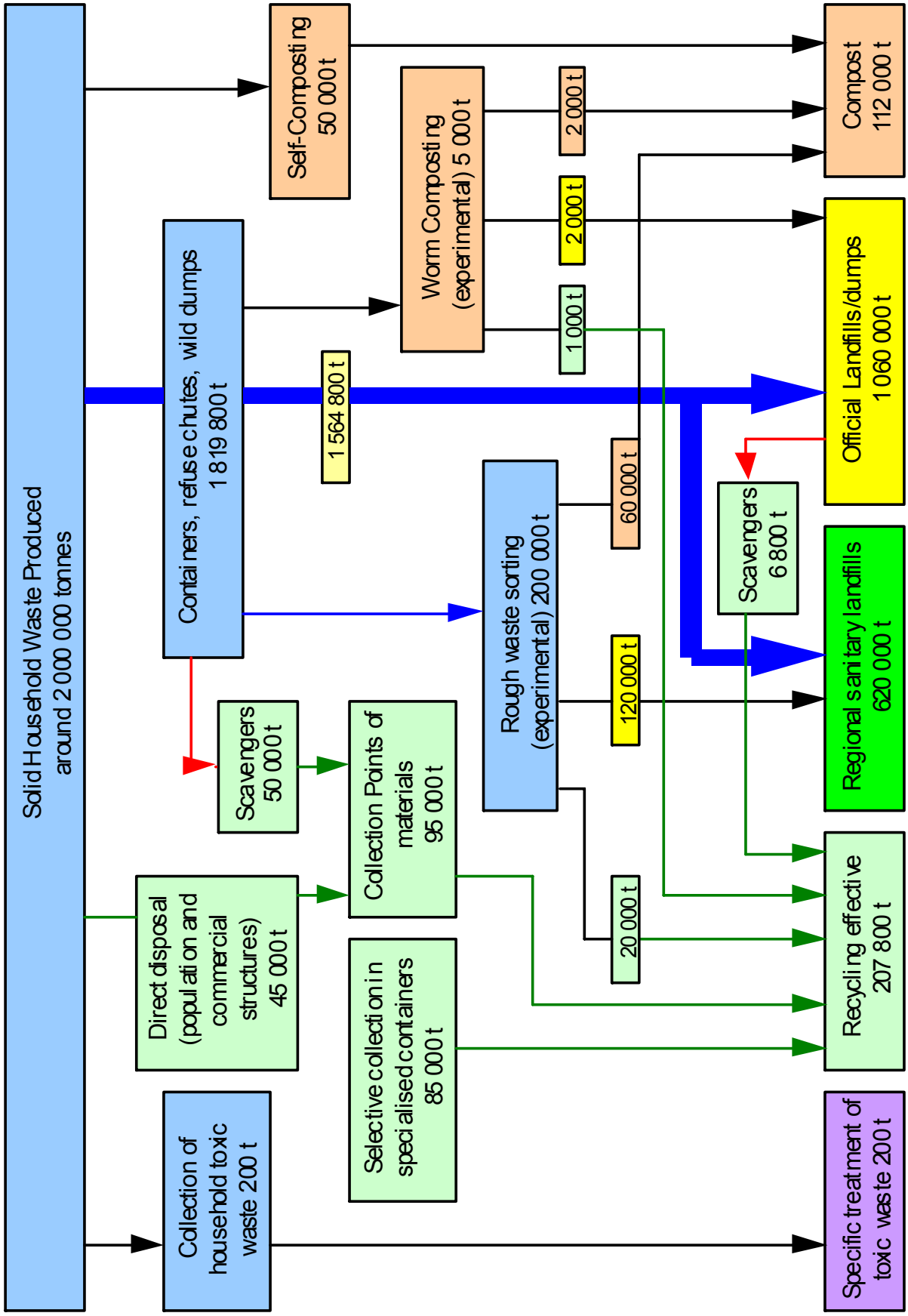


Graph 2 Evolution of the disposal to be scheduled, in size order, by type of disposal

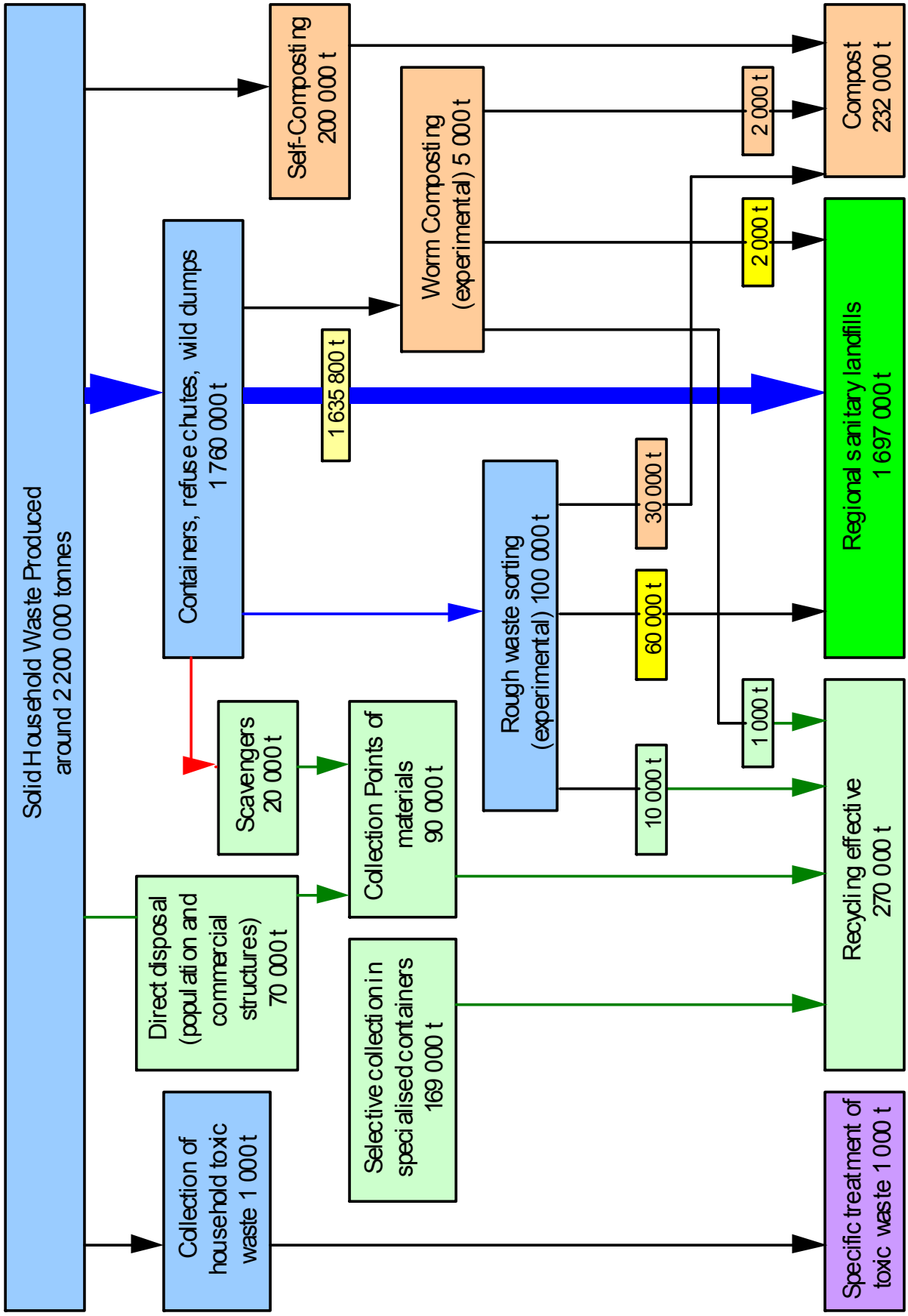
The quantities of SHW in 2004 and foreseen for 2014 are resumed on the two following synoptics. The techniques of waste treatment are generally presented at the following three schemes.



Graph 3 Situation assessed in 2004



Graph 4 Objectives 2009



Graph 5 Objectives 2014

3.9. Action Programme concerning the production, the collection and the disposal

3.9.1. Action priorities

The priority actions by years have been defined in accordance with the objectives set for 2009 such as 100% collection of SHW and 100% collection of payments from the population at the whole territory of the Oblast as well as the tasks related to construction of regional landfills, introduction of SHW selective collection, sorting and recycling of secondary raw materials.

As the level of mechanised collection of SHW for the Oblast as a whole is low (especially in the private sector and rural areas) resulting in a low ratio of payments received for the services delivered it is proposed to gradually increase the level of SHW collection year by year (this level will be different for the private sector and collective housing) increasing as a result the ratio of payments collected. At the same time there should be created similar conditions for payments for similar services so that the amount of a payment doesn't depend on a place of residence and will gradually become the same for each person per year (both for the inhabitants of the private sector and collective housing), not exceeding during 5 years the average amount of payment per year, i.e. **UAH 12 per person.**

Action priorities are described below year by year.

3.9.2. Programme 2005

3.9.2.1. To implement the toolboxes

- Computerization of the fees
  - Creation of a regional leasing company for the financing of collection and transfer vehicles;
  - Negotiation with the IFIs of a regional investment plan of waste disposal facilities (landfills, transfer stations, sorting plants);
  - Creation of a regional guarantee fund for the loans of the municipalities and rayons in waste management.
- Systematisation of the weighbridges
  - Implementation of a weighbridge on each new waste disposal and sorting facility and on each landfill whose exploitation is maintained for the transition period of the next 5 years.

3.9.2.2. Waste collection

For the year 2005 the task for the **Oblast as a whole** is to ensure **40%** waste collected in the private sector and **60%** waste collected in the collective housing.

For this purpose it is necessary to buy trucks and tractors with trailers in aim to renew 1/5 of the existing park of vehicles and containers.

3.9.2.3. Evolution of the fees

City and rayon authorities are asked to develop measures aiming at achievement of the ratio of payments in accordance with the planned level of SHW collection, i.e. not lower than the following (in some cities this level is already much higher).

Private Sector	Recovery rate	40	%
	Average fee	12.00	UAH/inh/y
Collective Housing	Recovery rate	60	%
	Average fee	6.00	UAH/inh/y

3.9.2.4. Recycling

Development of the selective collection bound to the sorting facilities of Kramatorsk, Donetsk, Khartsizsk.

3.9.3. Programme 2006

3.9.3.1. First sanitary landfill

Construction of the 1st sanitary landfill for the city of Donetsk

Construction of 6 transfer stations

Purchase of the necessary waste transfer semi-trailers

3.9.3.2. Collection

Renewing of 1/5 of the existing park of trucks and tractors + trailers

Equipment with trucks, tractors + trailers, and containers for 60% waste collected in the private sector and 70% waste collected in the collective housing

3.9.3.3. Evolution of the fees

City and rayon authorities are asked to develop measures aiming at achievement of the ratio of payments in accordance with the planned level of SHW collection, i.e. not lower than the following:

Private Sector	Recovery rate	60	%
	Average fee	12.00	UAH/inh/y
Collective Housing	Recovery rate	70	%
	Average fee	7.00	UAH/inh/y

3.9.3.4. Recycling

Implementation of the selective collection and a sorting facility in Marioupol

3.9.4. Programme 2007

3.9.4.1. Second sanitary landfill

Construction of the 2nd sanitary landfill for the cities of Kramatorsk, Slaviansk, Drujkovka and the rayon of Slaviansk

Construction of 6 transfer stations

Purchase of the necessary waste transfer semi-trailers

3.9.4.2. Collection

Renewing of 1/5 of the existing park of trucks and tractors + trailers

Equipment with trucks, tractors + trailers, and containers for **80%** waste collected in the private sector and **80%** waste collected in the collective housing

3.9.4.3. Evolution of the fees

It is asked to each municipality and rayon to establish a local programme aiming at the following objectives:

Private Sector	Recovery rate	80	%
	Average fee	12.00	UAH/inh/y
Collective Housing	Recovery rate	80	%
	Average fee	8.50	UAH/inh/y

3.9.4.4. Recycling

Implementation of the selective collection and a sorting facility in Makeyevka

3.9.5. Programme 2008

3.9.5.1. Third sanitary landfill

Construction of the 3rd sanitary landfill for the city of Marioupol

Construction of 4 transfer stations

Purchase of the necessary waste transfer semi-trailers

3.9.5.2. Collection

Renewing of 1/5 of the existing park of trucks and tractors + trailers

Equipment with trucks, tractors + trailers, and containers for **90%** waste collected in the private sector and **90%** waste collected in the collective housing.

3.9.5.3. Evolution of the fees

It is asked to each municipality and rayon to establish a local programme aiming at the following objectives:

Private Sector	Recovery rate	90	%
	Average fee	12.00	UAH/inh/y
Collective Housing	Recovery rate	90	%
	Average fee	10.00	UAH/inh/y

3.9.5.4. Recycling

Development of the existing selective collection

3.9.6. Programme 2009

3.9.6.1. Fourth sanitary landfill

Construction of the 4th sanitary landfill for the city of Makeyevka

Construction of 6 transfer stations

Purchase of the necessary waste transfer semi-trailers

3.9.6.2. Collection

Renewing of 1/5 of the existing park of trucks and tractors + trailers

Equipment with trucks, tractors + trailers, and containers for **100%** waste collected in the private sector and **100%** waste collected in the collective housing

3.9.6.3. Evolution of the fees

It is asked to each municipality and rayon to establish a local programme aiming at the following objectives:

Private Sector	Recovery rate	100	%
	Average fee	12.00	UAH/inh/y
Collective Housing	Recovery rate	100	%
	Average fee	12.00	UAH/inh/y

3.9.6.4. Recycling

Development of the existing selective collection

4. Project targets, project measures and target groups

4.1. Targeted public

As developed in this report, the project targets to improve the SHWM for all the inhabitants of Donetsk Oblast, so around 4.8 mln people.

Based on 2002 figures, only 30% were regularly collected and no landfill meets the international standards.

The Regional Strategic Plan flaunts concrete objectives translated in number of inhabitants in the following Table 4.

The objective of the Plan is to increase the tariffs up to 12 UAH/inh/year, so 1 UAH/inh/month. In 2006, we can consider that the largest part of the population has minimum incomes as:

	Minimum incomes UAH/month	‰ SHWM fees/incomes
Salaries in largest cities	1200	0.83 ‰
Other salaries	600	1.67 ‰
Retired	300	3.33 ‰

Action	Equipment	N	N inh. concerned	1st		2nd		3rd		4th		5th		6-10th	
				N	N inh.	N	N inh.	N	N inh.	N	N inh.	N	N inh.	N	N inh.
Weighbridges		25		25	3,750,000										
Computerization		100	4,800,000	100	2,400,000		600,000		600,000		600,000		600,000		
Put at level of collection	Trucks	400	2,000,000	80	400,000	80	400,000	80	400,000	80	400,000	80	400,000		
	Tractor + trailer	180	200,000	36	40,000	36	40,000	36	40,000	36	40,000	36	40,000		
	Containers	20,000	2,000,000	4000	400,000	4000	400,000	4000	400,000	4000	400,000	4000	400,000		
Development of collection	Trucks	450	2,200,000	100	490,000	100	490,000	100	490,000	75	370,000	75	370,000		
	Tractor + trailer	350	400,000	80	90,000	80	90,000	80	90,000	50	60,000	60	70,000		
	Containers	22,000	2,200,000	5500	550,000	5500	550,000	5500	550,000	2500		3000	300,000		
Selective collection	Containers	1,800	900,000	300	150,000	300	150,000	400	150,000	400		400	200,000		
	Trucks	10	900,000	2	180,000	2	180,000	2	180,000	2		2	180,000		
	Sorting plants	2	900,000			1	450,000	1	450,000						
Transfer	Semi-trailers	80	2,000,000			20	500,000	20	500,000	20	500,000	20	500,000		
	Transfer station	21	3,540,000			4	1,030,000	4	530,000	4	940,000	4	470,000	6	570,000
Landfills	New	4	4,800,000					1	500,000	1	500,000	1	500,000	7	2,300,000

Table 4 Number of people involved in the project

4.2. Education, information, sensitisation

4.2.1. Training of waste workers

The employees and the executives of the waste collection and landfill operation companies must receive training aiming to combine respect of environment, technical efficiency and economical viability.

The training of the employees of the companies in charge of waste collection and landfill operation can be organised by the Department of Housing and Public Utility Services of the Regional State Administration at the Centre of Professional Development and Re-training of the Regional State Administration with participation of the State Department of Ecology. The training may be organised within the framework of a new Tacis project.

4.2.2. Training of teachers of primary school and teachers of natural sciences

Children are privileged vectors of a change of behaviour of the population toward waste, their production by the homes, then their management in each family. It is indispensable that the primary school teachers and the professors of natural sciences and geography should be trained to the problematic of the waste management, in aim they could teach every child in this domain.

The training of the primary school teachers and the professors concerning at less one age class should be carried out during the years 2005 and 2006. The first pedagogical equipment has been designed and taken in charge by Tacis for the pilot-project in Slaviansk. A pedagogical case will be designed and distributed. For training of teachers it would be advisable to involve the Institute of Post-graduate Education.

4.2.3. Exemplary actions, events

Public authorities will encourage symbolically and financially all initiatives aiming to an awareness of the problem of the waste management or to an invitation to a more citizen behaviour.

Municipalities, administrations and public enterprises will be invited, not only to adopt an exemplary behaviour (sensitisation of the personal, use of ecological processes and materials, sorting of the waste at source, selective collection in the offices, …), but also to initiate and to sustain all exemplary action.

4.2.4. General public

The Regional Solid Household Waste Management Strategic Plan is a public document. Its large circulation is necessary to show the transparency of the collective choices and to justify the particular decisions in the interest of the general public.

The population will be informed of the draft plan and invited to take knowledge of it. The Oblast council, the regional administration, and the municipalities disposing of a website will put in consultation the project of plan itself and its summary. All elected councils disposing of a periodical are invited to use it to sensitise the general public and to remind laws and regulations about waste.

The expression of the citizens will be collected by the way of e-mail addresses, of a mailbox of the administration. Public meetings presenting the project of plan may be organized. The remarks and questions of the public will be synthesized in a report. This report will be sent to the working group who will answer point by point.

4.2.5. Elected, administrative executives and local officials

The Plan will be transmitted to a maximum of elected people, of administrations executives, of economics leaders, of journalists, of intellectuals, etc. Starting from October 2004 it will be necessary to publish a periodic bulletin which will become an important factor facilitating the understanding of the significance of the considered problems as well as a tool for dissemination of information about the progress in development and later on a progress in implementation of the SDW Management Plan. As an option, such a bulletin can be published in the ecological newspaper “Nash Kray” or in the “Herald of Sanitary and Epidemiological Station”.

4.3. Improvement of the data

4.3.1. Need for Data for Solid Household Waste Management

A good database is the cornerstone of any good management in SHW. The necessity to have good information arises from the ever growing costs of investment and operations in that sector. Furthermore, incineration plants, sorting facilities or even sanitary landfill sites have pay-back periods of 10 to 30 years, a fact that implies that one must anticipate the changes to occur over the said periods and therefore forecasts for instance population migrations, changes in life style and so on. In short, one need to know whatever modifications on quantities, composition and locations of the waste could occur, and therefore what these quantities, compositions and other parameters already are.

In the framework of the Tacis Programme "Improvement of Solid Domestic Waste Management in the Donetsk Oblast of Ukraine", a large data inventory and gathering has been organised in order for the Regional Administration and the expert team to understand the sub-sector tendencies.

4.3.2. Need for a Permanent Waste Observatory

The data collected during this first stage of the Programme should be incorporated in a database within a permanent structure such as a “Permanent Waste Observatory” (PWO). This PWO would be the one that will have to maintain, develop and update the database and carry out the necessary studies required for the choice of equipment in the near and long-term future. The PWO would have several missions among which the creation, development and updating of the database already mentioned, but also to use the said database to provide the relevant services and deciders with studies, guides and guidelines on the waste sub-sector. This is one of the fundamental tools in preparing long-term development programme.

It was also obvious that the first collected data would be incomplete and some of them only estimations. Thus, the PWO shall initiate in the future its own studies in order to precise a growing large number of detailed points pertaining to the management of wastes in general and of SHW in particular. Otherwise stated, data collected today as well as those of tomorrow will have to be periodically updated through new studies, new polls, and so on…. Hence the need to know which data are available, where they are and what is their level of quality and accuracy. The aim is to become familiar with the present state of the information already collected by regional organisations and gathers the part useful for the Project.

Anyway, the improvement of the SHWM will be a long and hard task. A lot of decisions must be taken continuously at the regional level and at the local level. The quality of the management decisions lays always on the quality of the available information. This last one must reflect the reality as soon as possible and as faithfully as possible and as subtly as possible. A large part of the inherited situation is caused by the pitiful management of the information on SHWM: the information is false, obsolete, incomplete, dispersed, such that nobody can get a full view of the problems he is in charge of. The major objective stays the improvement of the SHWM, which depends on decisions, which depend on information.

4.3.3. Weighbridges

All the facilities used for the sorting or the disposal of waste will be equipped with a weighbridge. All data about SHW management will be expressed in mass: kilogram or ton.

5. Design basis and design criteria, project area, population, waste quantities

5.1. Production of household waste

5.1.1. Definition of the waste concerned by the plan

There are no standards in Ukraine regulating household waste treatment. As far as waste terminology is concerned, the Ukrainian "Law on Waste" gives definitions of the main terms such as "waste", "hazardous waste" but doesn't specify "solid household waste".

"The Procedure of Service Delivery for Collection and Disposal of Solid and Liquid Domestic Waste", approved by the Order N° 54 as of 21.03.2000 of the State Committee of Architecture and Housing Policy, provides the following definition of solid household waste.

Solid household waste (SHW) is the waste generated as a result of human activities and accumulated in residential buildings, social and cultural establishments, public, educational, medical, trade and other organisations (these are the food waste, household appliances, garbage, fallen leaves, waste resulting from cleaning or renovating apartments, waste paper, glass, polymeric materials, etc.) which can no longer be used at the place they have been generated.

Thus, during the development of the present plan the following waste is taken into account:

- Regular household waste of residential buildings, hotels, hostels (food waste, glass, paper and polymeric waste, ash, vegetation residues, etc.)
- Bulky household waste (old furniture, electric household devices, etc.)
- Waste resulting from cleaning of territories and public buildings (hospitals, markets, railway stations, beaches, parks, etc.)
- Common non-hazardous waste of commercial enterprises, administrative buildings and institutions.

5.1.2. Tonnage

As nowadays in Ukraine there is no state primary registration of data, no single form of state statistic reporting concerning the volumes of household waste generated, disposed and accumulated the result is that there is no reliable data. What makes the situation worse is that SHW disposed is never weighted. SHW dumps and even landfills recently built in Donetsk Oblast are not equipped with weighting equipment. The registration of SHW collected and disposed at dumps/landfills is done in terms of volumes in m^3 by calculation methods or by fact (through the volumes of containers). But it's clear that 1 m^3 of waste is not the same quantity in the container (150-250 kg/m^3), in the truck (250-400 kg/m^3) and in the landfill (500-1000 kg/m^3)!

All calculations for the volumes of waste generated are done on the basis of SHW accumulation norms approved in cities and rayons by local authorities which are based not on on-site measurements and studies but on norms, recommended by the State Committee of Ukraine for Housing and Public Utility Services.

In 1995 the State Committee of Ukraine for Housing and Public Utility Services has approved the "Recommended norms of solid household waste accumulation for populated areas of Ukraine", which set up the norms for two sources of waste origin: residential buildings and public organisations, establishments and institutions. The norms depend on the type of the populated area (cities or rural area, number of inhabitants, availability of recreational zone) and the level of comfort of dwelling.

In accordance with this document the recommended annual norms for different residential buildings per person are the following:

Groups of residences	Facility	Norm of SDW generation per per inhabitant				Density of waste, kg/m^3
		Average daily		Average annual		
		kg	litres	kg	m^3	
Buildings with all modern conveniences (gas supply, centralized heating system, water supply, sewerage)						
1-2		0.64	3.07	235	1.12	210
3-5		0.67	3.00	245	1.09	225

Buildings with no modern conveniences (without water supply and sewerage)						
1-5	with gas heating	0.88	3.52	321	1.28	250
	with coal heating	1.07	3.56	390	1.30	300
Private sector houses with homestead land, including those in rural areas						
1-5	with gas heating	1.27	3.53	452	1.29	350
	with coal heating	1.59	3.86	580	1.41	410
Notes: Norms are given for SDW without extraction of food waste. In case of extraction of food waste norms decrease by 15%. For high-level facilities buildings with refuse chute norms of SDW generation are 10% higher than the same for buildings without refuse chute Density of waste corresponds to its state in waste collectors before loading into waste collection vehicles.						

Table 5 Average norms of solid domestic waste generation for residential buildings

Despite the fact that during 10 years since these norms have been established the volumes have increased, the norms set up by some of the cities and rayons are even lower than the recommended ones. For instance, in Donetsk for residential buildings with modern conveniences the norm is 1.05 m^3/year, while the recommended one is 1.12 m^3/year, so the norm doesn't reflect the factual situation. In contrast to that, the norm of SDW accumulation for buildings with modern conveniences in the city of Dimitrovo is 1.46 m^3/year.

Thus, the only one actual way to estimate the quantities of produced waste consists in to multiply the number of inhabitants by their production estimated by sampling. This method, as imprecise it can be, nevertheless allows to value the size of the problem.

In accordance with calculations done on the basis of the above-mentioned norms of waste accumulation, with 29% population housing in the private sector, the annual production of household waste in the Oblast should comprise about **1,752,000 tons per year** (803,000 tons for individual housing and 949,000 tons for collective housing).

Housing	Rate	Population	Norm	Tonnage
	%	inh	kg/inh/y	t
Private sector	29	1,385,000	580	803,300
Collective buildings	71	3,389,400	280	949,000
TOTAL	100	4,774,400		1,752,300

Table 6 Calculation of the estimated production of SHW

A more detailed calculation has been made with the figures of the number of homes of each type given in the questionnaire. This estimation is: **1,799,000 tons per year** (Table 7).

	1-Gas	1-Coal	2-4-Gas	2-4-Coal	5-8-Gas	5-8-Coal	9-12-Gas	9-12-Coal	Total
Oblast	**496,348**	**1,519,916**	**561,924**	**56,163**	**1,137,277**	**2,701**	**911,948**	**0**	**4,686,277**
Cities	**390,229**	**1,106,459**	**489,726**	**45,984**	**1,089,483**	**2,701**	**911,688**	**0**	**4,036,270**
Donetsk	214,657	185,377	126,631	7,955	198,936	0	309,062	0	1,042,618
Avdeyevka	0	10,170	1,765	0	19,806	0	7,859	0	39,600
Artemovsk	24,329	13,470	10,714	0	56,652	0	8,735	0	113,900
Gorlovka	2,867	124,106	72,160	1,340	92,210	0	19,317	0	312,000
Debaltsevo	4,365	10,000	1,849	836	32,376	839	1,535	0	51,800
Dzerjinsk	19,300	38,400	5,700	900	14,700	0	8,100	0	87,100
Dimitrovo	728	15,056	9,445	0	26,952	0	2,919	0	55,100
Dobropolye	8	17,841	14,558	8,619	25,753	1,062	2,937	0	70,778
Dokuchaevsk	9,000	1,000	7,000	0	8,000	0	0	0	25,000
Drujkovka	20,050	8,476	3,646	0	28,612	0	14,262	0	75,046
Yenakievo	1,100	86,754	8,875	8,197	37,838	0	14,936	0	157,700
Zhdanovka	100	1,600	6,636	0	6,164	0	0	0	14,500
Kirovskoye	260	2,440	8,900	50	7,270	0	11,480	0	30,400
Konstantinovka	14,199	1,500	28,837	0	39,479	0	8,985	0	93,000
Kramatorsk	7,473	63,800	9,802	0	62,280	0	71,445	0	214,800
Krasnoarmeysk	3,129	37,852	14,199	22	20,465	0	6,000	0	81,667
Krasniy-Liman	1,102	17,582	4,196	0	5,708	0	1,012	0	29,600
Makeyevka	29,448	163,309	77,001	0	91,260	0	78,298	0	439,316
Marioupol	4,019	118,159	22,100	745	75,551	0	265,171	0	485,745
Novogrodovka	0	2,804	12,424	0	1,872	0	0	0	17,100
Selidovo	95	13,685	13,211	2,544	19,485	0	4,680	0	53,700
Slaviansk	4,049	10,021	2,286	0	109,282	0	18,462	0	144,100
Snejnoye	0	48,642	6,460	3,418	14,740	0	6,340	0	79,600
Torez	8,333	52,852	6,130	4,735	15,164	0	5,886	0	93,100
Ugledar	0	0	0	0	6,728	0	10,172	0	16,900
Khartsizsk	20,480	8,542	7,224	0	46,556	0	22,398	0	105,200
Shahtersk	700	37,300	3,100	6,400	16,100	800	5,300	0	69,700
Yasinovataya	438	15,721	4,877	223	9,544	0	6,397	0	37,200
Rayons	**106,119**	**413,457**	**72,198**	**10,179**	**47,794**	**0**	**260**	**0**	**650,007**
Alexandrovsky R.	5,200	15,200	1,600	0	500	0	0	0	22,500
Amvrosievskiy R.	11,929	26,510	4,214	296	12,693	0	0	0	55,642
Artemovskiy R.	280	25,039	8,039	85	5,249	0	0	0	38,692
Velikonovoselkovskiy R.	15,300	24,700	5,200	950	2,300	0	0	0	48,450
Volnovahskiy R.	20,200	16,500	12,000	0	1,768	0	0	0	50,468
Volodarskiy R.	1,962	28,000	1,700	2,000	123	0	0	0	33,785
Dobropolskiy R.	0	20,000	0	500	0	0	0	0	20,500
Konstantinovskiy R.	3,071	15,569	1,212	0	648	0	0	0	20,500
Krasnoarmmeyskiy R.	1,752	33,027	50	2,750	0	0	0	0	37,579
Maryinskiy R.	11,128	58,350	9,800	0	7,800	0	260	0	87,338
Novoazovskiy R.	10,937	10,000	804	0	982	0	0	0	22,723
Pershotravneviy R.	18,000	0	10,000	0	0	0	0	0	28,000
Slavianskiy R.	0	36,680	1,570	0	150	0	0	0	38,400
Starobeshevskiy R.	2,102	31,300	11,060	0	11,068	0	0	0	55,530
Telmanovskiy R.	38	32,566	979	884	1,933	0	0	0	36,400
Shahterskiy R.	720	20,416	1,070	514	480	0	0	0	23,200
Yasinovatskiy R.	3,500	19,600	2,900	2,200	2,100	0	0	0	30,300
Norm of waste production (kg/y)	452	580	321	390	235	390	245		
Production of waste (t/y)	224,349	881,551	180,378	21,904	267,260	1,053	223,427	0	1,799,922

Table 7 Calculation of the production of SHW

But the data obtained by asking all administrative units of the oblast involved in the field of waste treatment are very far of this theoretic production. We have asked in 2003 the collected quantities in m^3 and in tons for the year 2002.

Very often the expressed figures in tons are only the result of a calculation applying a standard rate of 0,25 t/m^3 to the quantities in volume. In fact, the obtained figures are generally based upon the capacity of the collection containers and the number of truck rounds.

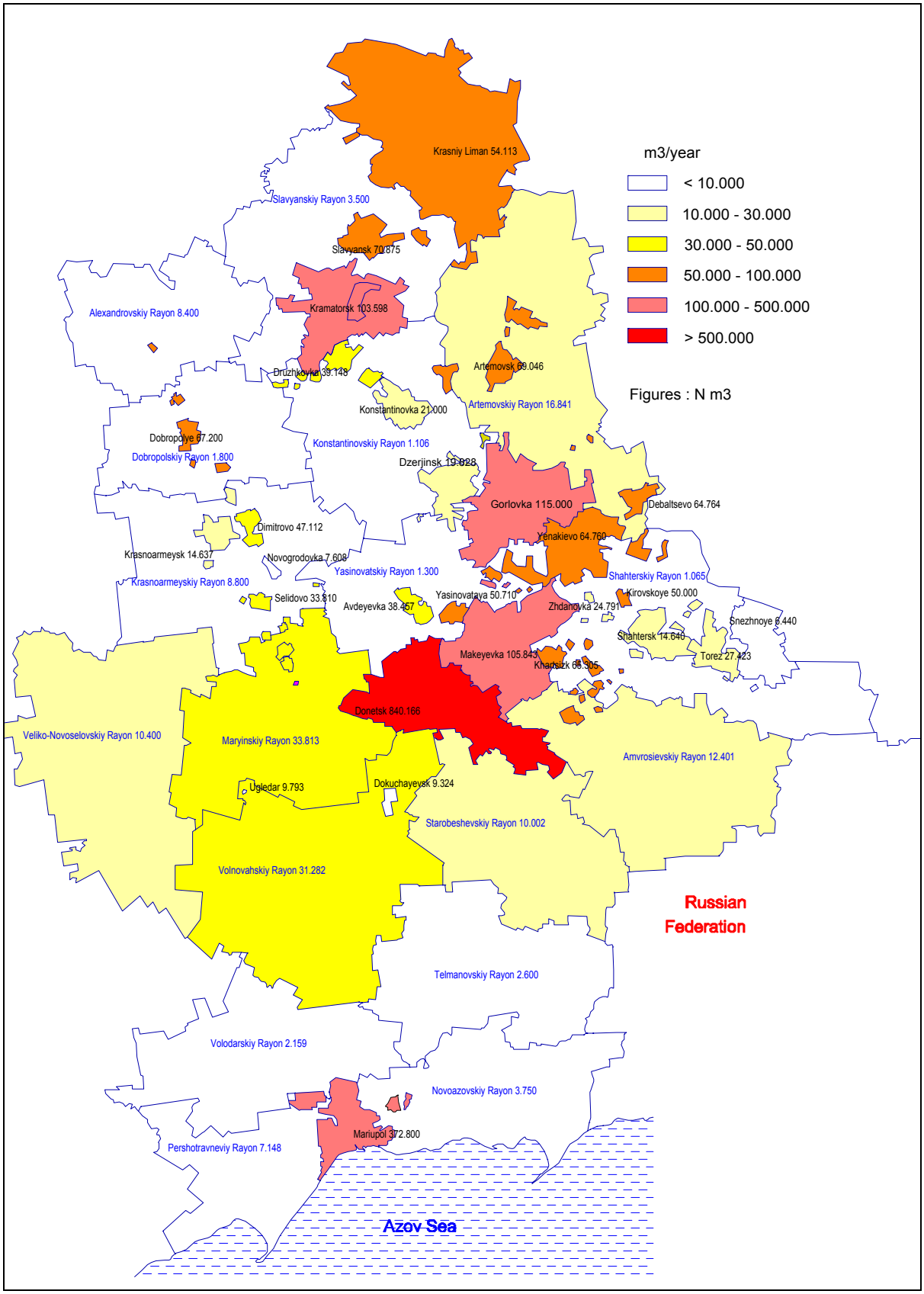
In this Table 8 are inserted the figures from the Department of Housing and Public Local Utilities as it calculates the production of household waste and the figures of the commercial waste (waste from

commerce, craft industry, collective equipments) and the municipal waste (markets, street cleansing, but also the picking up of wild dumpsites). All these figures are coherent between themselves: the questionnaire was focused on household waste, strictly speaking, but the activity of the local utilities is also concerned by the commercial waste and the municipal waste.

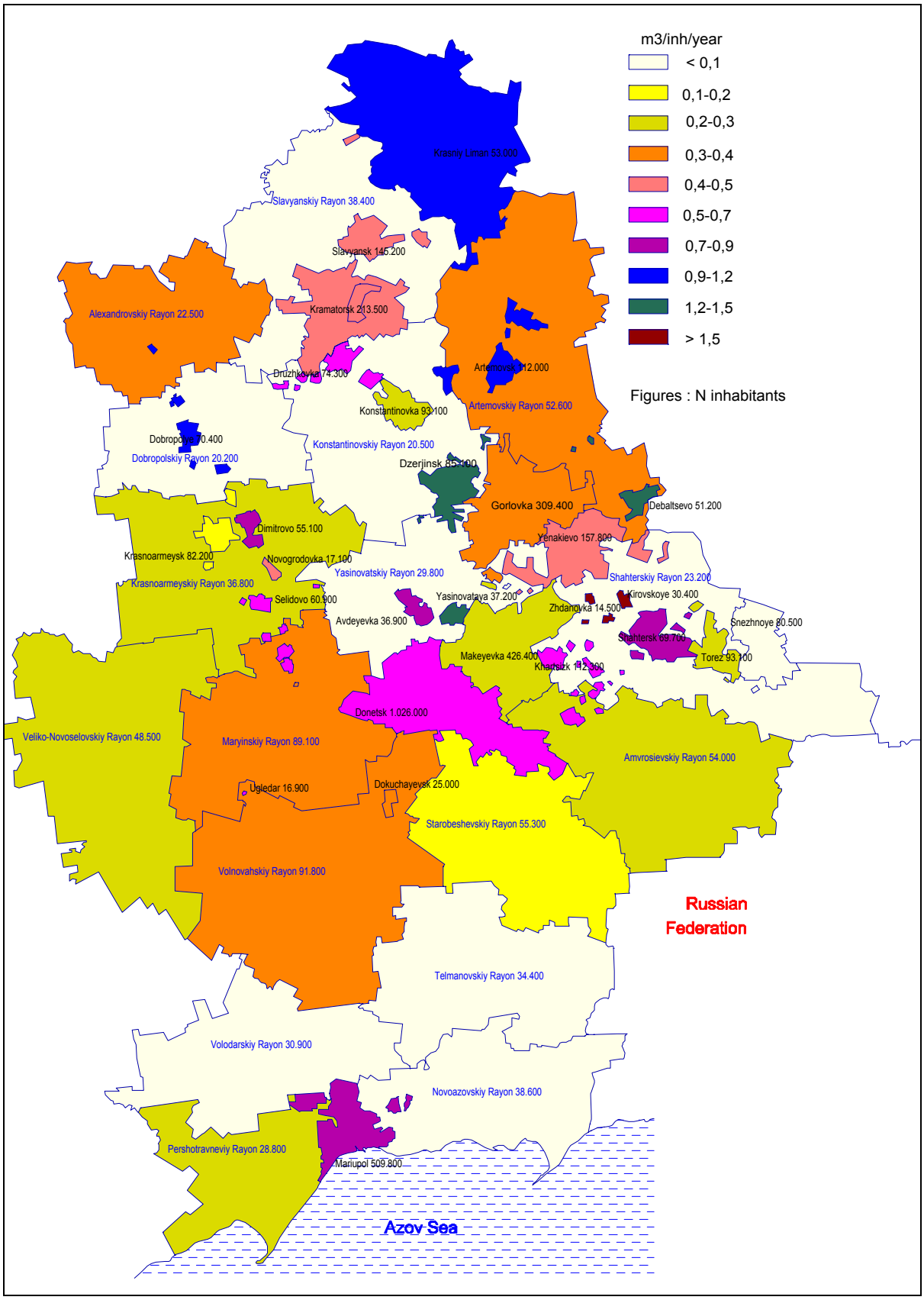
	Population 01/01/03	Surface	Volumes of SHW collected in 2002						Density of SHW	Volume of SHW per capita (residential sector)
			Residential sector		Commercial waste (except for residential sector)	Municipal waste	Total	Data of Dept of Housing & Pub. Utility Services		
	x 1000	km²	m^3	tonnes	m^3	m^3	m^3	m^3	kg/m^3	m^3/year
Oblast (total)	**4,774.4**	**26,517.5**	**2,564,438**	**648,762**	**1,192,959**	**383,612**	**4,139,601**	**3,457,100**	**253**	**0.537**
Cities (total)	**4,059.0**	**4,941.9**	**2,408,071**	**596,238**	**1,096,587**	**282,883**	**3,787,436**	**3,215,200**	**248**	**0.593**
Donetsk	1,026.0	570.7	840,166	210,041	243,955	76,600	1,160,721	1,081,200	**250**	**0.819**
Avdeyevka	36.9	29.3	38,457	8,653	33,627	6,100	78,184	36,400	**225**	**1.042**
Artemovsk	112.0	73.6	69,046	21,190	34,892	4,344	108,282	66,300	**307**	**0.616**
Gorlovka	309.4	422.5	115,000	14,950	45,000	25,000	185,000	133,200	**130**	**0.372**
Debaltsevo	51.2	37.5	64,764	16,196	69,818	3,460	138,042	11,700	**250**	**1.265**
Dzerjinsk	85.1	61.9	19,828	4,957	15,025		34,853	27,600	**250**	**0.233**
Dimitrovo	55.1	22.8	47,112	11,778	4,184	660	51,956	57,300	**250**	**0.855**
Dobropolye	70.4	19.8	67,200	16,800	67,523	6,189	140,912	60,000	**250**	**0.955**
Dokuchaevsk	25.0	118.9	9,324	2,331	23,089	727	33,100	32,400	**250**	**0.373**
Drujkovka	74.3	46.5	39,148	9,826	20,046	3,972	63,100	57,900	**251**	**0.527**
Yenakievo	157.8	425.2	64,670	23,345	17,708	3,602	85,981	69,100	**361**	**0.410**
Zhdanovka	14.5	2.0	24,791	4,958	3,052	4,216	32,058	20,900	**200**	**1.710**
Kirovskoye	30.4	7.0	50,000	12,500	4,000	121	54,121	50,000	**250**	**1.645**
Konstantinovka	93.1	66.0	21,000	5,250	19,250	5,540	45,790	46,600	**250**	**0.226**
Kramatorsk	213.5	355.7	103,598	27,454	34,323	3,488	141,409	142,200	**265**	**0.485**
Krasniy Liman	53.0	1,209.8	54,113	13,530	55,920	3,217	113,250	90,900	**250**	**1.021**
Krasnoarmeysk	82.2	39.2	14,637	2,214	2,000	2,030	18,667	10,700	**151**	**0.178**
Makeyevka	426.4	425.7	105,843	26,910	68,258	43,893	217,994	300,700	**254**	**0.248**
Marioupol	509.8	243.9	379,800	93,000	191,400	----	564,200	563,600	**249**	**0.731**
Novogrodovka	17.1	5.5	7,608	1,978	0		7,608	11,000	**260**	**0.445**
Selidovo	60.9	108.2	33,810	8,711	4,308	6,070	44,188	23,000	**258**	**0.555**
Slaviansk	145.2	74.2	70,875	17,850	10,651	61,531	143,057	81,900	**252**	**0.488**
Snejnoye	80.5	188.8	6,440	1,610	13,624	2,987	23,051	22,000	**250**	**0.080**
Torez	93.1	104.8	27,423	9,324	31,184	11,032	69,639	50,200	**340**	**0.295**
Ugledar	16.9	5.3	9,793	2,448	4,403	1,025	15,222	17,800	**250**	**0.579**
Khartsizsk	112.3	206.9	65,305	13,626	28,329	3,459	97,093	53,900	**209**	**0.582**
Shahtersk	69.7	51.0	14,610	3,652	36,962	1,629	53,201	31,900	**250**	**0.210**
Yasinovataya	37.2	19.2	50,710	11,156	14,056	1,991	66,757	64,800	**220**	**1.363**

	Population 01/01/03	Surface	Volumes of SHW collected in 2002					Density of SHW	Volume of SHW per capita (residential sector)
			Residential sector		Commercial waste (except for residential sector)	Municipal waste	Total	Data of Dept of Housing & Pub. Utility Services		
	x 1000	km²	m^3	tonnes	m^3	m^3	m^3	m^3	kg/m^3	m^3/year
Districts (total)	**715.4**	**21,575.6**	**156,367**	**52,524**	**96,372**	**100,729**	**352,165**	**241,900**	**336**	**0.219**
Alexandrovskiy R.	22.5	1,010.1	8,400	2,100	1,150	1,200	10,750	3,300	**250**	**0.373**
Amvrosievskiy R.	54.0	1,455.5	12,401	5,500	3,052	779	16,232	14,700	**444**	**0.230**
Artemovskiy R.	52.6	1,686.8	16,841	1,835	4,236	2,628	23,704	2,200	**109**	**0.320**
Velikonovoselkovskiy R.	48.5	1,901.3	10,400	2,600	0	1,000	11,400	2,000	**250**	**0.214**
Volnovahskiy R.	91.8	1,848.2	31,282	25,040	38,400	28,200	97,882	44,200	**800**	**0.341**
Volodarskiy R.	30.9	1,221.5	2,159	540	123		2,282	25,600	**250**	**0.070**
Dobropolskiy R.	20.2	949.3	1,800	900	0	1,300	3,100	1,800	**500**	**0.089**
Konstantinovskiy R.	20.5	1,171.7	1,106	277	0	13	1,119	600	**250**	**0.054**
Krasnoarmmeyskiy R.	36.8	1,315.7	8,800	2,200	2,000	4,320	15,120	1,200	**250**	**0.239**
Maryinskiy R.	89.1	1,350.4	33,813	3,519	40,707	57,000	131,519	86,300	**104**	**0.379**
Novoazovskiy R.	38.6	1,000.4	3,750	1,125	1,036		4,786	2,700	**300**	**0.097**
Pershotravneviy R.	28.8	792.1	7,148	1,787	2,496	303	9,947	29,900	**250**	**0.248**
Slaviankiy R.	38.4	1,273.7	3,500	875	0	2,036	5,536	1,500	**250**	**0.091**
Starobeshevskiy R.	55.3	1,254.9	10,002	2,501	2,838	1,800	14,639	17,800	**250**	**0.181**
Telmanovskiy R.	34.4	1,340.1	2,600	600	0		2,600	2,700	**231**	**0.076**
Shahterskiy R.	23.2	1,194.4	1,065	800	334	150	1,549	4,100	**751**	**0.046**
Yasinovatskiy R.	29.8	809.5	1,300	325	---	---	0	1,300	**250**	**0.044**
"Official Data"									**250**	

Table 8 SHW known production per Administrative Unit (2002)



Map 5. SHW Production and Disposal by Administrative Units (m^3/year)



Map 6. Collection of SHW per inhabitant (in m^3/y)

5.1.2.1. Quality of the information

The data provided in Table 8 as regards volumes of solid household waste disposed has been taken from questionnaires distributed among city executive committees and district state administrations which are in charge of solid household waste treatment. Simultaneously there is provided the data of the Department of Housing and Public Utility Services of the State Regional Administration requested from cities and rayons of the Oblast. In many cases they differ a lot from each other, which shows that the level of data reliability is low and the system of primary registration of data by public utilities is poorly developed. It seems that not all of the city and rayon public utilities have carefully calculated the volumes of waste collected and disposed at landfills and it is also possible that estimations have been prepared on the basis of different approaches.

The data about SHW volumes provided by public utilities have been calculated taking into account the capacity of containers and trucks and the number of rounds, and thus are expressed in m^3. As there is no system of weighting of SHW all numeric data concerning the volumes of SHW disposed, expressed in tons, are the ones that are calculated by converting m^3 in tons using the density of waste. However, there are only few cities that have carried out studies allowing to define the average density of SHW for municipal buildings and private sector. At the same time it might happen that even such studies are not always properly done. For instance, in Gorlovka based on the results of studies there has been established the following average density of SHW – 130 kg/m^3, which is twice as low as the recommended value and seems doubtful. The data concerning density of SHW in Shahterskiy and Volnovahskiy Rayons (750-800 kg/m^3) also causes some doubts. As it can be seen from Table 8, most of public utilities convert m^3 in tons using an officially recommended average density 250 kg/m^3.

In Western-European countries it is practiced to register the data in tons on a regular basis. This is done by weighting waste collection trucks with special weighting equipment that transfers the data in a computer format. Such a system allows to receive true data.

5.1.2.2. Critical analysis

Even if the liability of the provided figures is open to criticism, they are nevertheless significant of a reality that everybody knows and they allow to situate a little better the problems.

- Rate of collection of domestic waste in cities and rayons of the Oblast
  - Average rate for the Oblast

  The tonnage collected in normal conditions by the administrative units should be as order of 650,000 t/year.

  The theoretic tonnage according to the official rates (realistic because close those of other countries) and to the number of inhabitants in each type of housing should be 1,752,000 t/year.

  The rate of normally collected waste should be so 37% all over the territory of the Oblast.

  - Dispersion

  The official rates of household waste accumulation in cities and districts of the Oblast are presented in volumes: from 1 m^3/inh/y in collective housing and 2 m^3/inh/y in individual housing.

  On that base, the administrative units which announce a collected tonnage of an order of 1.5 m^3/inh/y are close to the 100% collected.

  32 administrative units of 45 should be under the 0.5 m^3/inh/y, so fewer than 40% collected.

- Rural factor

If the 28 cities show very diverse performances (from 0.1 to 1.8 m^3/inh/y), all the rayons are under 0.4 m^3/inh/y.

These figures confirm the very low performance of the collection of waste in rural areas.

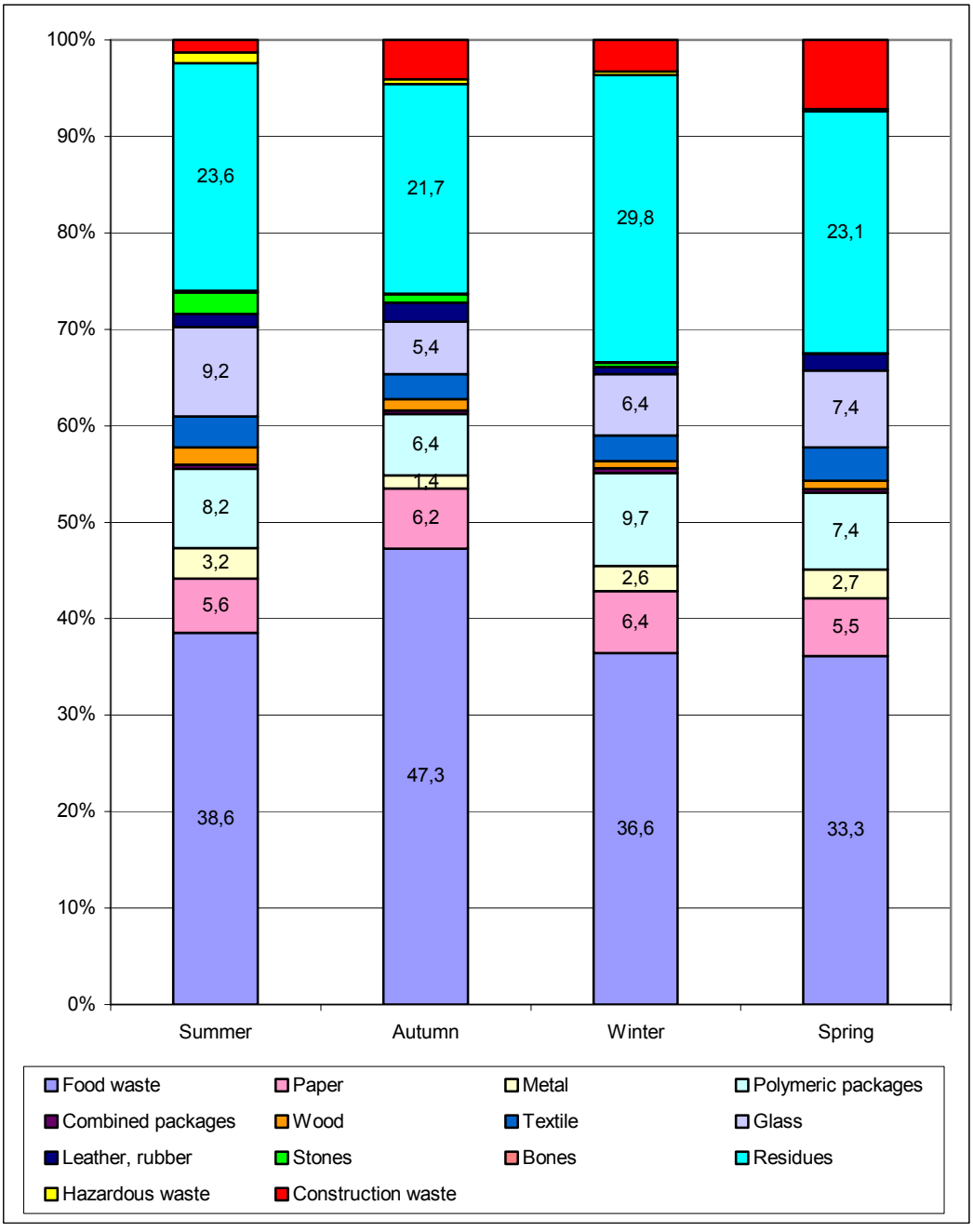
5.1.3. Characteristics of the production

The composition of the household waste varies according to the season, the type of housing, the level of incomes of the family, etc. It has been studied with the following method.

- The first study (including the opinion poll) allowed to determine the socio-types among the population of the Oblast, among them 8 were kept as pertinent.

- On the territory of the Oblast, 18 containers have been selected in aim to represent the 8 socio-types.

These containers have been carefully supervised to avoid an unauthorised retrieval of recyclable waste. The containers have been emptied, their contents have been analysed. All in all 4 waste composition studies have been implemented (spring, summer, autumn and winter). The Graph 6 indicates the average composition of the containers for each season. This sampling doesn't presume the global quantities of waste (most likely subject to changes depending on the season). Naturally it doesn't integrate the part of the household waste that has been put away before the disposal in the container.



Graph 6 Average composition of household waste in the Oblast (by weight)

Note: Among the household waste, it can be found around 1% of toxic waste (batteries, solvents, etc…).

After 4 seasons, the average composition of solid household waste in the Donetsk Oblast is estimated as:

% (by weight)	Fraction
39.5%	Food waste
5.9%	Paper
2.5%	Metal
7.9%	Polymeric packages
0.4%	Combined packages
1.1%	Wood
2.9%	Textile
7.4%	Glass
1.4%	Leather, rubber
1.1%	Stones
0.1%	Bones
25.3%	Residues
0.6%	Hazardous waste
3.9%	Construction waste
100.0%	

Table 10 Average composition of SHW

5.2. Prospective

5.2.1. Socio-economical scenarios

Ukraine knows for some years a strong economical growth. This growth manifests itself by a rise of the average purchasing power and a change of the consumption ways of the most favoured part of the population. Already it can be noticed that the part of the population having the highest incomes, not only consumes more, but also consumes differently: new products, individually packaged goods, etc.

So the persistence of the economical growth will imply the generalization of some of these behaviours, which will inevitably involve an increase of the quantity of packages (plastics, paper, cardboard). In parallel, it can be seen in such a case a decrease of the production of organic waste and an increase of the complexity of these packages (multi-materials, multi-layers).

The Western-European experience shows that to change the behaviours in matter of waste is a long and exacting task, and that the reduction of the production is difficult to do, even where volunteer public policies have been led. If the regulation, the normalization or the tax incentives are relevant of the national level, on the other hand, it is possible at the level of an Oblast to anticipate the negative changes of behaviour toward environment and to try to prevent them by awareness actions.

5.2.2. Expectations of the population

Only 27% inhabitants are satisfied of the frequency of the waste collection. In other respects, the large majority of them say to be concerned by the problem of waste, as so by their dissemination in the nature, their effects on underground water, than by their presence or their odour in daily life.

It is noticed a relatively strong adhesion of the population to the idea of to act for the reduction of their own waste: 35% say for example to be ready to sort their waste and to bring them in appropriate places.

It must be noticed that the environment protection associations have recently developed.

Quantity of Legal Citizens' Associations *(for the end of the year)*	1995	2000	2001	2002
Environment protection (ecological) associations (communities)	17	63	67	66

5.2.3. Forecast

If the production of waste risk to increase in next years, it is impossible to estimate in which proportion. Depending to the economical growth, this increase could reach some % per year.

On the other hand, it is unavoidable to improve the collection, so a better collection will provoke less fires, less wild dumpsites, less dispersion, and so inevitably **a hard increase of the quantities to be disposed**.

The disposal of these increasing quantities will require the progressive overture of sanitary landfills able to absorb a stream doubtlessly over 1,800,000 tons per year. In aim to limit these streams to be landfilled, while sparing on the cost of treatment, it's advisable to develop at the maximum the individual composting and the recycling.

More than 50% of the household waste are not collected by the collection companies neither the municipal utilities. It will require at less to double the capacity in aim to ensure a satisfying collection to everybody. It will require investments in containers and trucks, but the implementation of transfer stations should improve the efficiency of the trucks by reducing the time necessary to go to the unloading point.

The selective collection of fermentable matters in collective housing can be experienced but will not probably constitute a possibility extendable to the Oblast for the reason of the effort it requires in such housing. But in individual housing it's possible to encourage the individual composting in aim to divert in term one third of the fermentable which are there produced, so around 160,000 tons nowadays and 200,000 tons in term.

The recycling is already 90,000 tons per year for glass and 38,000 tons per year for paper-cardboard. The rate of collection of the paper-cardboard will not increase without a sorting by the individuals in aim of a separate collection. But even in this case, to reach 100% of effective recycling is impossible.

To collect the remaining 30 % glass will also require the start-up of an organized separate collection system.

The rate of recycling of plastics (potential 93,000 tons per year), supposing it should be systematically collected, should not overpass 50%.

Globally, it is so conceivable that the effective rate of recycling reach in term 10 or 12% of the household waste, instead of 7.5% nowadays.

Supposing an actual production of 1,752,000 tons per year which should increase by 3% per year, the needs of landfilling capacity in 2014 should be then around 1,697,000 tons per year. The capacities of sanitary landfilling being nowadays null, it must be opened sanitary landfills covering the whole territory.

5.2.4. Economical prospective

The cost of the existing SHW management can be estimated at 1 UAH/month/family. It's near the amount paid by the inhabitants to the JEK for those who are living in collective buildings. In the private sector, it's theoretically 3 UAH/month/family but less than 30% of the concerned inhabitants are really paying that. For the active population, it was in 2003 a size order around 0.25% of the annual income. In comparison, in Western Europe, it's around 0.5%.

One main goal is that the SHW management gets as soon as possible its financing autonomy. The total needs of money of the Oblast for that are far to be covered.

1/ Less than 50% of the inhabitants are paying, so it's possible to double the waste budget.

2/ The waste tariff can be doubled, so it's possible to double again the waste budget.

3/ The incomes of the inhabitants are expected to increase strongly in the next years and the tariffs should follow this recovery.

But the question of low-income inhabitants stays unsolved. A lot of people will not participate to the economics recovery, mainly retired people, handicapped, pensioners, jobless, … The State provides subsidies to the local entities for the waste fees of these inhabitants. But it seems that the procedure for receiving such a subsidy is long and inconvenient for the population.

It is expected that a considerable role in increasing the ratio of payments for public utility services by inhabitants will be played by reforms initiated in the sector of housing and public utility services. The reforms,

among other things, include new forms of residential building maintenance, namely: creation of associations of co-owners of multi-storied buildings and special services for operation of residential buildings; transfer of the right to maintain residential buildings to private companies, improvement of a tariff policy.

6. Waste collection

6.1. Existing collection system

6.1.1. Municipal enterprises

The municipal companies of the public utility sector are in charge of the waste collection, transportation and disposal. They are financed by the contracts they pass with JEKs and individuals in residential sector as well as the contracts with companies, institutions and organisations. So they are in charge of the recovery of the fees due for the services delivered.

They are 82 such companies in the Oblast. They amount 1035 workers. Generally they are directly under the supervision of their municipality, which is the owner of the assets (premises, trucks, etc…).

According to the results of the public opinion carried out by the Donetsk Analytical and Information Centre in 2003, 35% of the polled inhabitants consider that the household waste collection is done in their street / yard less than once a week. Among them 18% consider that no collection is organized for them. On total, 64% of the polled are unsatisfied of the service.

In the case of individual houses, half the polled declare to practice the wild dump although 27% declare to dispose their waste at a particular place of their street.

The municipal enterprises cannot ensure a correct development of their equipments (trucks, containers, …) for the reason of insufficient finance means. The system of the contracts with the individuals oblige these enterprises to do by themselves the recovery and it can happen that the **rate of non-payment** (or of non-contraction) **reaches more than 50%**. In other respects, too high interest rates forbid these enterprises to help with bank loans in aim to make the necessary investments.

It should be noted that there are no big regional companies (inter-municipal) in the Oblast delivering services to several cities and districts, which could be financially sustainable and efficient.

6.1.2. Private companies

Some local self-government bodies have started to entrust more frequently some tasks in household waste collection and disposal to private companies. Most of them get involved in SHW collection, some companies operate dumps, the others combine both activities.

In Donetsk, the company ISTOK has been devoted to cleansing a part of the Leninsky district of Donetsk city. This area is 10 km large, with about 100 buildings from 1 to 9 floors. The building conditions are rather low, with high expenditures for engineering networks (water, heating...) and entrances. The company operates two city dumps (rent contract).

At the same time ISTOK is building a sorting plant for SHW collected in two sub-districts and plans to construct recycling facilities for sorted waste.

For the moment, there are not a lot of examples of privatisation of the household waste management. It must be underlined that the contractual relationships between the municipalities, the private companies, the JEKs and the inhabitants are not clear and are missing a strong legal and regulatory framework.

6.1.3. Technical aspects of SHW collection

The system of sanitary cleaning of populated areas of the Oblast (mainly in cities) is based on planned and regular removal of household waste exercised with the help of stationary and removable containers installed at special platforms. In private sector of cities as well as in rural areas there prevails a door-to-door system of collection (the inhabitants put the waste in front of their doors in their own containers or bring waste directly to a waste collection truck).

The sites for container platforms are chosen by representatives of housing organisations and agreed with a sanitary service and a company in charge of SHW collection. The sites should be located not closer than 20 m to residential buildings and recreational zones and not further than 100 m from the most remote entrance to a residential building. The platforms should have an access road, firm cover and a fence in line with the architecture and it's very seldom the case. The sizes of platforms and a number of containers are defined on the basis of daily volumes of SHW accumulation. The containers at platforms should have a distance of 350 mm between themselves, 1 m from the fence and 1.5 m from the road.

These requirements in most cases are not met. The park of containers is obsolete and has started to be renewed only during the last two years. In 2004 in some cities of the oblast, including Donetsk, they have started to use plastic containers with lids. The questions concerning the system of SHW collection have been included in the questionnaire distributed among public utilities, but no all of the respondents answered it. The data about the park of containers and waste collection trucks as of beginning of 2003 are provided in tables below.

Cities, districts	Population x1000	Number of containers of different capacity					Capacity m^3	Capacity l/inh
		0.55 m^3	0.75 m^3	1.0 m^3	10 m^3	TOTAL		
Oblast	**4,774.4**	**7,714**	**13,805**	**2,683**	**152**	**24,184**	**17,281**	**3.6**
Cities	**4,059.0**	**7,452**	**13,216**	**2,633**	**152**	**23,301**	**16,645**	**4.1**
Donetsk	1,026.0	2,077	3,294	1,814	152	7,185	5,427	5.3
Avdeyevka	36.9	705	134	0		839	488	13.2
Artemovsk	112.0	535	27	0		562	315	2.8
Gorlovka	309.4	120	960	120		1,200	906	2.9
Debaltsevo	51.2	134	133	0		267	173	3.4
Dzerjinsk	85.1	303		0		303	167	2.0
Dimitrovo	55.1	0	318	0		318	239	4.3
Dobropolye	70.4	0	569	0		569	427	6.1
Dokuchaevsk	25.0	200	54	0		254	151	6.0
Druzhkovka	74.3	159	496	22		677	481	6.5
Yenakievo	157.8	82	446	0		528	380	2.4
Zhdanovka	14.5	36	22	122		180	158	10.9
Kirovskoye	30.4	117	182	0		299	201	6.6
Konstantinovka	93.1	298	119	43		460	296	3.2
Kramatorsk	213.5	896	1,664	0		2,560	1,741	8.2
Krasniy Liman	53.0	34	0	85		119	104	2.0
Krasnoarmeysk	82.2	18	73	0		91	65	0.8
Makeyevka	426.4	0	1,693	0		1,693	1,270	3.0
Marioupol	509.8	0	1,499	264		1,763	1,388	2.7
Novogrodovka	17.1	0	0	0		0	0	0.0
Selidovo	60.9	300	35	45		380	236	3.9
Slaviansk	145.2	147	299	10		456	315	2.2
Snezhnoye	80.5	0	240	0		240	180	2.2
Torez	93.1	0	264	60		324	258	2.8
Ugledar	16.9	159	0	0		159	87	5.1
Khartzisk	112.3	262	288	33		583	393	3.5
Shahtersk	69.7	115	257	15		387	271	3.9
Yasinovataya	37.2	755	150	0		905	528	14.2
Rayons	**715.4**	**262**	**589**	**50**	**0**	**883**	**636**	**0.9**
Alexandrovskiy Rayon	22.5	0	0	30		30	30	1.3
Amvrosievskiy Rayon	54.0	0	47	0		47	35	0.6
Artemovskiy Rayon	52.6	0	32	0		32	24	0.5
Velikonovoselkovskiy Rayon	48.5	0	0	0		0	0	0.0
Volnovahskiy Rayon	91.8	88	207	0		295	204	2.2
Volodarskiy Rayon	30.9	0	26	0		26	20	0.6
Dobropolskiy Rayon	20.2	0	0	0		0	0	0.0
Konstantinovskiy Rayon	20.5	0	44	0		44	33	1.6
Krasnoarmmeyskiy Rayon	36.8	0		0		0	0	0.0
Maryinskiy Rayon	89.1	0	64	0		64	48	0.5
Novoazovskiy Rayon	38.6	48	0	0		48	26	0.7
Pershotravneviy Rayon	28.8	0	18	0		0	14	0.5
Slavianskiy Rayon	38.4	0	0	20		20	20	0.5

Starobeshevskiy Rayon	55.3	124	135	0		259	169	3.1
Telmanovskiy Rayon	34.4	2	0	0		2	1	0.0
Shahterskiy Rayon	23.2	0	16	0		16	12	0.5
Yasinovatskiy R.	29.8	0	0	0		0	0	0.0
Not taken into account, specific to Donetsk								

Table 11 Park of containers

As it can be seen from the table, among **24,184** containers used in the Oblast, the total capacity of which is 17 thous. m^3, 95% are installed in cities. There mainly used the containers of 0.75 m^3. The analysis by cities of the Oblast has shown that the best situation in terms of number of containers per inhabitant is in the cities of Yasinovataya, Avdeyevka, Zhdanovka and the worst it is in districts.

Household waste is collected by trucks (mainly in urban areas) and tractors with trailers (mainly in rural areas). In the Oblast as a whole (by 01.01.2003) at the disposal of companies there are 506 waste collection trucks, 121 tractors and 71 trailers of the total capacity of 7.5 thous. m^3.

However, most of the vehicles are morally and physically obsolete and should be renewed.

	N inh (x1000)	Truck				Tractors			Trailers				Vol/inh l/inh	SDW from residential sector 2002 m^3	Vol/inh m^3/inh	N rounds
		Park	In good state	In Repair	Total Vol m^3	Park	In good state	In Repair	Park	In good state	In Repair	Total Vol m^3				
Oblast (total)	**4,774.4**	**506**	**424**	**80**	**7,206**	**121**	**105**	**15**	**82**	**71**	**11**	**327**	**1.58**	**2,564,438**	**0.54**	**342**
Cities (total)	**4,059.0**	**453**	**374**	**77**	**6,828**	**73**	**62**	**10**	**40**	**38**	**2**	**178**	**1.73**	**2,408,071**	**0.59**	**341**
Donetsk	1,026.0	178	130	48	3,760	0	0	0	0	0	0	0	3.66	840,166	0.82	224
Avdeyevka	36.9	6	5	1	79	5	5	0	5	5	0	28	2.87	38,457	1.04	362
Artemovsk	112.0	15	14	1	180	2	2	0	2	2	0	12	1.71	69,046	0.62	363
Gorlovka	309.4	11	9	2	95	3	3	0	3	3	0	18	0.37	115,000	0.37	1,000
Debaltsevo	51.2	8	8	0	68	3	3	0	0	0	0	0	1.33	64,764	1.26	947
Dzerjinsk	85.1	11	7	4	65	8	8	0	0	0	0	0	0.76	19,828	0.23	303
Dimitrovo	55.1	10	10	0	189	0	0	0	0	0	0	0	3.43	47,112	0.86	251
Dobropolye	70.4	23	22	1	294	10	10	0	10	10	0	31	4.61	67,200	0.95	206
Dokuchaevsk	25.0	3	3	0	34	0	0	0	0	0	0	0	1.36	9,324	0.37	272
Drujkovka	74.3	12	11	1	135	0	0	0	0	0	0	0	1.82	39,148	0.53	291
Yenakievo	157.8	9	8	1	72	3	3	0	3	3	0	10	0.52	64,670	0.41	788
Zhdanovka	14.5	1	1	0	8	0	0	0	0	0	0	0	0.52	24,791	1.71	3,288
Kirovskoye	30.4	3	1	2	28	2	1	1	1	1	0	8	1.18	50,000	1.64	1,390
Konstantinovka	93.1	10	8	2	128	0	0	0	0	0	0	0	1.37	21,000	0.23	168
Kramatorsk	213.5	19	18	1	137	2	1	0	0	0	0	0	0.64	103,598	0.49	766
Krasniy Liman	53.0	8	7	1	53	1	1	0	1	1	0	7	1.13	54,113	1.02	903
Krasnoarmeysk	82.2	12	10	2	95	0	0	0	0	0	0	0	1.16	14,637	0.18	155
Makeyevka	426.4	12	12	0	112	7	7	0	7	7	0	35	0.34	105,843	0.25	735
Marioupol	509.8	41	36	5	692	0	0	0	0	0	0	0	1.36	379,800	0.73	537
Novogrodovka	17.1	2	2	0	6	2	2	0	1	1	0	3	0.53	7,608	0.44	830
Selidovo	60.9	5	5	0	55	3	3	0	0	0	0	0	0.90	33,810	0.56	622
Slaviansk	145.2	19	17	0	202	14	6	8	4	2	2	10	1.46	70,875	0.49	336
Snejnoye	80.5	3	2	1	23	0	0	0	0	0	0	0	0.28	6,440	0.08	286
Torez	93.1	2	2	0	20	0	0	0	0	0	0	0	0.21	27,423	0.29	1,381
Ugledar	16.9	2	2	0	19	2	2	0	2	2	0	10	1.72	9,793	0.58	337
Khartsizsk	112.3	18	14	4	180	1	1	0	1	1	0	6	1.65	65,305	0.58	352
Shahtersk	69.7	5	5	0	50	3	2	1	0	0	0	0	0.72	14,610	0.21	292
Yasinovataya	37.2	5	5	0	53	2	2	0	0	0	0	0	1.42	50,710	1.36	958

	N inh (x1000)	Truck				Tractors			Trailers				Vol/in h l/inh	SDW from residential sector 2002 m^3	Vol/inh m^3/inh	N rounds
		Park	In good state	In Repair	Total Vol m^3	Park	In good state	In Repair	Park	In good state	In Repair	Total Vol m^3				
Districts (total)	**715.4**	**53**	**50**	**3**	**378**	**48**	**43**	**5**	**42**	**33**	**9**	**149**	**0.74**	**156,367**	**0.22**	**297**
Alexandrovskiy R.	22.5	1	1	0	8	1	1	0	1	1	0	6	0.60	8,400	0.37	617
Amvrosievskiy R.	54.0	3	3	0	18	1	1	0	1	1	0	6	0.44	12,401	0.23	523
Artemovskiy R.	52.6	7	5	2	43	5	1	4	5	1	4	12	1.05	16,841	0.32	305
Velikonovoselkovskiy R.	48.5	1	1	0	11	2	2	0	0	0	0	0	0.23	10,400	0.21	913
Volnovahskiy R.	91.8	4	4	0	45	6	5	1	4	3	1	12	0.62	31,282	0.34	548
Volodarskiy R.	30.9	2	2	0	11	0	0	0	0	0	0	0	0.34	2,159	0.07	206
Dobropolskiy R.	20.2	2	2	0	15	0	0	0	0	0	0	0	0.74	1,800	0.09	122
Konstantinovskiy R.	20.5	2	2	0	11	0	0	0	0	0	0	0	0.51	1,106	0.05	98
Krasnoarmmeyskiy R.	36.8	3	3	0	9	4	4	0	4	4	0	12	0.58	8,800	0.24	414
Maryinskiy R.	89.1	10	10	0	60	12	12	0	16	12	4	56	1.30	33,813	0.38	292
Novoazovskiy R.	38.6	1	1	0	7	0	0	0	0	0	0	0	0.18	3,750	0.10	556
Pershotravneviy R.	28.8	6	6	0	52	3	3	0	0	0	0	0	1.81	7,148	0.25	138
Slavianskiy R.	38.4	1	1	0	15	0	0	0	0	0	0	0	0.39	3,500	0.09	231
Starobeshevskiy R.	55.3	6	5	1	58	3	3	0	1	1	0	3	1.10	10,002	0.18	164
Telmanovskiy R.	34.4	2	2	0	11	6	6	0	6	6	0	27	1.10	2,600	0.08	73
Shahterskiy R.	23.2	2	2	0	6	2	2	0	1	1	0	3	0.39	1,065	0.05	128
Yasinovatskiy R.	29.8	0	0	0	0	3	3	0	3	3	0	12	0.40	1,300	0.04	100

Table 12 Park of collection vehicles

6.1.4. Non collected waste

A low percentage of inhabitants covered by mechanised SHW collection as well as untimely collection of waste bring to appearance of wild dumps both in cities and rural areas.

It can be estimated, by difference between the declarations of the Questionnaire **(650,000 tons** regularly collected but **1,030,000 tons** picked up (SHW + waste from social and cultural establishments and other companies + municipal waste, including the waste resulting from cleansing of dumpsites)) and the theoretical production of SHW **(1,750,000 tons)** that **720,000 tons** to **1,100,000 tons** per year are not regularly collected or disposed.

In aim to be clear, the local utilities declare they collect in normal conditions 650,000 tons per year. From his side, the Department of Housing and Public Utility Services has figures amounting household waste, municipal waste and commercial waste.

	Residential sector	Commercial waste (except for residential sector)	Municipal waste	Total	Data of Dept of Housing and Public Utility Services
m^3	**2,564,438**	**1,192,964**	**383,615**	**4,139,608**	**3,457,100**
tons	**648,762**				

The debate is that the notions of commercial waste and municipal waste include some household waste as the liquidation of the dumpsites. So if we consider the point of view of the collection, the figure as 650,000 tons per year are collected in regular conditions is liable. But if we consider the point of view of the disposal, the figure of the disposed household waste if between 650,00 and 1,030,000 tons per year.

The non-collected waste, if by default of service, if because a non-payment, are disposed on unauthorized sites, or burnt in the garden or in the stove (in the case of individual houses) or again gathered and burnt, either just outside the little towns and the villages, either in the street.

Beside that, the public spaces non systematically maintained are often strewn of refuses (plastic bottles, papers, plastics, glass bottles, …).

Out of the little aesthetic aspect, urban dumpsites can put sanitary problems and don't correspond to an efficient management way, because the municipal services will have then to cleanse them in conditions worse than a classical collection.

6.1.5. Spontaneous selective collection

Some of the waste is retrieved from the general flow in order to be sold later on. It's principally about the glass and the cardboard, whose the sorting is made by the individuals, the caretakers and mainly the scavengers.

About the ¾ glass, so 90,000 t/year, and ½ paper-cardboard, so 38,000 t/year, are so recycled in the facilities of the region, transiting through intermediary purchasing points. Plastics are not systematically searched. The rates concerning glass and paper-cardboards are rather good. Their improvement should require a sorting preliminary to the disposal in the bin. Nevertheless, the creation of a centralized network of collection will put some social problems, in the measure it should deprive a population among the most fragile of an indispensable resource.

6.2. Other waste

6.2.1. Rubble

The rubble (the construction waste generated as a result of liquidation of mines and other production facilities is not considered here) and other inert waste disposed at dumps don't put any environmental or sanitary problem. The problem is principally in their transport unto a storage site. It should be solved within the framework of an existing legal waste management framework and the Regional Plan will not pay a special attention to it.

6.2.2. Household hazardous waste

The household waste contain hazardous waste in low quantities. This presence puts some problems in case of leaching at landfills, individual burning of waste or incineration at waste incineration plants.

Toxic household waste are mainly:

- Batteries and accumulators
- Paints and solvents
- Fry oils and car oils
- Out of date remedies
- Aerosols
- Out of date electrical and electronics devices
- Medical devices containing mercury, luminescent lamps

The whole of these waste is nowadays spread in the environment, either by landfilling, either by burning as there is no system of collection of such waste in the Oblast.

6.3. Organisation of the collection

6.3.1. Different approaches toward the choice of the collection system

The existing Ukrainian system is based on light trucks and basic containers put in a disposal point common for one or a few buildings. In today's conditions, it's the cheapest equipment for the waste collection in urban areas.

There are described below the advantages and drawbacks of the existing system of SDW collection in Ukraine.

Advantages	Drawbacks
Low Investment cost of trucks	Low efficiency of containers downloading in trucks
Able to drive on existing landfills	Limited capacity of trucks (2-2.5 tons), implying a lot of time spent in trips between the collection area and the landfill So, a high rate of fuel consumption per collected ton
	No waste transfer stations, so long average distance between collection areas and landfills
Home-made containers	Fragility of the attachment of the container, implying a lot of repairs and a waste of time to pick the container with the elevator of the truck
1 worker /truck	No time to clean the disposal point
Low salaries of the employees	

The Western Europe systems should offer some advantages but also some drawbacks:

Drawbacks	Advantages
High Investment cost of trucks	High efficiency of containers downloading in trucks
Too heavy to drive on existing landfills	High capacity of trucks (9-10 tons), saving the time spent in trips between the collection area and the landfill So, a low rate of fuel consumption per collected ton
	Waste transfer stations, reducing the average distance for collection trucks, waste reloaded on huge trucks to the landfills (1 driver and less fuel/ton)
Expensive containers provided by private manufacturers	Easy to carry to the truck (rolls) Easy and fast to empty in the truck No necessity to clean the disposal point
3 workers /truck	
High salaries of the employees	

The advantages of the existing system will progressively disappear with the expected economical recovery: growth of the salaries and of the fuel costs, but the decisions have to be taken for 8 years (life length of the trucks).

So a particular attention will be paid to balance the investments between a catching up of the immediate needs with existing technologies, cheap for some years but open to a quick obsolescence, and a bet on new technologies answering the needs of the future.

6.3.2. Solving the problems of renewal of vehicles and containers

The technico-economical standard is that the life length of the collection trucks is 8 years as: "*At the same time the vehicle fleet of specialised public utilities is obsolete, almost 75% of cars have exhausted their life-time and are to be written off from the balance sheets. Despite of the fact that the norm is 12%, only 1% of the vehicle fleet is renewed.*[1]*".*

The life length of the usual containers, associated with the existing trucks, seems to be no longer than 5 years.

The situation of the local utilities is a vicious circle: bad service, low rate of payment, no money for investment. The principle of the financing autonomy of the local utilities is only a principle. In aim to break this vicious circle and to reboot a virtuous circle, an input of money must be done in the renewing of the equipment: new trucks and new containers. The subsidies of the State will be as a priority allocated to the efficiency of the waste collection.

The collection is today ensured with trucks (mainly in urban areas) and tractors + trailers (mainly in rural areas). The park of existing vehicles was asked in the Questionnaire. Some didn't answer these questions. The results are showed in.

It can be targeted to renew the existing park within a period of 5 years. The needs are per year 100 trucks and 50 tractors + trailers.

6.3.3. Increasing the capacities of the enterprises

In aim to collect 100% waste produced by the household, the collection companies or the local utilities must use the best available technologies in rural middle. So, in a small village, it's not necessarily opportune to invest in a truck, a tractor canning be used for the collection. On other respects, downtown, there will be no hesitation in some cases to experiment or to generalize new norms in a concern of economies of scale.

The declared trucks and trailers sum a volume of 7,500 m^3. Bearing in mind that some of the companies didn't provide any data this figure might increase up to 9,000 m^3.

The hypothesis taken into account are: a truck can do 2 collection rounds a day (collection and trip to the landfill), and a trailer can do 1 collection round a day; the quantity of waste to be collected may be shared in 7/8 in urban areas and 1/8 in rural areas. So the objective of 100% collected is 1.8 Mt *(according to the data of General assessments and forecasts)* in 2009, so 6.4 Mm^3 (density of 0.41 for the private sector and 0.25 for the collective buildings), shared in 5.6 Mm^3 in urban areas and 800,000 m^3 in rural areas. In aim to satisfy these needs, the park of vehicles should be:

- 5,600,000 m^3 / 300 days / 2 rounds / 11 m^3/truck = 850 trucks
- 800,000 m^3 / 300 days / 1 round / 5 m^3/trailer = 530 tractors + trailers

According to the existing park, the increasing of collection capacity is (as size order) 350 trucks and 340 tractors + trailers. Taking into account the fact that a number of rayons has not provided the data about the existing park of tractors and trailers the demand for such kind of vehicles might be lower.

The collection companies will have to optimise the use of the existing equipment before to envisage new investments. This passes by example by the settlement of a second crew where there's only one actually, which can double the rate of utilization of the equipment.

Nevertheless, in most cases, a program of re-equipment will be necessary, at least concerning the containers.

[1] Resolution as of March 4, 2004, N° 265, Kiev

A modernization of the collection of the refuse-chutes is indispensable for reasons of as efficiency as hygiene: that pass by the use of roll-containers at the bottom of the columns.

6.3.4. Organisation of the enterprises

SHW collection is a specific job. The recovery of the due amounts, as far they concern a contract as a tax, is an other job. The operation of a landfill is a third one (see below).

It seems logical that municipalities pass contracts with the collection enterprises (even if that ones stay public enterprises). These contracts will contain:

- the service sold, precisely described (streets, districts, frequency of the picking up, quality of the work, …);
- the price and the conditions of payment;
- the clauses of evaluation of the service;
- the penalties to forecast in case of non-respect of the contract;
- etc.

This kind of organization supposes that the collection enterprises become independent bodies, owning their equipment, employing salaries, contracting loans, etc. These enterprises must be in condition to merge if their capacities are insufficient or in aim to realizes economies of scale.

It is also indispensable that these enterprises adopt a normative analytical accounting, integrating the assets, the financial charges, etc.

6.4. Measures of source separation in urban areas

Maybe 10 % of the solid household waste can be recycled. For the moment, an unknown part is recycled. Very low-income people use to sort the waste directly inside the containers, the bunkers and the sidewalk bins within the urban areas. They pick mainly the glass bottles and the cardboard they can easily sell to collectors' shops.

Directly on the landfills, scavengers are sorting glass bottles, PET bottles, cardboard, iron and non-ferrous metals. They make packets with polypropylene bags. Usually these packets are bought by collectors and some bribes may be distributed.

The previous Tacis Project has equipped 20,000 inhabitants of Slaviansk with a selective collection. It started in July 2004 and the collected packaging waste (with a large majority of PET bottles) is accumulating in the yard of the municipal company. These packaging waste must be sorted and baled to be sold but: i) the sorting plant of Kramatorsk is not operational; ii) the PET recycling plant built by UkrEkoKomResurcy in Slaviansk is under construction and there's no outlet for the moment.

6.5. Recommendations for the Collection System in Rural Areas

The Tacis Programme has identified 3 ways of improvement of the collection in the rural areas that will be experimented. The existing system (when it exists) is a "bell" collection: a tractor with a trailer passes in the streets and announces itself by ringing a bell. The inhabitants have to let their waste in front their home or to bring the bin to the trailer.

6.5.1. Transfer

The municipal (or private) service can be responsible only for the operations it manages. During the collection, the municipal service must check the waste it collects. When the waste are mixed at the transfer station, it becomes difficult to attribute any responsibility to a particular truck driver. So we consider that there must be a transfer of responsibility at the downloading of the collection truck in the transfer station.

The company operating the landfill must operate also the transportation and the transfer stations. It's the best way to optimise the transportation between the populated area and the landfill.

For the villages, A transfer equipment is made of a simple quay and the waste are carries with removable 30 m^3 tippings. The collection truck or the trailer is downloaded by gravity into the tipping. A truck equipped with a handling arm brings an empty tipping and take away the full one. It exists the possibility to carry 2 tippings with a truck and a specific trailer.

6.5.2. Self-Composting

Domestic self-composting has been developed as a technique of waste collection and disposal in aim to solve the problem of the collection in specific geographic conditions: hamlets in mountain with 1 m snow during winter, very isolated houses or farms, etc. It may be successful at a large scale with a strong effort of communication toward the involved inhabitants.

The investment is cheap. The operation cost is null for the organic (and paper) waste. But the non-biodegradable waste must be collected and the fee must be reduced for these inhabitants.

6.5.3. Pre-paid bags

It sets a direct relationship between the payment and the service. The bags must be specifically identified and easy to procure. A variant is to propose two bags: one with charge for rough waste, one free of charge for the recyclable. In this last case, the bags must be transparent for an easy checking of the nature of the recyclable waste.

7. Conceptual approach on dealing with other wastes recycling and waste treatment measures

7.1. Existing system of secondary raw materials storage and recycling

As it is seen from the analysis of household waste composition the waste accumulated in the Oblast contains up to 6% of waste paper, up to 8% of plastic, more than 7% of glass and other components that are valuable recyclable materials. An efficiently organized system of waste collection in populated areas should take into account this factor and be focused on retrieval of these useful components for further utilisation. However, there is no selective collection of SHW by population in the Oblast today envisaging collection of separate fractions into individual containers and requiring preliminary sorting of waste generated by the inhabitants (that is in houses/apartments) (the first experiment dealing with selective collection of waste is being implemented by the Tacis project in Slaviansk). For organization of selective collection it is necessary to find considerable means (specialized containers, vehicles) and what is most important is to train the inhabitants and to find relevant incentives.

Today in the Oblast the system of collection and storage of the secondary raw materials is already in operation. It works through special collection points. The activities concerned with collection and preparation of certain types of waste as secondary raw material are subject to licensing in accordance with the laws of Ukraine “On Licensing” and “On Waste”. Licenses are given by the Ministry of Ecology and Natural Resources of Ukraine. By today some 64 companies and private entrepreneurs from the Donetsk Oblast have licenses for this type of activity. Among them there are large and branched companies as DonEkoResurcy, Donetskvtorresurcy, DonetskEkoKomResurcy, Oblpotrebsoyuz, etc. But in spite of the fact that the extent of preparation of the secondary materials has increased over the last several years it still remains low, especially as regards raw materials from SHW of dwelling sector.

Development and construction of facilities for recycling of stored raw materials in the Oblast has been very important and active recently: a big plant for recycling of waste paper and a number of facilities for recycling of plastic waste have been commissioned in Donetsk which confirms the growth of interest towards this type of secondary raw materials.

City	***Company***	***Type of activity***
Polymeric waste		
Gorlovka	joint-stock company of a closed type «Stirol-PAK»	Recycling of polyethylene, polystyrene, polypropylene, with production of household goods
Druzhkovka	joint-stock company of a closed type «Plant Remschetmash»	Recycling of polymeric waste
Snezhnoye	utility company «Vnorpolymerpererabotka»	Production of polyethylene films, pipes, etc. using polymeric waste
Donetsk	«Ukrvtorplast» Ltd.	Recycling of used polyethylene, polystyrene
Khartsizsk	«Promin» Ltd.	Recycling of polyethylene waste, production of pipes
Makeyevka	«Ukrdonprommet»	Recycling of polymers (1000 tons/years)
Donetsk		Recycling of used polyethylene films
Marioupol	“Technology” Ltd.	Recycling of plastic
Donetsk	private company “Bolius”	Recycling of plastic
Waste paper		
Donetsk		Production of paper for corrugated cardboard from waste paper
Waste glass		
Konstantinovka	open joint-stock company «Kristall»	Recycling of used glass
Secondary textile materials		
Donetsk	“Migma” Ltd.	Recycling of used glass
Hazardous waste		
Konstantinovka	open joint-stock company «Megatex»	Utilization and complex recycling of used accumulator batteries
Gorlovka	«Nikit-Service» Ltd.	Collection, storage, treatment of waste containing mercury

City	*Company*	*Type of activity*
Donetsk	open joint-stock company «Donetsk Machine-building Plant «Astra»	Collection, storage, transportation of used batteries of lead accumulators
Konstantinovka	joint-stock company of a closed type «Svinets» *(lead)*	Utilization of waste containing lead (batteries of lead accumulators)
Donetsk	«Union-Nefteproduct» Ltd.	Collection, transportation, storage, utilization of used oil products

Table 13 List of existing facilities for recycling of secondary raw materials in Donetsk Oblast

7.2. Development of sorting-recycling

7.2.1. Objective

Around 7% of the weight of the waste is actually recycled (notability glass and paper). By improvement of the collection, by experiencing the volunteer disposal of recyclable materials, by extending the network of secondary raw materials collection centres and increasing the capacities of sorting, it's to reach 12% of effective recycling in 2014.

7.2.2. Experimentation of Kramatorsk and Donetsk

A sorting facility of rough waste from three cities – Kramatorsk, Slaviansk and Drujkovka with a 100 000 tons per year capacity will be settled in Kramatorsk in 2004. It will allow to check the economical viability and the technical interest of this solution. It should allow to reach a rate of recovery of matter (recycling or composting) of 30 to 40%.

In parallel in Donetsk the private company "Istok" Ltd. carries out the construction of a waste sorting facility designed for 100 thous. tons of rough waste.

This experiment will be assessed according to the rate of effective recycling and of composting, subject to a sufficient financial efficiency. In case of success, it will be to develop the capacities of sorting of rough waste within the Donetsk Oblast.

7.2.3. Experimentation of Slaviansk

Within the framework of the Tacis project upon the initiative and with the support of the Slaviansk city administration an experiment is carried out with the inhabitants of the pilot zone aiming at selective collection of SHW. The idea of the experiment is that the inhabitants voluntary dispose glass and other types of secondary raw materials (polymeric materials, paper, metal) in specific containers (one for glass and the other one for other types of secondary raw materials) installed at specially equipped platforms. The waste from specialised containers is planned to be delivered to the Kramatorsk waste recycling plant for final sorting. At the same time this experiment should demonstrate the efficiency of sorting and rate of collection of valuable components after selective collection of waste by the inhabitants.

This rationalization of the selective collection will be assessed according to the rate of collection that will have to be superior to the one that can be seen today, to its economical efficiency and to the attitude of the population toward the project.

7.2.4. Creation of the first «wastery» in Donetsk

The wasteries are places clean and secured where the general public can bring the waste it is forbidden or not practicable to put in the bin.

An experimental wastery is proposed to be created in Donetsk, biggest urban centre of the Oblast, in aim to incite the individuals to bring there their bulk refuse and their toxics, and the craftsmen to bring their bulk or heavy refuse. The investment is several thousands UAH that should be granted by the Oblast Council and the Municipality. The operation requires the employment of at least one person for the guest. The transport and the disposal of so collected waste will also be in charge of the Municipality.

The modes of future disposal of toxic waste stay to be defined, but a treatment, even imperfect, is always preferable to a spreading in Nature.

The pilot project of wastery must be accompanied with a large campaign of promotion. This project will be assessed according to the frequenting and the quantity of brought waste.

7.2.5. Experimentation of waste room

A building yard accounting some tens of homes can justify, in the existing economical conditions, the settlement of a kept waste room. The purpose is to improve the rate of collection of glass, paper-cardboard, toxics, etc, by calling to the public-spiritedness of the inhabitants.

The room, which has not to be necessarily expensive, could be held either by a caretaker or other person, who should be as “M./Mrs Waste” of the yard. This keeper could be paid by the sale of the materials, this wage canning be complemented by the JEK. By the way, this service could reduce the quantity of bins to be collected and justify a reduction of the contribution of the JEK to the collection.

An experiment of this concept will be developed in a sub-district of a big city. It will be assessed according to its viability and the collected quantities.

7.2.6. Waste recycling facilities

Within the programmes carried out in the Oblast (national and regional Programmes of Utilisation of Industrial and Household Waste for the Period up to 2005, the Programme of Environment Protection and Assurance of Ecological Safety of the Donetsk Oblast for 2001-2005, annual Programmes of Economic and Social Development of the Oblast, cities and districts) up to now there have been constructed the capacities for recycling of valuable components of domestic waste (see Table 13), while a number of other activities is at the stage of implementation or planned to be implemented by 2009, also within the framework of a system of collection, sorting, transportation and utilisation of solid domestic waste established by the regional directorate “DonetskEkoKomResurcy” and other organisations.

SHW recycling projects scheduled in the Oblast (01.01.2004)	
Place and name of activities	Organisations in charge for implementation
Donetsk	
Commissioning of a unit for recycling used-up tyres	“Donbaskhimresurcy” Ltd.
Construction of a waste sorting facility in the Petrovskyi sub-district	“Scientific and production firm ISTOK” Ltd.
Gorlovka	
Commissioning of a unit for recycling accumulator batteries with electrolytes	Donetsk regional directorate “DonetskEkoKomResurcy”
Debaltsevo	
Commissioning of a plant for thermo chemical recycling of solid organic waste	Donetsk regional directorate “DonetskEkoKomResurcy”, public utility “Pyrolysis”, State Department of Ecology and Natural Resources in the Donetsk Oblast
Kramatorsk	
Construction of a unit for thermo-chemical utilisation of SHW and waste resulting from human activities as substitution fuel in the production of clinker	Open joint-stock company “Kramatorsk cement factory “Pushka”
Construction of a SHW recycling facility	Executive committees of city councils: Kramatorsk, Slaviansk, Druzhkovka
Slaviansk	
Plant for recycling of PET bottles	Donetsk regional directorate “DonetskEkoKomResurcy”
Commissioning of a unit for production of foam glass from cullet	Donetsk regional directorate “DonetskEkoKomResurcy”

Various	
Implementation of collection, recycling and utilisation of SHW as secondary raw materials in the cities of Avdeyevka, Gorlovka, Donetsk, Yenakievo, Marioupol, Slaviansk, Snejnoye, Torez, Shahtersk	Donetsk regional directorate "DonetskEkoKomResurcy"

7.2.7. Action of "DonetskEkoKomResurcy"

The Resolution of the Chairman of the Donetsk Regional State Administration as of 11.10.2002 N° 486 «On activities aimed at improvement of conditions of collection, sorting, transportation, recycling and utilization of waste as secondary raw materials», signed by V.F. Yanukovich, has defined the tasks to be solved by the Donetsk Regional Directorate "DonetskEkoKomResurcy" and local self-government bodies, which are to work together in this direction.

The activities of the Donetsk Regional Directorate "DonetskEkoKomResurcy" are based on the state and regional programmes of waste treatment, approved by the relevant resolutions of the Cabinet of Ministers of Ukraine as of 28.06.97 N° 668 with changes and addendums and decision of the Donetsk Regional Council as of 24.02.2000 N° 23/12-275.

In 2003 the Donetsk Regional Directorate "DonetskEkoKomResurcy" carried out a series of organizational activities aimed at creation of the state system of collection and recycling of solid household waste as secondary raw materials. Based on the proposals agreed with city executive committees and directorates of the regional state administration, included into the programmes of cities after having been submitted by the Donetsk Regional Directorate, there has been defined a series of environment protection activities, which have later on become a part of the Draft Programme of Economic and Social Development of the Donetsk Oblast for 2004, sections "Environment Protection" and "Use of Secondary Raw Materials".

The Programme foresees construction of plants for recycling of secondary raw materials and implementation of a system of selective collection and recycling of solid household waste.

The total economic effect from implementation of projects will be 13 mln. UAH. In the cities of the Oblast about 440 new working places will be created.

7.2.8. Development of the recycling channels

Tacis has dressed a first inventory of the solutions of recycling and the outcomes of the recyclable materials within the Donetsk Oblast and the neighbour Oblasts. The municipalities and rayons need to get transparent and complete information about the facilities of recycling. This inventory of the market will be published on paper and on the websites of Tacis and of the Administration.

These data constitute help for decision for the elected, the administrations, the craftsmen, the industrialists. On the other hand, it cannot be ignored that industries, which can absorb these secondary raw materials, have technical requirements. These must be written under the form of contractual specifications.

7.3. Composting

7.3.1. Objective

The composting in individual housing requires that the inhabitants put away the organic waste by putting them in a special bin that will take only food waste and some paper. This bin must be covered because of odours. It must be then regularly emptied in a specific container that must itself be regularly emptied in aim to avoid odours and insects.

If an experiment must be led with a volunteer municipality, it's not yet possible to conclude about the realism of the idea to generalize such practices which are well operating only with populations very sensitive to environmental questions (Netherlands, Germany, …).

But in individual housing, the family garden can constitute a complementary incitation that may be determining. By the way it is relatively simple to self-build a composter of less than one cubic meter help with, for example, some pallets. Remaining that organic waste can amount until 60% of the total weight in rural middle, this potential is important and can constitute a non-negligible conditioner for the garden.

The household composting could amount 20% of the waste produced in individual housing in 2014.

7.3.2. Promotion of household composting

Tacis 2 will be asked to take in charge a set of pilot projects in several villages. These projects must be operating for spring 2005. They will be assessed for fall 2005. A phasing of the promotion of the individual composting all over the Oblast could then be realized.

7.3.3. Experimentation of the "worm-composting"

A pilot facility of worm-composting (composting of the organic matters of the rough waste by ground worms) is on going of finalization in Svetlodarsk. This facility will have a capacity of 5,000 tons per year. It is conceivable that this process allows to get a rate of composting of about 40% with the possibility of a facilitated sorting at the end.

8. Technical planning transfer stations

8.1. Transition management

On one hand, the construction of a park of regional sanitary landfills cannot be done at once and each construction will require months if not years. On the other hand, for the moment, Ukraine has no means for the landfills remediation. There are a lot of other priorities. Nevertheless, as low are the means, it can exist some high emergencies and it's important to detect them as soon as possible.

The clever management of the transition period supposes to know what are the most favourable sites for the disposal of the household waste that are produced every day. These sites will requires some short studies and eventually some works and they must allow to keep the situation under control with good practices for the operation of the landfills.

So it has been decided to begin a qualified inventory of the existing landfills aiming at a classification according two criteria:

- the degree of hazard for the environment and the public health;
- the interest to pursue the exploitation of the landfill during the transition period.

8.2. Results of the inventory

The inventory is described in another report. 50 landfills have been audited and rated. They are reported on the following Map 7.

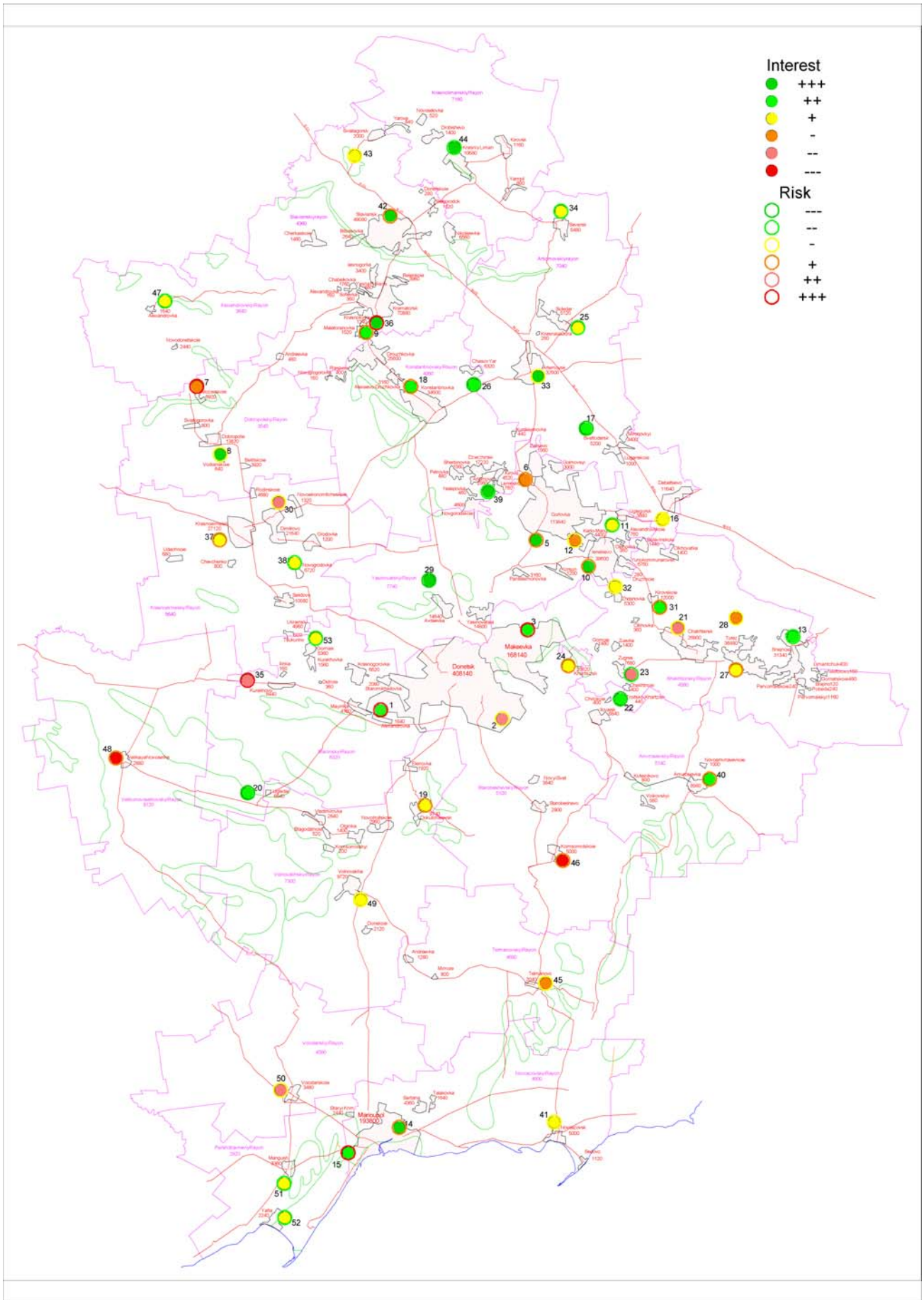
8.3. Interesting landfills

The following landfills are interesting by their capacity, their location, and their impact on environment:

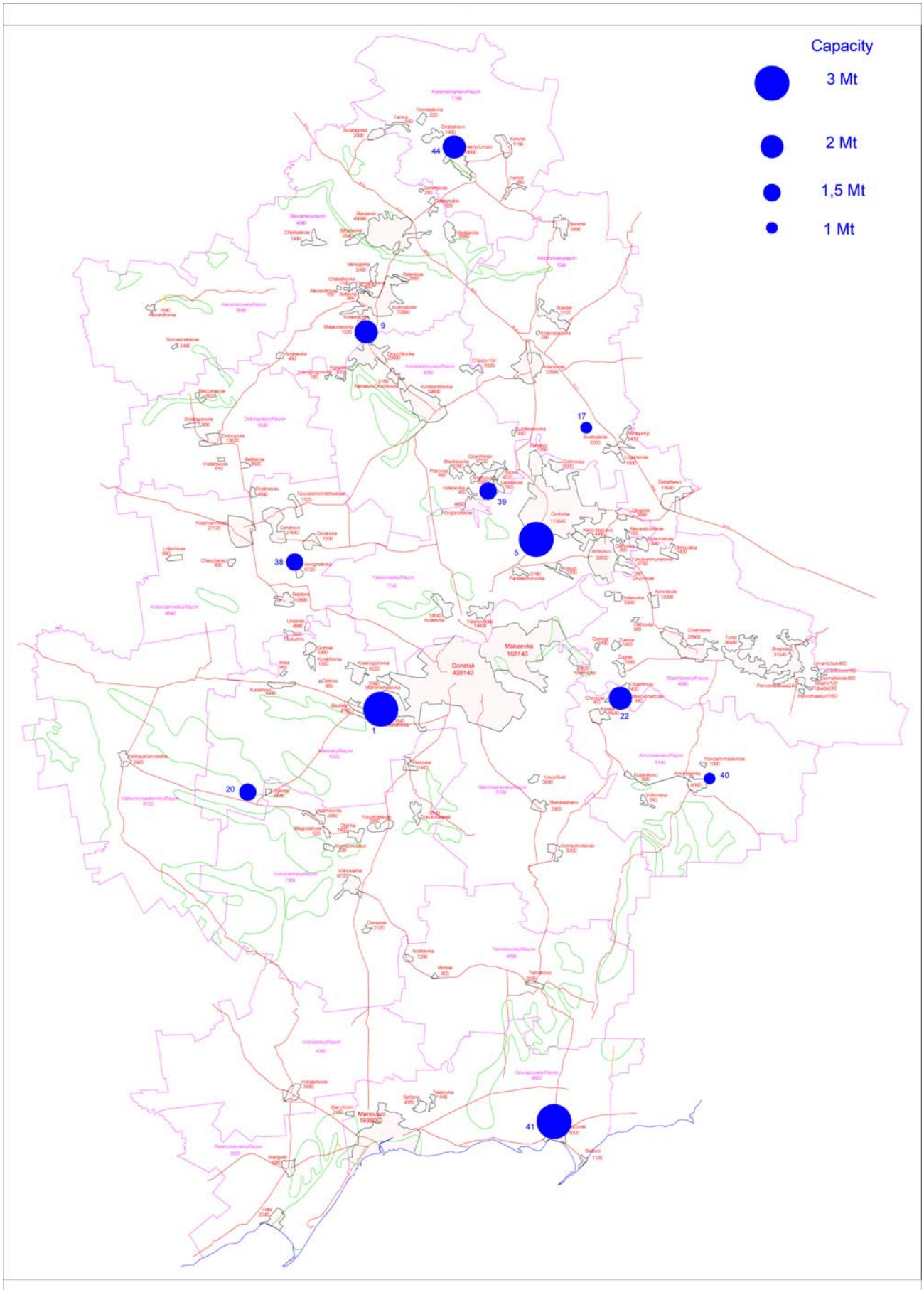
Landfill	Stream m^3/y	Remaining capacity 2004 m^3
0001 Petrovskyi (City of Donetsk)	360,000	3,000,000
0005 Gorodskay (City of Gorlovka)	160,000	3,000,000
0009 Municipal landfill of Druzhkovka	62,000	2,000,000
0017 Municipal landfill of Svetlodarsk	15,500	1,000,000
0020 Municipal landfill of Ugledar	18,500	1,500,000
0022 Municipal landfill of Ilovaysk	9,500	2,000,000
0038 Municipal landfill of Novogrodovka	13,000	1,500,000
0039 Municipal landfill of Dzerjinsk	100,800	1,500,000
0040 Municipal landfill of Amvrosievka	4,600	1,000,000
0041 Municipal landfill of Novoazovsk	6,000	3,000,000
0044 Municipal landfill of Krasniy Liman	105,000	2,000,000
TOTAL Capacity		21,500,000

Table 14 Interesting landfills

These landfills are reported on the following Map 8.



Map 7 Rating of the landfills



Map 8 Proposition of transition landfills

8.4. Transfer network

The decision to progressively pass from the existing situation (Map 10) to a selection of transition landfills (Map 8) lies on the implementation of a transfer network. It includes transfer stations and transfer trucks.

There are two main situations: big cities and small settlements.

8.4.1. Big cities

The classical transfer station is able to treat 300 t/day (on average), up to 600 t/day. It means that this equipment is sized for 50,000 to 100,000 t/year, or 150,000 to 300,000 inhabitants (depending also of the commercial waste).

So for the oblast, transfer stations should be implemented in:

	Population (1000)	N transfer stations
Donetsk	1026.0	4
Artemovsk	112.0	1
Gorlovka	309.4	2
Dzerjinsk	85.1	1
Druzhkovka	74.3	1
Yenakievo	157.8	1
Konstantinovka	93.1	1
Kramatorsk	213.5	1
Krasnoarmeysk	82.2	1
Makeyevka	426.4	2
Marioupol	509.8	2
Slaviansk	145.2	1
Snezhnoye	80.5	1
Torez	93.1	1
Khartzisk	112.3	1
TOTAL		21

Table 15 Transfer stations

The transport between the transfer station and the regional landfill is done with specialized semi-trailers. On the base of 3 rounds per day for each one, the transport will require 60 semi-trailers.

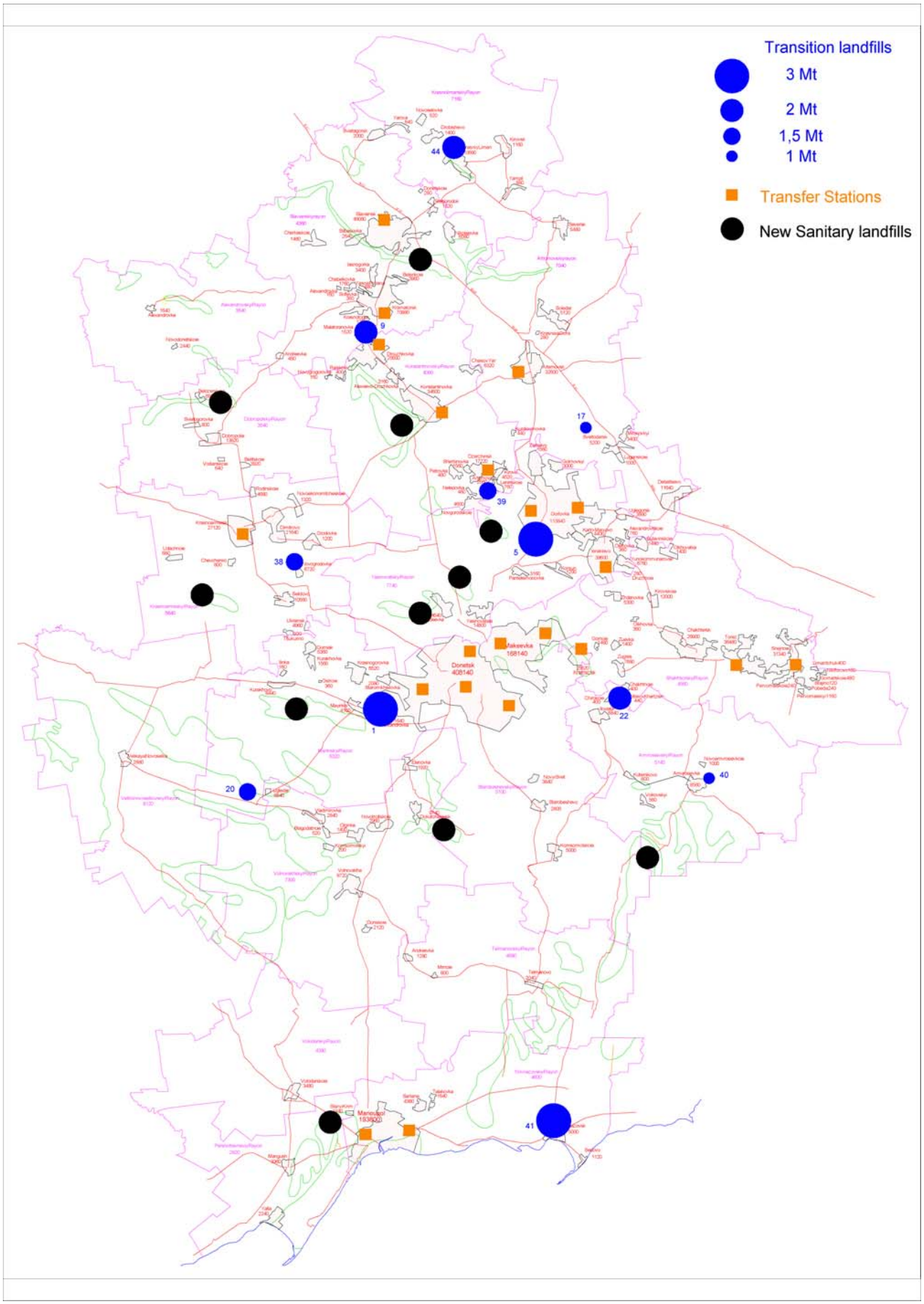
8.4.2. Small cities

The transfer should be done by a direct downloading of the collection truck in a movable 30-m^3 tipping. A road carriage includes a truck with a handling arm and a trailer and can take 2 30-m^3 tippings.

The transfer place is made of a single quay with a hopper.

The mobile means are 160 30-m^3 tippings and 20 road carriages (truck + trailer).

All that is summarized on the following Map 9.

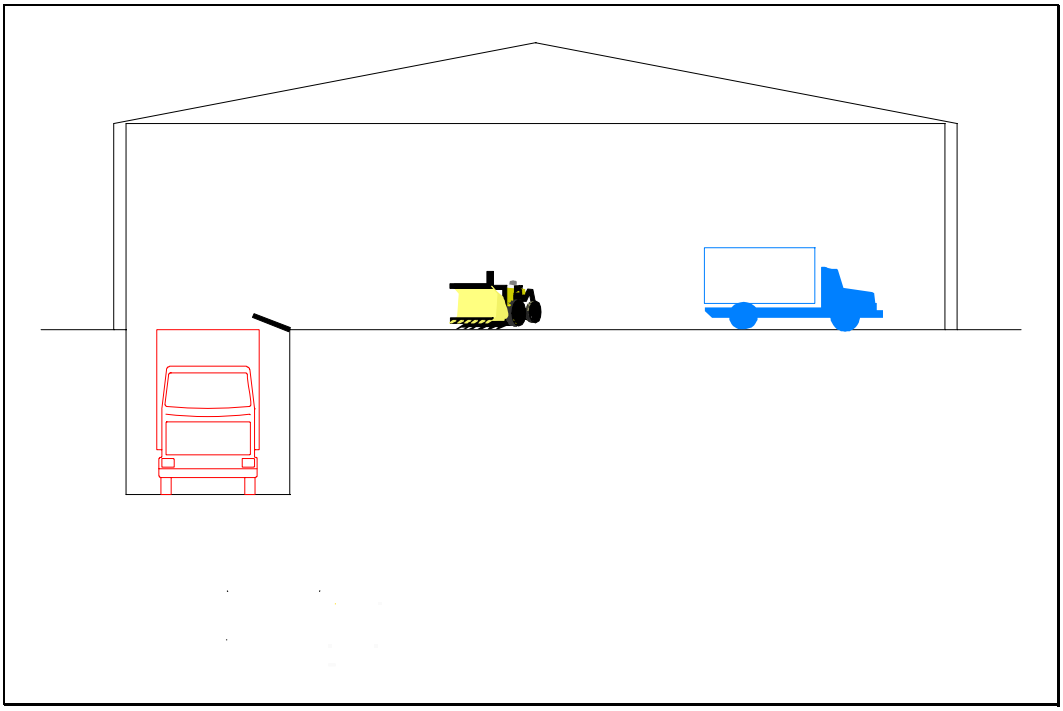


Map 9 Summary of the transition programme

8.5. Transfer facilities

In aim to avoid the collection trucks have too long distances to run, it is necessary to build transfer stations in which they will unload in aim to concentrate on their main role which is to collect.

A transfer station allows then to carry higher masses of waste by a well-fitted mean (trucks of higher capacity, with a driver alone, and consuming less gas par ton x kilometre, eventually by railway in some cases).



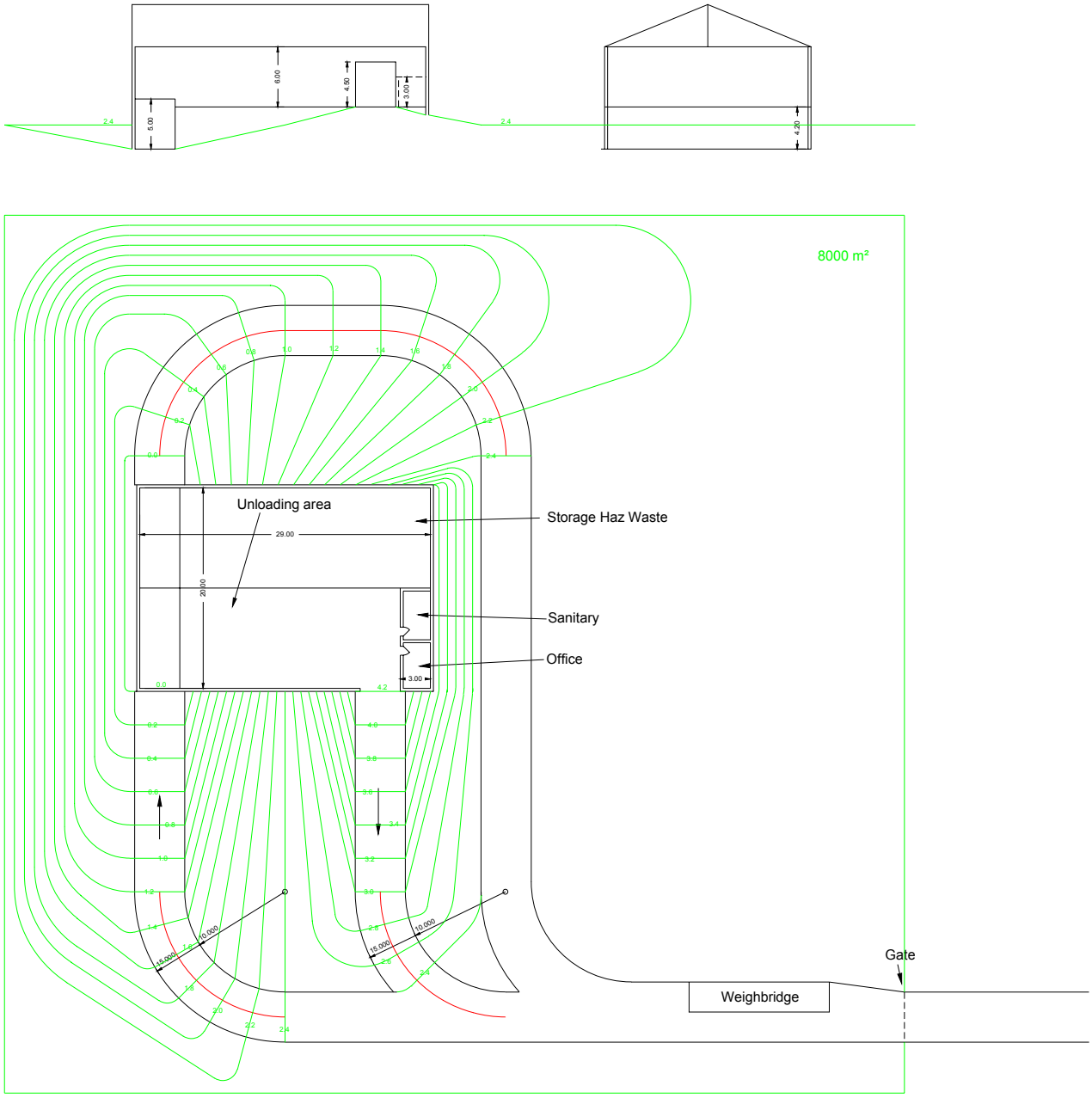
Drawing 1 Scheme of a transfer station

The transfer station is a closed building, on 2 levels:

- **Upper level**: the collection trucks download the waste on a concrete platform; the waste are spread in aim to pick up big elements as cardboards and wood pallets; then the waste are pushed in the transportation trucks; a mobile iron flap extends the platform over the transportation truck.
- **Lower level**: a corridor is sized for the transportation trucks.

Both at upper and lower levels, doors (entrance and exit) allow to close the transfer station. The water and juice of the waste are collected and connected to the public waste water network. The transfer station must be emptied during the non working days.

The construction of a standard transfer station (Drawing 2) at the local market price has been estimated to 2,000,000 UAH in 2004.



Drawing 2 Standard Transfer Station

9. Technical planning sanitary landfill

9.1. Existing landfills

9.1.1. Functioning of the landfills

In accordance with the Questionnaire, the local authorities of cities and rayons of the Oblast manage 300 SHW dumps/landfills (including the dumps of village councils). Only 64 of them are used for disposal of SHW collected in a mechanised way by public utilities, 41 of these dumps are located in 28 cities of regional subordination. Many of them have already exhausted their capacities, other will be full in the short-term perspective as there are more than 30 dumps that have already been operated for 20 to 50 years.

The passports for waste disposal sites allowing to include a dump into the regional inventory of waste disposal sites have been developed only for 29 dumps, i.e. 10%.

As a rule, the facilities used for SHW disposal have not been constructed as technical structures in accordance with design documentation, that's why they do not have a geomembrane and are not properly equipped. Many of them do not have documents confirming the right for using the land. As the existing dumps do not meet sanitary and ecological requirements the State Department of Ecology provides permits for disposal of waste only at 30-40 SHW dumps/landfills annually.

Usually a visual control takes place at the entrance of the dump. The disposal of waste, delivered at the dump by other companies (self-collection) is done on a commercial basis. As a rule, there is used a voucher system (for disposal of a certain volume of waste one is to buy vouchers which are to be submitted upon delivery of waste to a dump).

Normally, the dumps belong to public utilities engaged in waste treatment activities. However, there have been registered few cases when such facilities have been transferred to private companies.

Almost at all of the landfills, starting from a certain size, certain categories of low-income citizens are very active in sorting secondary raw materials. Such activities take place in an unauthorised way within extremely anti-sanitary and unsafe conditions. The fires are a usual practice.

It should be noted that as soon as a Ukrainian Law "On Waste" has been published and a permitting system has been introduced for disposal of waste, since 2000 SHW landfills in the Oblast have started to be designed and constructed in accordance with current sanitary and ecological requirements. By now landfills (1st part) have been constructed in the cities of Svetlodarsk, Ilovaysk, Chasov-Yar, Ugledar, Avdeyevka (Avdeyevka Coke-Chemical Plant) where waste is disposed. A number of landfills in other cities have started to be constructed.

9.1.2. Dumpsites

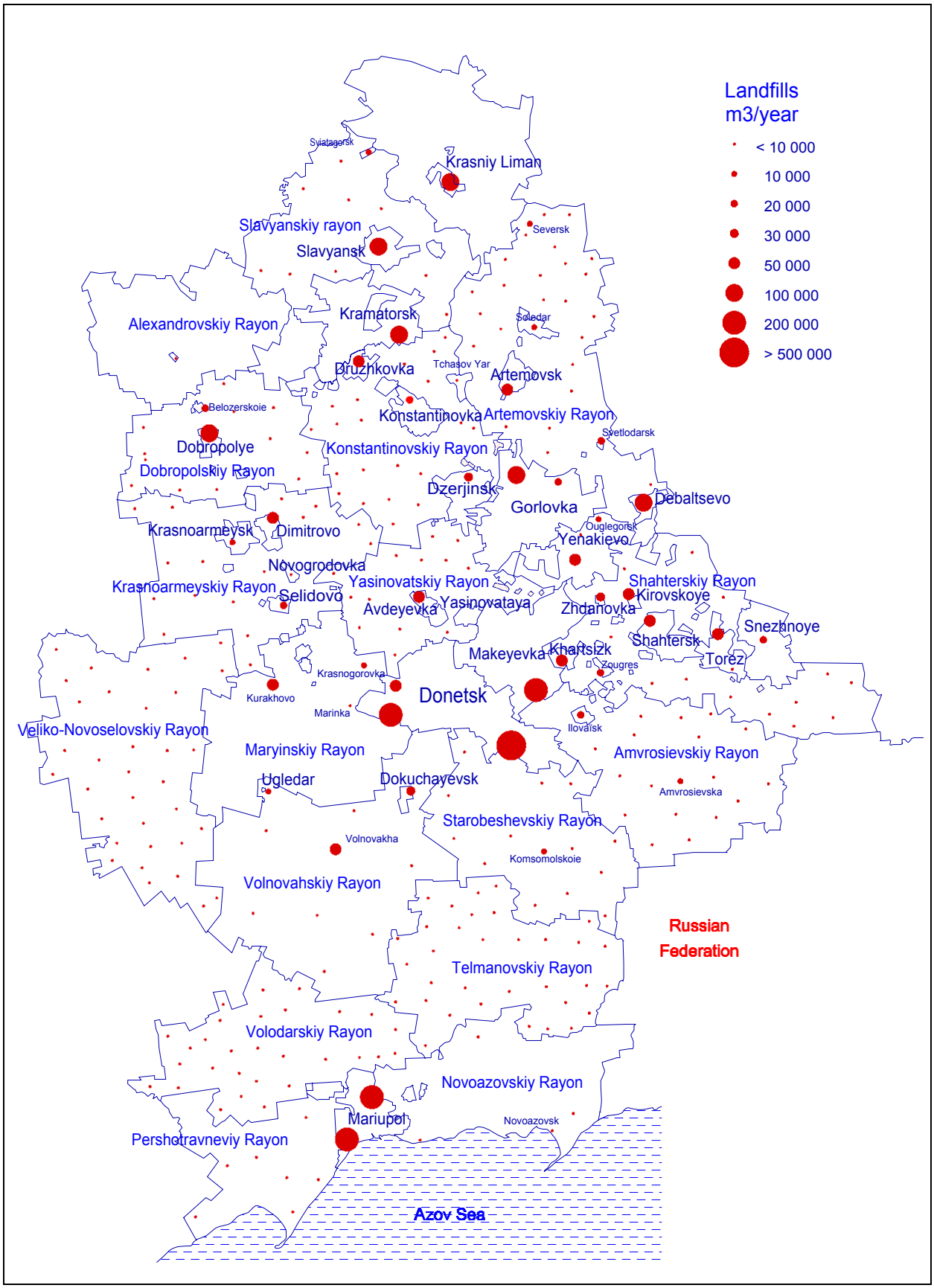
500 to 1000 sites of wild dumping exist within the Donetsk Oblast. It put a problem both environmental and sanitary, in the measure these dumpsites are made without any caution and bring a diffuse pollution all over the territory. This pollution is mainly done by infiltration. Otherwise, these dumpsites are often only covered of soil instead of cleansed.

Liquidation of unauthorised dumps is within the competence of local self-government bodies. This kind of activities are organised in cities and rayons of the Oblast on the annual basis, especially in spring. For instance, during the spring season of this year there has been liquidated more than 1.5 thous. dumps with the total volume of 150 thous. m^3. However, most part of the dumps appear again in the same places as it is mainly a poor waste collection which results in appearance of dumps.

9.1.3. Existing landfills

The answers that could be extracted from the Questionnaire sent to the administrative units are incomplete. Nevertheless they have the merit to exist and they are reproduced on the Map 10 on which the landfills are put on according to the yearly volume of disposed household waste.

The less that can be said is that there's an atomisation of the landfills. It's typically the situation of past practices. Each one is putting the waste in the closest hole. Unfortunately such an approach is still in use.



Map 10 Landfills used by administrative units[2]

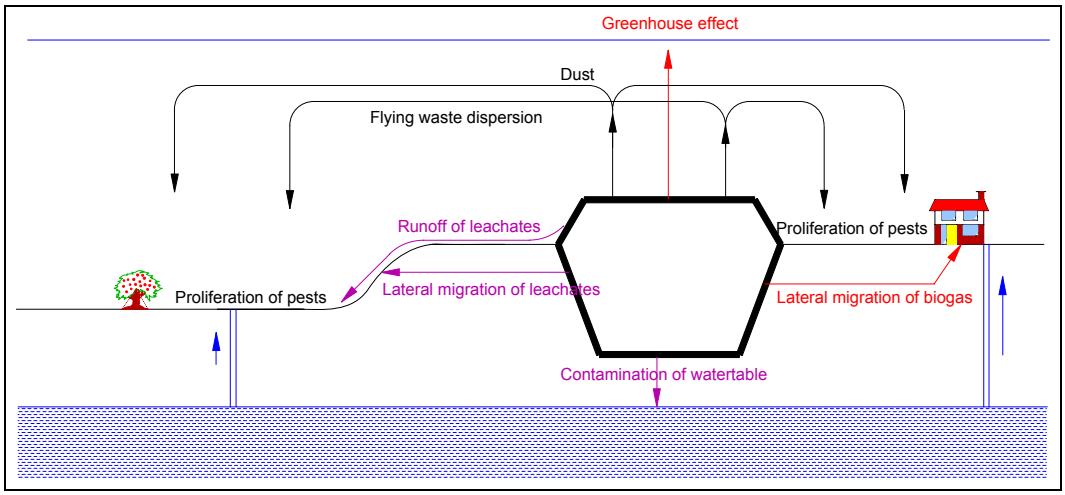
[2] declarations from the Questionnaire

9.1.3.1. Environment risks

The most immediate risk is about the fires (garden fires, village fires, landfill fires). The burning of complex mix as household waste such produces a lot of toxics: hydrochloric acid, volatile organic compounds, dioxins, etc. The dioxins, notably, are extremely carcinogenic, non-biodegradable, and accumulate at the summit of the food chain.

In other respects, the disposed waste contain toxic waste (solvent, batteries, etc.), whose the combustion provokes too a dispersion of heavy metals and other toxic molecules.

The leaching off of the landfill by the rain put also a major environmental problem, in the measure the leachates are not managed: then they are the vector of the contamination of the surface water by run off and/or of the watertable by infiltration.

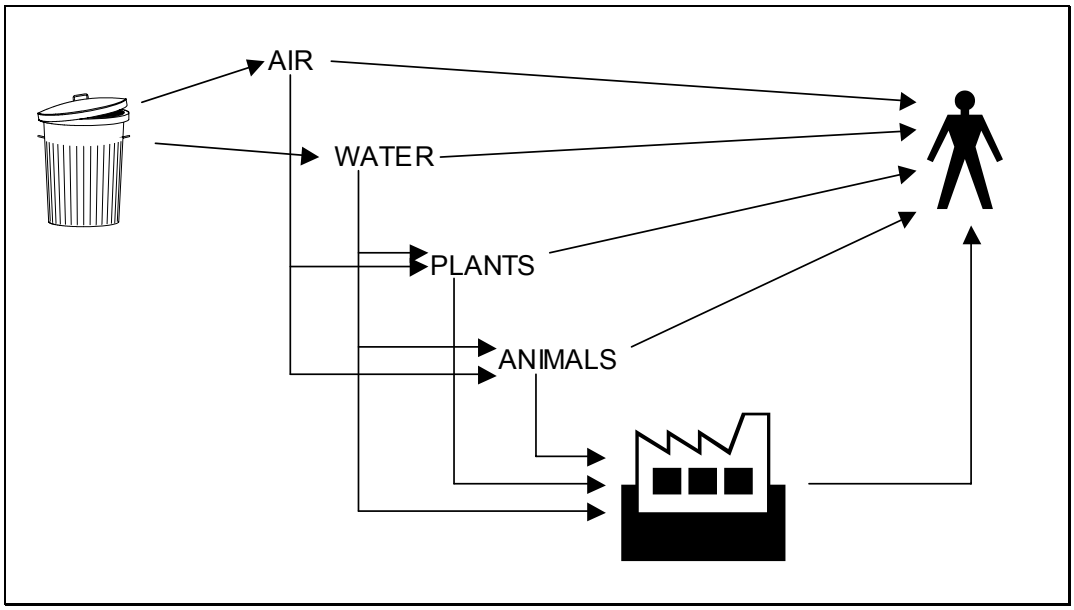


Drawing 3 Emissions of pollution from Dumpsite and Exposure Pathways

9.1.3.2. Health risks

These pollutions caused by the landfills, and notably the smokes, make to run important sanitary risks to the scavengers (in addition to the risks of accident), to the salaries of the landfill, even to the neighbourhood.

Out of evident human considerations, it must be considered the amount of the huge public expenses that could represent in mid and long term the management of the sanitary consequences of the lack of the on going taking into account of the problem.



Drawing 4 Contamination Pathways

The possible contamination chains usually taken into account for human health are:

Gas, dust, aerosols	Air				Human Breathing
Gas, dust, aerosols	Air	Plants			Human Feeding
Gas, dust, aerosols	Air	Plants	Animals		Human Feeding
Leachates	Surface water				Human Drinking
Leachates	Surface water	Plants			Human Feeding
Leachates	Surface water	Plants	Animals (wild & breeding)		Human Feeding
Leachates	Surface water		Animals (wild & breeding)		Human Feeding
Leachates	Surface water			Food Industry	Human Feeding
Leachates	Groundwater				Human Drinking
Leachates	Groundwater		Animals[3] (breeding)		Human Feeding
Leachates	Groundwater			Food Industry	Human Feeding
Waste dispersion		Animals			Human Feeding
Fire propagation					Disaster

Table 16 Possible contamination chains

[3] Breeding of animals uses network water for animal drinking

9.2. Programme of actions concerning the disposal of ultimate waste

9.3. Principles

9.3.1. Objectives and transition

The objectives are:

- To pass from 600,000 t/y (collected) to 1,800,000 t/y (really produced) disposed in landfills;
- To pass from several hundreds landfills and dumpsites to 10-12 regional sanitary landfills;
- To organise the landfilling by catchments including an area of production of SHW, a sanitary landfill, a network of transfer stations, a park of transfer trucks.

In parallel, the wild dumpsites must be progressively remedied.

9.3.2. Resorption of the dumpsites

9.3.2.1. To fine all new dumpsites

Never any new dumpsite will be tolerated. Public awareness campaigns should include an invitation for the general public to report about any new dumpsite, inform about ecological consequences of the illegal disposal of SHW, explain the responsibilities for violation of environmental legislation. For this purpose it is necessary to strengthen sanitary and environmental controlling bodies as well as local administrations. The persons violating waste legislation by illegal disposal of waste should be punished also through administrative commissions created at municipalities. It might be worthwhile to create specialised subdivisions on the basis of militia bodies delegating them the powers to impose an administrative responsibility for illegal waste disposal. It can be an “environmental militia” as the one created in the city of Donetsk.

9.3.2.2. Mapping

It can be roughly estimated that the wild dumpsites are an amount of one million tons, shared among several hundred sites. Tacis proposed a systematic inventory entrusted to the Inspectors of Environment, which will allow to map these dumpsites and to assess the risk they represent. This inventory will allow to constitute a database and to determine then programs of Resorption-remediation, privileging the potentially most hazardous situations. In order to put illegal dumps on the map the cities are recommended to use GPS devices and based on those maps to create a regional database.

9.3.2.3. Programme of resorption

It is necessary to activate the work of standing commissions (regional, city and rayon ones) for treatment of abandoned waste created in accordance with the Resolution of the Cabinet of Ministers of Ukraine as of 03.08.98 N°1217. Based on the results of consideration of cases of abandoned waste identification (unauthorised SDW dumps), local self-government bodies and local state administrations should decide on how to proceed. After making the inventory of unauthorised dumps and putting them on the map it is necessary to develop a programme of their liquidation considering the risk they present. The environment inspectors should study the potential risk of illegal dumps. The sites presenting the highest risk for the environment should be rehabilitated as a first priority measure.

For implementation of these works it is necessary to have some labour resources and equipment, that’s why from now on one should start thinking about the relevant finances.

9.4. Organisation of the landfilling

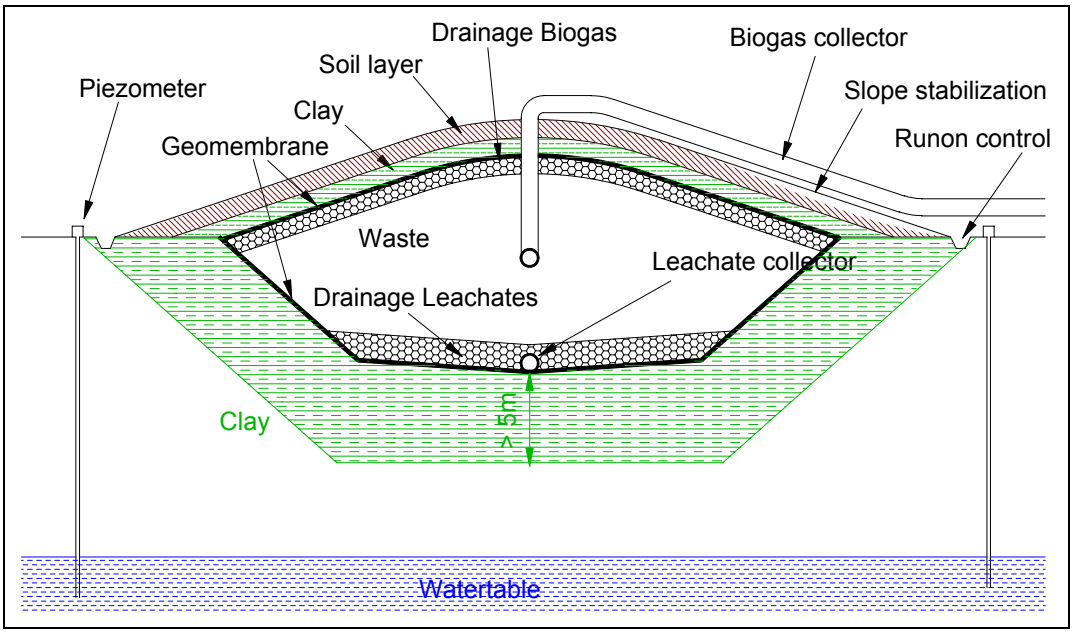
9.4.1. Principles of sanitary landfills

The sanitary landfill is distinguishable from a dumpsite in the way it is designed and built in aim to ensure the security of environment in short, mid and long term. Its immediate cost is higher than a single landfilling but it represents by counterpart a security insurance, including financial consideration.

Landfills are a common method of waste management for both untreated waste and the residues from treatment technologies and require careful construction as well as continuous maintenance and monitoring.

The cross-section of a completed and closed secure landfill is shown in Drawing 5. Appropriate liners to protect the groundwater from contaminated leachate, run-off control, leachate collection and treatment, monitoring wells and appropriate final cover design are integral components of an environmentally sound waste landfill.

The long-term protection of the watertable is done by the passive barrier of clay. It's helped by an active barrier constituted of a drainage system whose the key-elements are: a waterproof liner (geomembrane); a drainage layer (usually gravels); a convenient slope; a leachate collection pipe. So the major key-element for the implementation of a sanitary landfill will always be the geology of the site.



Drawing 5 Schematic Cross-Section of a Secure Landfill

The primary concern at landfills is to prevent groundwater contamination. Design and management emphasize prevention of leachate formation and migration. Prevention methods include: (a) elimination of free liquids (liquid waste should be dewatered or solidified before placement), (b) diversion of surface waters (run-on), (c) use of relatively impermeable daily and final cover to minimize infiltration of precipitation, (d) compaction of wastes, (e) use of cells throughout the landfill, (f) collection and treatment of leachate, and (g) groundwater monitoring.

Approaches to keep water out of landfills are:

- Proper siting to avoid wetlands, flood plains and areas of high groundwater
- Diversion of surface run-on
- Minimizing exposed waste surfaces
- Avoiding ponding of precipitation on the site
- Proper use of intermediate cover material
- Prompt covering and closing of inactive areas
- Proper closure and post-closure management

The ideal waste landfill is one that is underlain by many meters of impermeable clay in a non-seismic zone. Waste landfills should not be placed above a drinking water aquifer.

At some landfills it may be worthwhile extracting gas for use as a fuel but to be successful a number of requirements have to be met. These are:

(a) A suitable use for the gas must be identified.

(b) The landfill must have a minimum depth of at least 10 m of biodegradable material.

(c) There must be a large quantity of waste already deposited. Experience suggests that at least 0.5 million tons is required.

(d) The waste should not be too old and should not have been burnt. Wastes deposited for between 5 and 10 years seem generally to produce the highest gas yields.

(e) The water level should be at least 5m below the landfill surface.

Saturated conditions are not conducive to landfill gas collection. By these criteria, venting gas to the atmosphere or flaring will remain the only control option for most landfills. However, at some landfills it may be worthwhile utilizing the gas as a process fuel, for electricity generation or, conceivably, as a chemical feedstock.

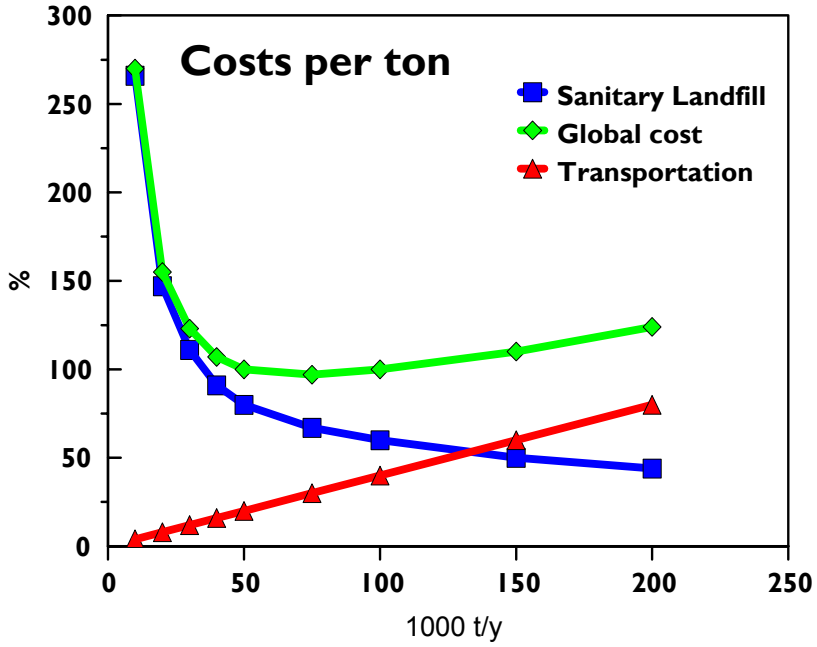
9.4.2. Global cost

Such facility requires huge investment and has non negligible operation costs.

The final result is that the modern landfill:

- represents an initial investment of (size order) 5 M€;
- has an operation cost (all charges included) of (size order) 10 €/ton.

In aim to minimize the costs, a sanitary landfill must receive the biggest possible tonnage, which will improve the amortization per ton. But as more the area deserved increases, as more the average transportation costs increase. The sum of the two costs passes by a minimum as shown on Graph 7.



Graph 7 Global cost of landfilling/annual flow

Generally, there's a zone of optimisation of the global cost between 50,000 t/y and 200,000 t/y.

9.4.3. Variants and transition

The implementation of such a Plan will be spread on a ten years. On the other hand, the increase of the collected tonnage will be also progressive and spread in time.

The first sanitary landfill of big capacity, aimed to absorb quickly a maximum of production, situated on the rail and road axle Slaviansk – Kramatorsk – Gorlovka – Donetsk could absorb the production of the big cities, then be progressively relayed with the construction of other sanitary landfills.

It is also possible to make the transfer of the waste by railways:

- A quantity of 1 mln tons per year, so 3,000 tons/day, can be carried on dedicated trains (ore wagons: loading by top help with specific quays, fast unloading by bottom in a pit);
- Average speed = 25 km/h: possibility to run 450 km/day, so more than Slaviansk – Gorlovka – Donetsk – Torez – Donetsk – Marioupol go and back;
- An assessment of the transportation cost (it's necessary to ask a quotation from the railway company) and of the necessary infrastructure investments should be done.

9.4.4. Organisation of the landfilling at the maturity of 2014

A full transfer to SHW disposal at regional landfills is planned to be implemented by 2014. 8 potential sites proposed at the map for construction of regional landfills selected with consideration of geological and hydrogeological peculiarities of the Oblast are preliminary and will require additional studies and agreements by the relevant local self-government and specially authorised bodies in case the location of landfills should be finalised.

9.4.4.1. First regional landfill

The priority is to equip the conurbation of Donetsk-Makeyevka which is around 1,5 mln. inhabitants. The site must be enough large (100 ha). It's possible that this site receive during a period tonnage up to 600,000 t/y as some sanitary landfills in Europe.

The sanitary landfills will be linked to transfer stations that will be simultaneously implemented.

9.4.4.2. Inert waste landfill

The conurbation of Donetsk-Makeyevka is also the place where a lot of constructions and civil works are done. It is necessary to create an inert waste landfill in aim to dispose in the best conditions the construction waste.

These waste may be useful (in particular conditions) for the operations of a SHW sanitary landfill. So the site of this inert waste landfill should be close the SHW sanitary landfill.

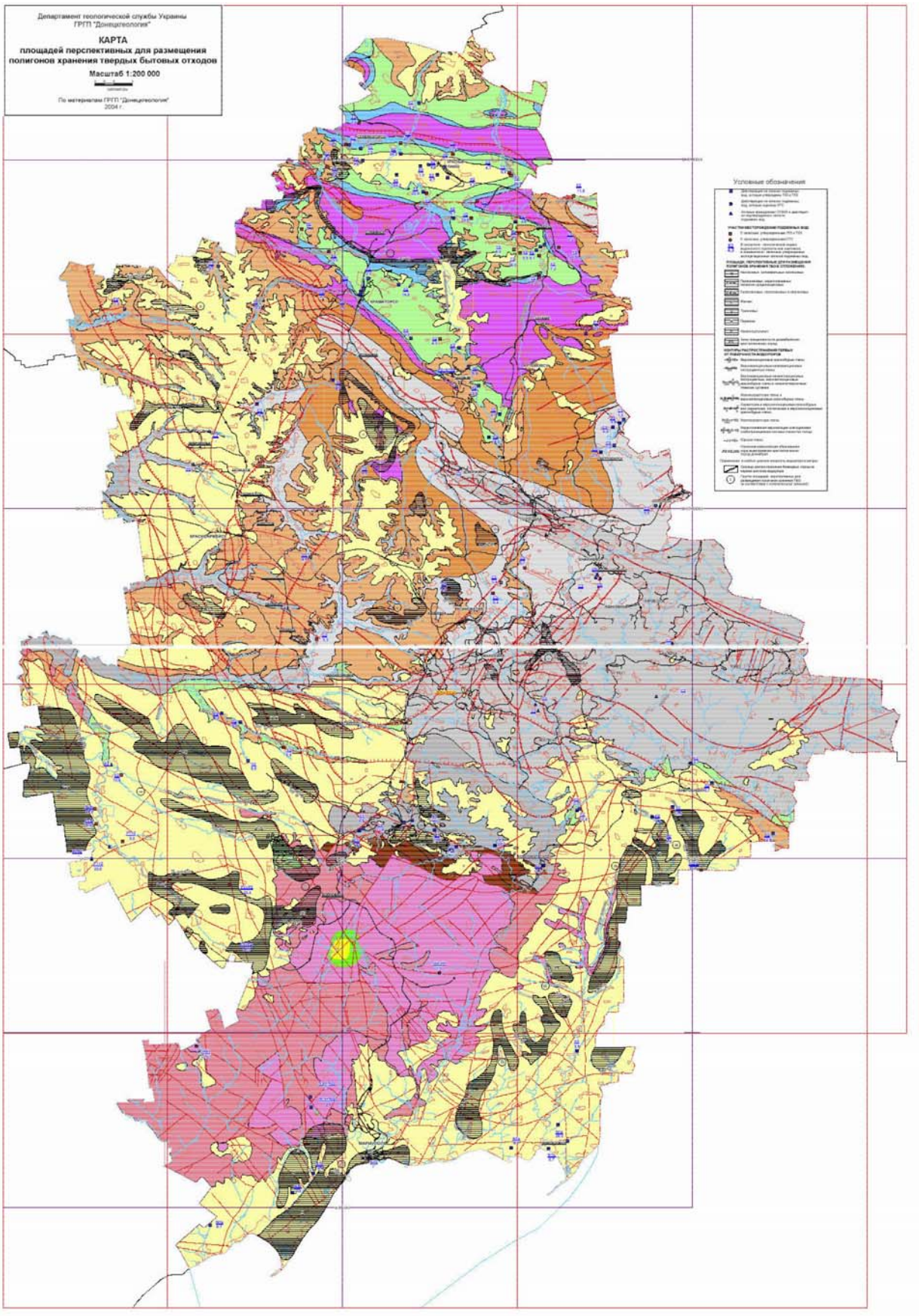
9.4.5. Incineration

The programmes carried out in the Oblast foresee the construction of facilities for thermal recycling of SDW, including the one for incineration of SHW in the cities of Dimitrovo, Makeyevka, the Kramatorsk cement plant, etc. Such facilities must apply the European regulation concerning the incineration of household waste. It supposes that the emissions in atmosphere could be metered and could respect the limits of this regulation. It should be noted that these are high-cost facilities both in terms of construction and operation.

9.5. Organisation of the landfilling at the maturity of 2009

9.5.1. Siting

During summer 2005, the Tacis Project "Capacity Building in Donetsk Oblast for Waste Management – Ukraine" has located potential sites for the implementation of regional sanitary landfills (see Annexe 3). The study has been based on the map of the clay areas provided by the state company Donbass Geology (Map 11). Additional criteria (relief, surface water, neighbour housing, …) allowed to select 40 potential sites. The visit of the 40 sites allowed to select 11 potential sites. The definition of the catchments of waste production was made by taking into account the transportation cost between the cities and the sites.



Map 11 Clay areas for sanitary landfills

9.5.1.1. Waste production catchments

The location and the sizing of the landfills obey to some principles. It has been said that there's and optimum of size (between 50,000 and 200,000 t/y), and that the main consideration for the location is the existence of a good clay layer.

Firstly, the optimum of size can be converted in optimum of population deserved. Aiming that within the duration of the Plan, the whole population of the Oblast will be collected, the optimum of deserved population will be for a landfill between 125,000 and 500,000 inhabitants[4]. This number of inhabitants must be found within a radius of reasonable transportation distance. With 80-m^3 semi trailer, 70 km are a maximum.

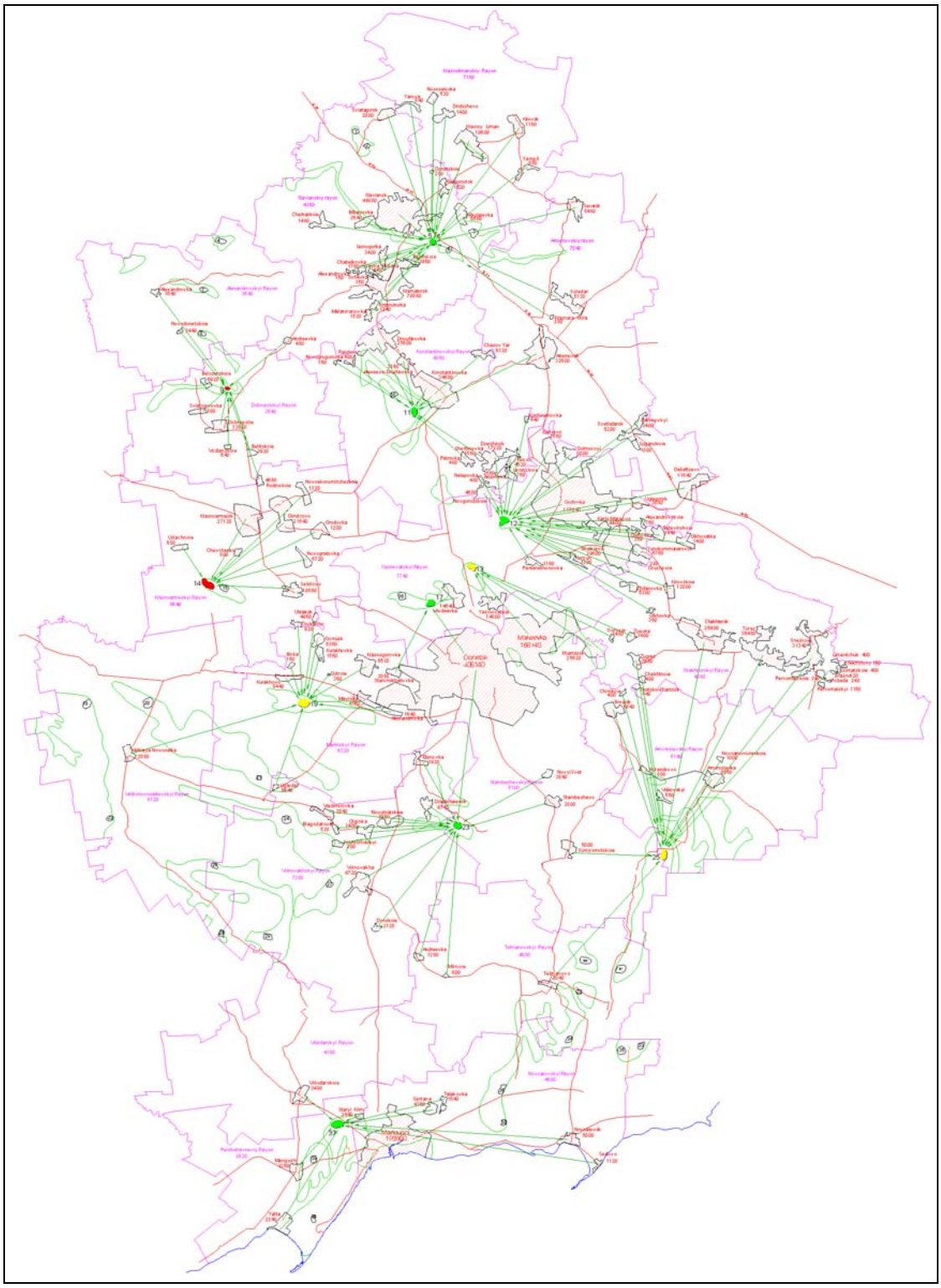
The following Table 17 shows an example of sizing. It gives a good potential for each landfill with reasonable transportation distances. The case of the conurbation of Donetsk-Makeyevka requires 3 or 4 landfills.

Site	Administrative entities		Pop. 1000 inh.	SHW tons/y
	Site Tcherevkovka (Slavianskiy Rayon)			
5	Artemovsk (City council)	Soledar	12.8	5,120
5	Artemovskiy Rayon	Seversk	13.7	5,480
5	Artemovskiy Rayon	Rural area	35.2	7,040
5	Kramatorsk (City council)		211.2	84,320
5	Krasniy Liman (City council)		51.8	18,100
5	Slaviansk (City council)		144.1	57,640
5	Slavianskiy Rayon		37.8	10,280
		Total site	**506.6**	**187,980**
	Site Belozerskoie (Dobropolskiy Rayon)			
9	Alexandrovsky Rayon		22.3	5,280
9	Dobropolye (City council)		69.4	27,740
9	Dobropolskiy Rayon		19.7	4,340
9	Krasnoarmeysk (City council)	Rodinskoye	11.7	4,680
9	Slavianskiy Rayon	Andreevka settlement	1.2	480
		Total site	**124.3**	**42,520**
	Site Artema (Konstantinovskiy Rayon)			
11	Artemovsk (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**
	Site Troïtskoe (Yasinovatskiy Rayon)			
12	Artemovskiy Rayon	Luganskoye settlement	2.5	1,000
12	Debaltsevo (City council)		50.6	20,240
12	Dzerzhinsk (City council)		83.3	32,620
12	Yenakievo (City council)		153.9	60,820
12	Gorlovka (City council)		305.2	121,560
12	Khartsizsk (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**

[4] For the calculation of the catchments, we took as rate of production 400 kg/inh/y in urban areas and 200 kg/inh/y in rural areas, considering that the inhabitants of the rural areas use individual heating and a garden.

Site	Administrative entities		Pop. 1000 inh.	SHW tons/y
	Site Kamenka (Yasinovatskiy Rayon)			
13	Makeyevka (City council)		421.5	168,140
13	Yasinovatskiy Rayon		29.6	7,740
		Total site	**451.1**	**175,880**
	Site Novoelizabetovka (Krasnoarmmeyskiy Rayon)			
14	Dimitrovo (City council)		54.6	21,640
14	Krasnoarmeysk (City council)		69.8	27,920
14	Krasnoarmmeyskiy Rayon		36.2	8,840
14	Novogrodovka		16.8	6,720
14	Selidovo (City council)		26.4	10,560
		Total site	**203.8**	**75,680**
	Site Severnoe (Yasinovatskiy Rayon)			
17	Avdeyevka		36.6	14,640
17	Donetsk (City council)		510.6	204,070
17	Maryinskiy Rayon	Staromikhailovka settlement	5.2	2,080
		Total site	**552.4**	**220,790**
	Site Dolneie (Maryinskiy Rayon)			
19	Maryinskiy 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 Dokuchaevsk (Starobeshevskiy Rayon)			
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	2,080
23	Volnovahskiy Rayon		90.7	28,980
		Total site	**673.4**	**256,610**
	Site Kumanovo (Amvrosievskiy Rayon)			
25	Amvrosievskiy Rayon		53.0	16,060
25	Khartsizsk (City council)		40.7	16,060
25	Shahtersk (City council)		68.3	26,900
25	Shahterskiy Rayon		22.8	4,560
25	Snezhnoye (City council)		78.8	31,340
25	Starobeshevskiy Rayon	Komsomolskoye settlement	12.5	5,000
25	Telmanovskiy Rayon		28.5	6,720
25	Torez (City council)		91.2	36,480
		Total site	**395.8**	**143,120**
	Site Priazovskoie (Pershotravneviy Rayon)			
37	Marioupol (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 17 Proposition of zones for new sanitary landfills



Map 12 Proposition of zones for new sanitary landfills

9.6. Particular sites: Slaviansk

9.6.1. Implementation

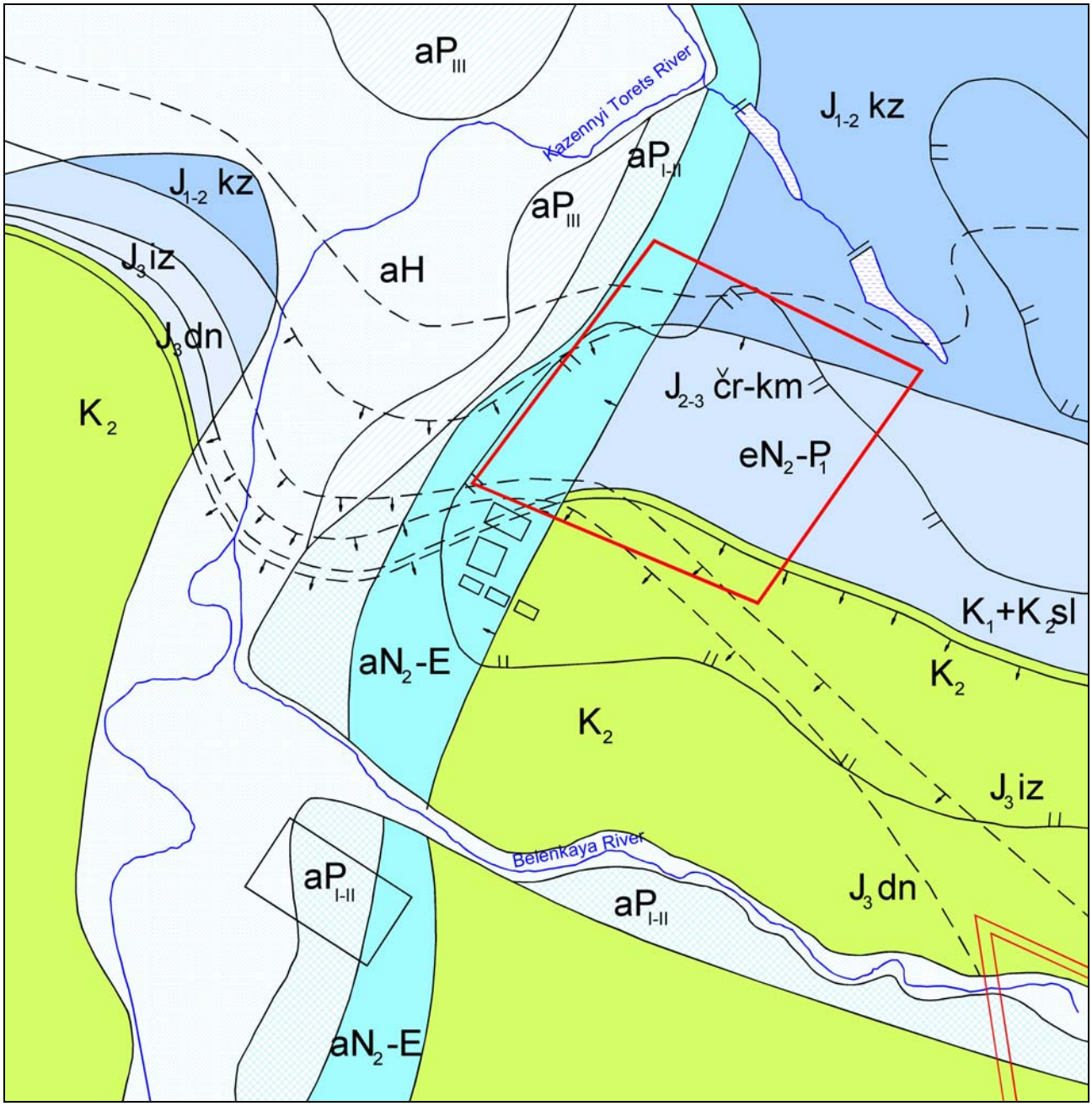
The City of Slaviansk is developing for some years a project of a new landfill, on a land situated along the main road P40, between Slaviansk and Kramatorsk (Map 13). The Regional Administration aims to make of it a regional landfill deserving the inhabitants of Slaviansk, Kramatorsk and Druzhkovka. The Regional Administration announced its intention to fund itself the construction of this landfill.

Map 13 Area for the new landfill (from 1/100,000 map)

9.6.2. Geology and hydrogeology

The hydrogeological regional data are as on Map 14.

First from the surface water-bearing strata and complexes	
aN_2-E / aP_{I-II} / aP_{III} / aH	Water-bearing complex of flood-plain and above flood-plain alluvial sediments
K_2	Water-bearing stratum of fractured zone of upper Cretaceous shiropovsko-konoplianovskikh sediments
K_1+K_2sl	Water-bearing stratum of lower and upper Cretaceous slavianogorsk sediments
J_3dn	Water-bearing complex of upper Jurassic Donetsk sediments
J_3iz	Water-bearing complex of middle-upper Jurassic izum sediments
$J_{2-3}čr-km$	Water-bearing complex of middle Jurassic cherkassko-kamenskikh sediments
$J_{1-2}kz$	Water-bearing complex of non-separated lower-middle Jurassic sediments
Confining beds (aquifuge)	
	The first from the surface aquifuge of Pliocene of lower neo-Pleistocene eluvial foxy (red-brown) clays (eN_2-P_1)
Other symbols	
	SHW landfill area
	Water-bearing strata border
	Outline of water-bearing strata distribution located second from the surface
	Hydro network
	Outline of water withdrawal



Map 14 Hydrogeology of the site

The collection of the available regional geological and hydrogeological data gives the following conclusion on geological and hydrogeological conditions of the site for SHW landfill in Slaviansk region.

SHW landfill is situated on the right side of the valley slope at Kazyonny Torets River, on the right hand of the highway connecting Kramatorsk and Slaviansk. Absolute marks of the ground surface make 115-140 m.

Mesozoic, Cenozoic and quaternary deposits are found in the geological cut of the territory.

Mesozoic deposits can be found everywhere. They are represented by Jurassic and Cretaceous systems.

Jurassic system

Jurassic system is represented by two sections – middle and upper ones.

Chercasskaya ($J_{2\ ĉn}$), Podluzhnaya (J_{2pd}) and Kamenskaya suites (J_{2km}), ($J_{2\ ĉr\text{-}км}$) constitute the middle section of Jurassic system.

Lithologic deposits of Chercassy-Kamensk deposits are made up by sandstone, siltstone, clay and limestone.

Upper Jurassic deposits occur on the degraded surface of Middle Jurassic period rocks and are represented by two suites: Izyum (J_{3iz}) and Donetsk ($J_{3\,dn}$) ones.

Izyum suite ($J_{3\,iz}$) is made up by a sandstone stratum in the lower part of the cut and a limestone stratum in the upper part of the cut.

Donetsk suite ($J_{3\,dn}$) is represented by variegated continental deposits – interbedding clay and sandstone, more seldom - siltstone.

Cretaceous system

Deposits of this system are represented by the upper and lower sections.

Lower Cretaceous deposits (K_1) are represented by white inequigranular sandstone with thin interlayers and streaks of grey thin-washed or oversanded clay.

The upper section is represented by a manifold stratum of loamy and cretaceous rock with glauconite sand assise of Slavyanogorsk suite at the bottom.

Slavyanogorsk suite $K_{2\,sl}$ is an assise of green quartz – green earth sandstone and weak sandstone of different grain with flint and quartz pebble at the bottom.

There occur organogenic sandstones with the capacity of 0.1 – 0.2 m.

Loamy and cretaceous stratum (K_2) is made up by Mironovskaya, Sidorovskaya and Konoplyanovskaya suites. As far as its Lithologic structure is concerned it is represented by writing chalk, often including light-grey and light-brown flint aerites.

Cenozoic deposits are represented by Neogene and quaternary systems.

Neogene system is represented by sub-aerial and alluvial formations.

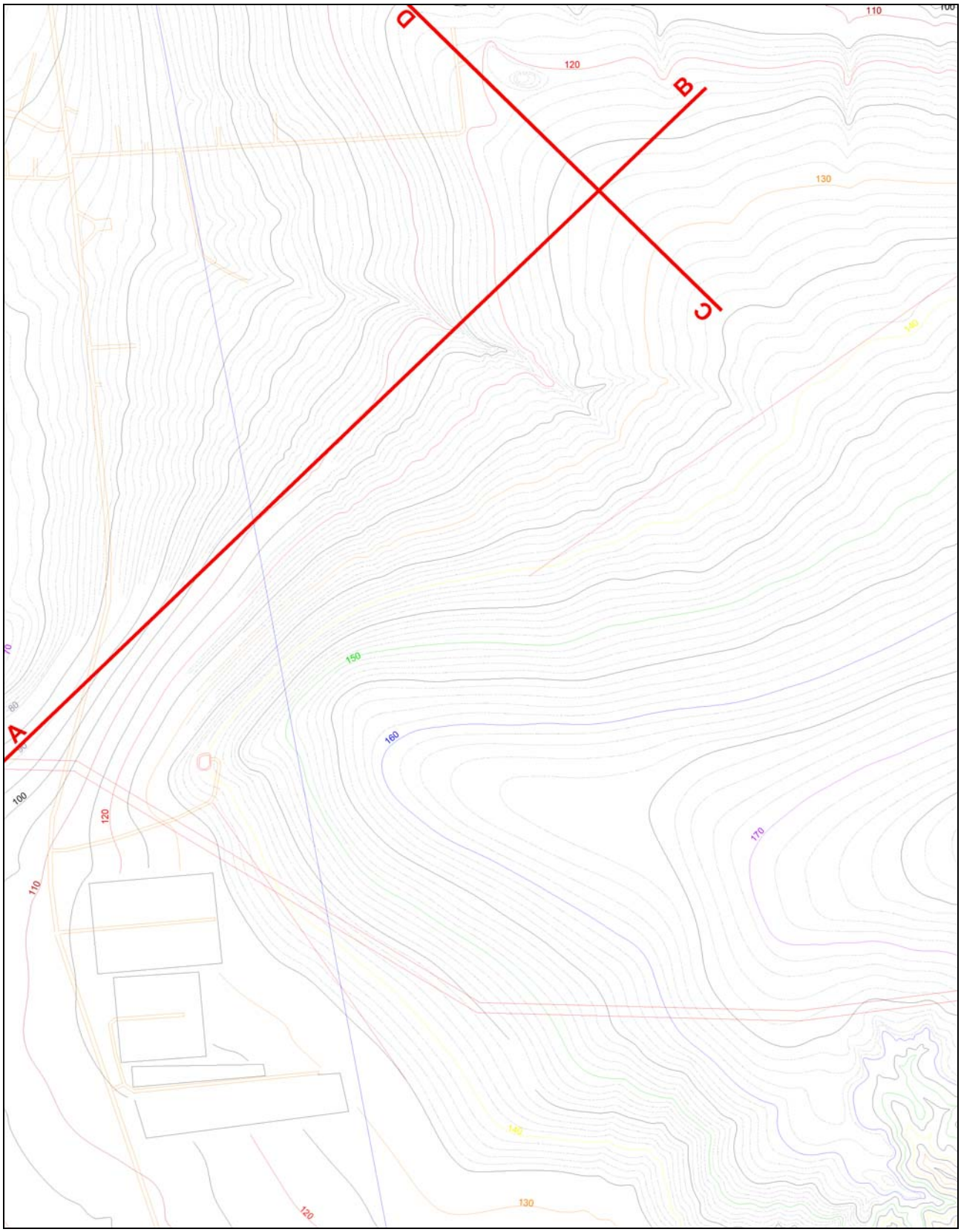
Loam and heavy clay prevail in the cut of sub-aerial deposits («foxy clay» horizon). Foxy clay horizon is the first from the surface local aquifuge. Capacity of deposits makes 2-5 m.

Alluvial Pliocene deposits (a N_2) are represented by light-grey and yellowish fine-grained, thin-washed, quartz sands. Capacity of deposits makes 2 m.

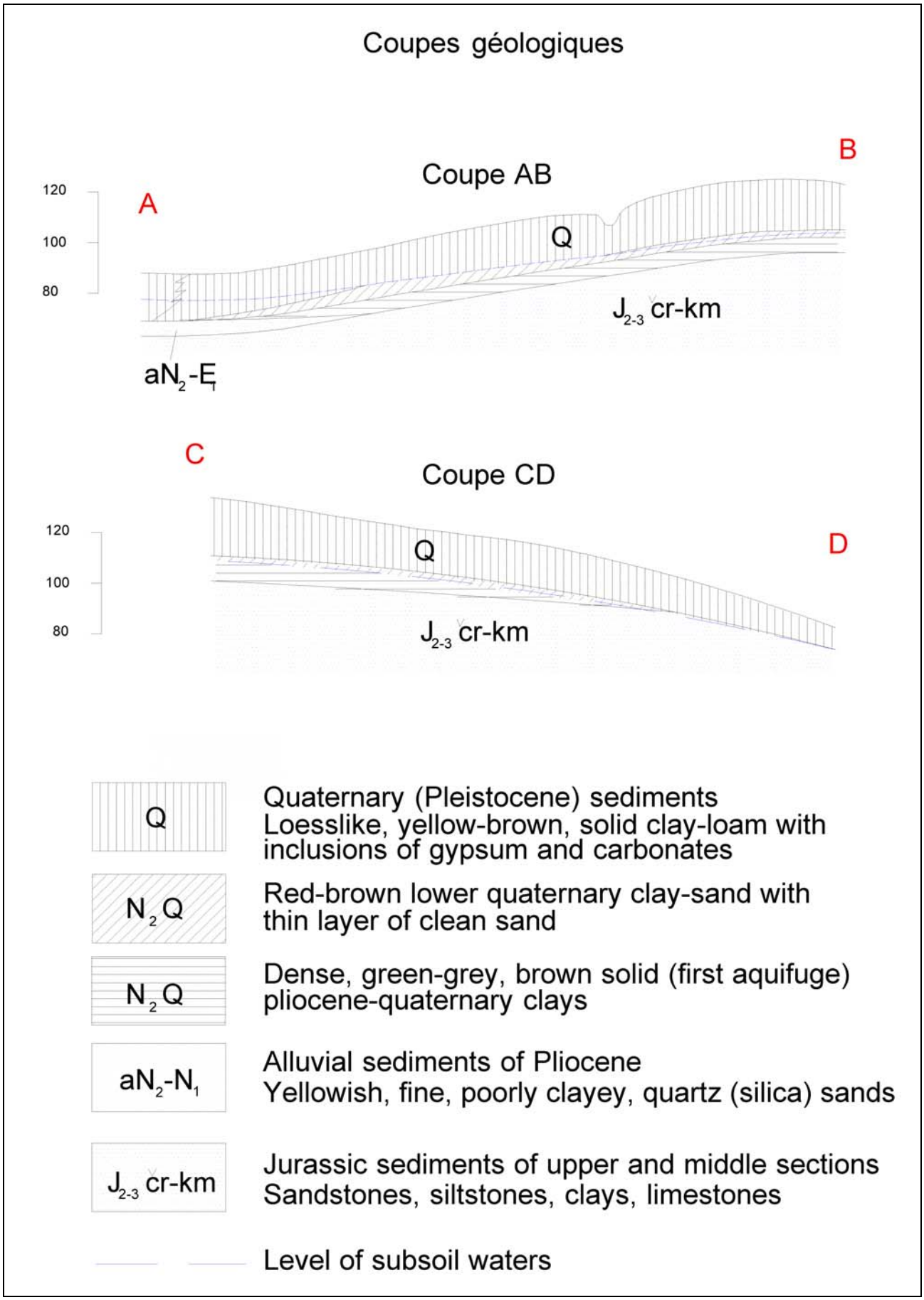
Pliocene deposits are located under the quaternary system sediments which make an entire overthrust of loose deposits on the regarded territory.

Sub-aerial deposits are located on top of the geological cut of the sediment stratum. Lithologic deposits are represented by clays, heavy, medium-textured and light loams, clay sand. The capacity of the deposits makes 5-10 m.

The structure can be drawn as on the following cuts.



Map 15 Position of the cuts



Drawing 6 Geological cuts

Characteristics of water-bearing horizons, complexes and local aquifuges.

Water-bearing horizon of Pliocene and Eocene alluvial terraces (aN_2 –E) is spread on the right bank of the Kazyonny Torets River.

Water-bearing rock is inequigranular sand.

Abundance of water of alluvial deposits is on the whole low. Permeability coefficient rates from 0.004 to 0.73 m/day. Sweet water of hydro-carbonate and sulphate- hydro carbonate type prevails.

Water of the given horizon is not protected from contamination.

Water-bearing complex of the fissured zone of the upper cretaceous Mironovsko-Konoplyanovskie deposits (K_2), is located in the upper zone of the exogenous fissuring of loam and cretaceous rock. The water-bearing horizon is free-flow.

Permeability coefficient value rates from 0.12 to 68.09 m/day, on the average 10.48 m/day. Waters are of hydrocarbonate-sulphate, sulphate-hydrocarbonate and hydrocarbonate types. Degree of mineralization rates from 0.1 to 2.0 g/dm^3.

The water-bearing complex is supplied by way of infiltration of the precipitation through Cenozoic and Eopliocene deposits covering it.

Underground water of the upper cretaceous water-bearing complex is one of the main sources of water supply of populated areas.

Belyanskiy water inlet situated in 5.0 km S-E from the SHW landfill exploits the upper cretaceous water-bearing complex.

SHW landfill can not affect the activity of Belyanskiy water inlet.

Water-bearing complex of lower cretaceous and upper cretaceous Slavyanogorsk deposits (K_1+K_{2sl}).

Water-bearing rock is represented by green and quartz sands and sandstones with clay interlayers.

Permeability coefficient rates from 0.16 to 2.9 m/day (average 1.2 m/day).

The qualitative composition of underground waters is mostly characterized by mineralization of 0.2 to 1.5 g/dm^3.

The water-bearing complex is supplied on the limited area of its outcrop to the precenozoic surface and discharged into alluvium of river valleys.

Water-bearing complex of upper Jurassic Donetsk deposits($J_{3\ dn}$).

Water-bearing rocks are represented by sandstones interlaying with clay.

Permeability coefficient makes 0.008 to 3.2 m/day.

As to their chemical composition waters are hydro-carbonate and sulphate-hydro-carbonate with degree of mineralization up to 1 g/dm^3.

Supply and discharge conditions are equal to those described above.

Water-bearing complex of middle and upper Jurassic Izyum deposits ($J_{3\ iz}$).

Water-bearing rocks are represented by limestone and calcareous sandstone.

Permeability coefficient makes 0.1 to 0.54 m/day. The water of the complex is of hydrocarbonate-sulphate type with mineralization degree rating from 0.3 to 1.0 g/dm^3.

Water-bearing complex of middle Jurassic Chercassy-Kamenskie deposits ($J_{2\ čn\text{-}km}$).

The complex is made up by interlaying sands or loose sandstones with the streaks of clay, siltstone and limestone.

Permeability coefficient in the river valleys rates between 0.26 and 4.23 m/day (average 1.8 m/day).

As to the chemical composition waters of hydro-carbonate and sulphate- hydro carbonate types with degree of mineralization from 0.4 to 1,0 g/dm^3 prevail.

The first from the surface aquifuge of Pliocene-lower Neopleistocene eluvial foxy clay (eN_2-P_1) has the capacity of 0 to 2.5 m.

The aquifuge is made up by eluvial foxy loams, silt loams, brown heavy loams and clay.

Permeability coefficient in the vertical direction rates from – $8.2*10^{-5}$ to $1.3*10^{-4}$ m/day.

On the ground situated near the territory under consideration «Ecogeoproject» company has conducted a geological engineering survey, which allowed a more detailed study of the cut and defined physico-mechanical properties of the grounds. According to these data covering Pleistocene deposits are represented by loess-like yellow and brown loams with the capacity from 10 to 22 m, and underlying clay sand with the capacity 1.5 to 6.0 m. Dense clays with the capacity 2.0 m lie lower. Capacity of Pleistocene deposits rises in the direction from bottom to top of the slope.

Underground waters are locater in the clay sand, sea level surface is 9.5 to 23.2 m deep from the ground surface. The water-table gradient is directed down the slope to the Kazyonny Torets River and reaches the value from 0.04 to 0.06.

According to the data of the survey loess-like ground is heterogeneous: in the upper part (till 6m deep) it is less dense and is characterized by subsident qualities, underlying loam sand is more dense and non-subsident. As far as filtration is concerned loam sand is also heterogeneous: upper loam sand is more permeable ($Coef_{perm}$ = 0.94 m/day), lower one is characterized by the average value of $Coef_{perm}$ rating 0.30 m/day. Underlying clay has an average $Coef_{perm}$ rating 0.0014 m/day and is the first from the surface aquifuge preventing underground water penetration into the underlying horizons.

Thus, the geofiltrational scheme of the territory is rather simple:

- Underground waters are located in the loose deposits;
- According to the circulation conditions waters are of pore type;
- The source of supply of underground waters is precipitation, falling on the area of covering loam sands spreading;
- Underground stream is plane-parallel in the plan and is directed to the river – discharge area (thus water-bearing horizon is half-closed in the plan: it has a dispersed supply area and a linear hydrodynamic boundary with a constant pressure head);
- The stream has an aquifuge represented by clays, the roof of which is inclined in the direction of the slope bottom;
- Underground waters are discharged into alluvium of the river valley that has a direct hydraulic connection with the surface waters.

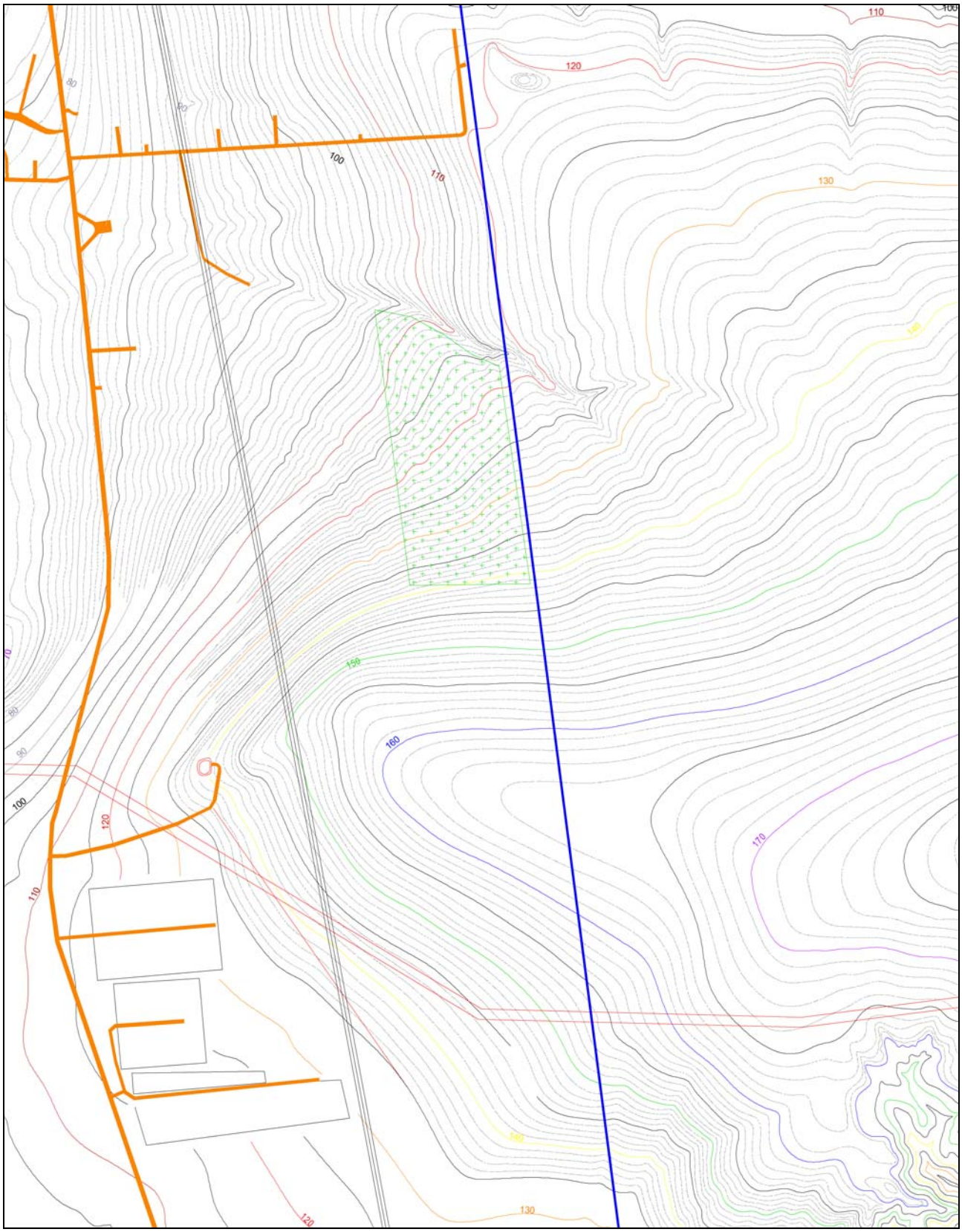
Considering geological engineering and hydrogeological conditions of the territory, underground waters that are located first from the ground surface are characterized as unprotected from chemical and bacterial contamination, while underlying water-bearing horizons are protected from contamination. Ground waters located in the sand stones are not used for water supply as a result of low water abundance of the horizon and low water quality.

The territory can be recommended for designing and construction of a SHW landfill. At the same time it is necessary to conduct a geological engineering survey on the landfill site and identify water permeability of the tract of land with the help of filtration tests.

9.6.3. Project design

The main constraints of the area are the presence of:

Oil pipe (Picture 1)	
Water pipe (Picture 2)	
Very High Voltage line (Picture 3)	
Orchard (Picture 4)	



Map 16 Topography of the area

Picture 1 Sign of the oil pipe

Picture 2 Water pipe

Picture 3 Very high voltage line

Picture 4 Orchard on the site

So the site has been already studied as:

In 1997 PGP “Artiomovskaya Hydrogeological Party” (4) conducted engineering and geological investigation of the site designed for location of SHW landfill in Slaviansk.

In 2001 “Izyskatel-1” ltd. (5) conducted engineering and geological investigations within the borders of the area for location of SHW landfill.

"Scientific and production centre Ecogeoproject" ltd. performed additional engineering and geological investigations for the project "SHW Landfill of Slaviansk" in March 2002.

The results and comments of these studies are interesting but:

- The investigation drillings and the geological cuts are not located on the topographic map or by any coordinates system, so it's impossible to determine which are the conditions of the proposed location.
- The laboratory tests have been made on 4 samples and the permeability is as size order 10^{-5} m/s.

On Map 17 the initial project has been studied on the area A (yellow). We have estimated what could be a project at the same place with area B (blue). And we have developed an approach on a third area C (orange).

The study of March 2002 is based on 6 drillings. The study provides a map but the drillings are not located by their coordinates, longitude and latitude. Nevertheless, we have approximately reported these drillings on our Map 18. The drilling 1 is on the line of the cut BB. We have projected the data of the drillings 4 and 2 on this line. On this base, it's possible to approximate the structure of the geological layers along the cut line BB.

The structure of the subsoil is made of, from top to bottom:

- Pedological layer (0,20 m – 0,30 m);
- Limon (6 m) permeability around 10^{-5} m/s ②;
- Reddish limon (15 m) permeability around 4.10^{-6} m/s ③;
- Mix sand-clay (4 m) permeability around 10^{-5} m/s ④;
- Clay (? m) permeability around $1,6.10^{-8}$ m/s ⑤.

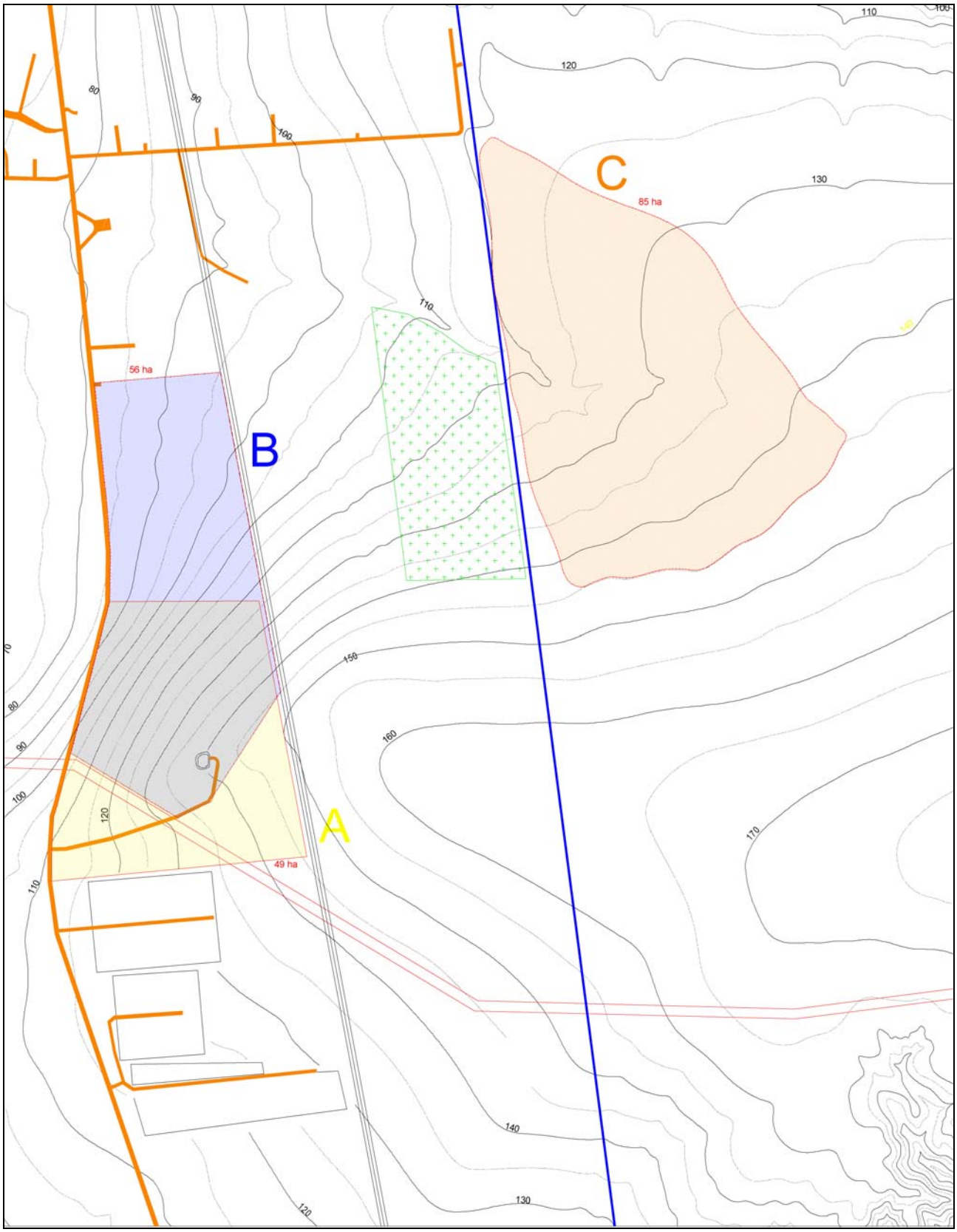
The international regulations are, from top to bottom:

- Clay (1 m) permeability < 1.10^{-9} m/s; it said that this layer may be artificially reconstituted for instance with 0,3 m of bentonite offering a permeability < 1.10^{-12} m/s;
- Clay (5 m) permeability < 1.10^{-6} m/s.

It should be admissible to consider that the clay in place with a permeability around $1,6.10^{-8}$ m/s should constitute the passive barrier if the thickness is >5 m. Unfortunately: 1) we don't know the thickness; 2) there's around 15 m of limon to remove to access to the clay.

The study of March 2002 says itself:

4.8 Underground waters of quaternary sediments, taking into account high values of permeability coefficient of layers EGE – 2, 3, 4, are not protected from chemical and bacteriological contamination. That is why it is recommended that the design of the SHW landfill should envisage artificial leachate screen.

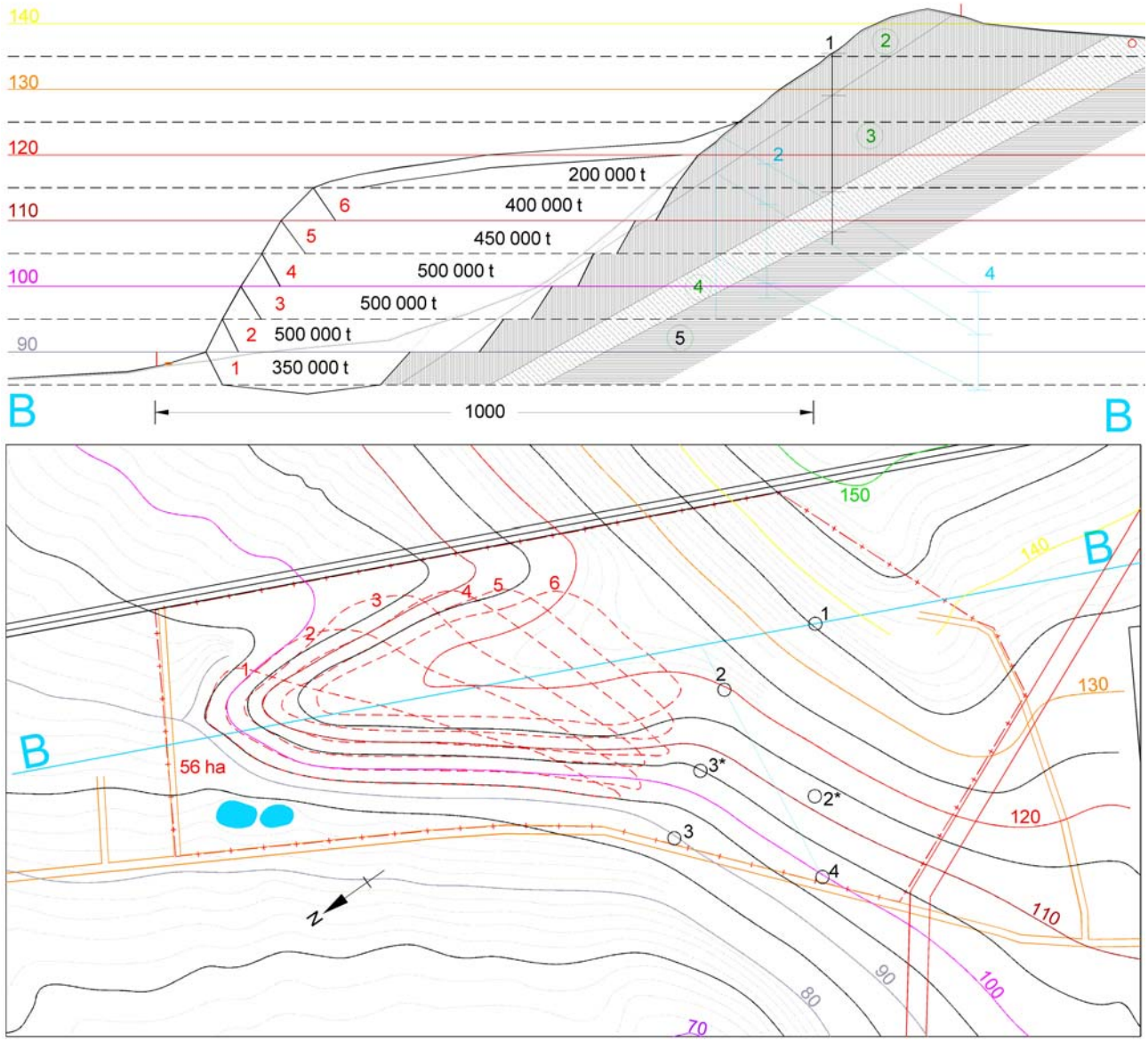


Map 17 Potential location of projects

The project B, developed on a surface of 56 ha could receive 2,900,000 tons.

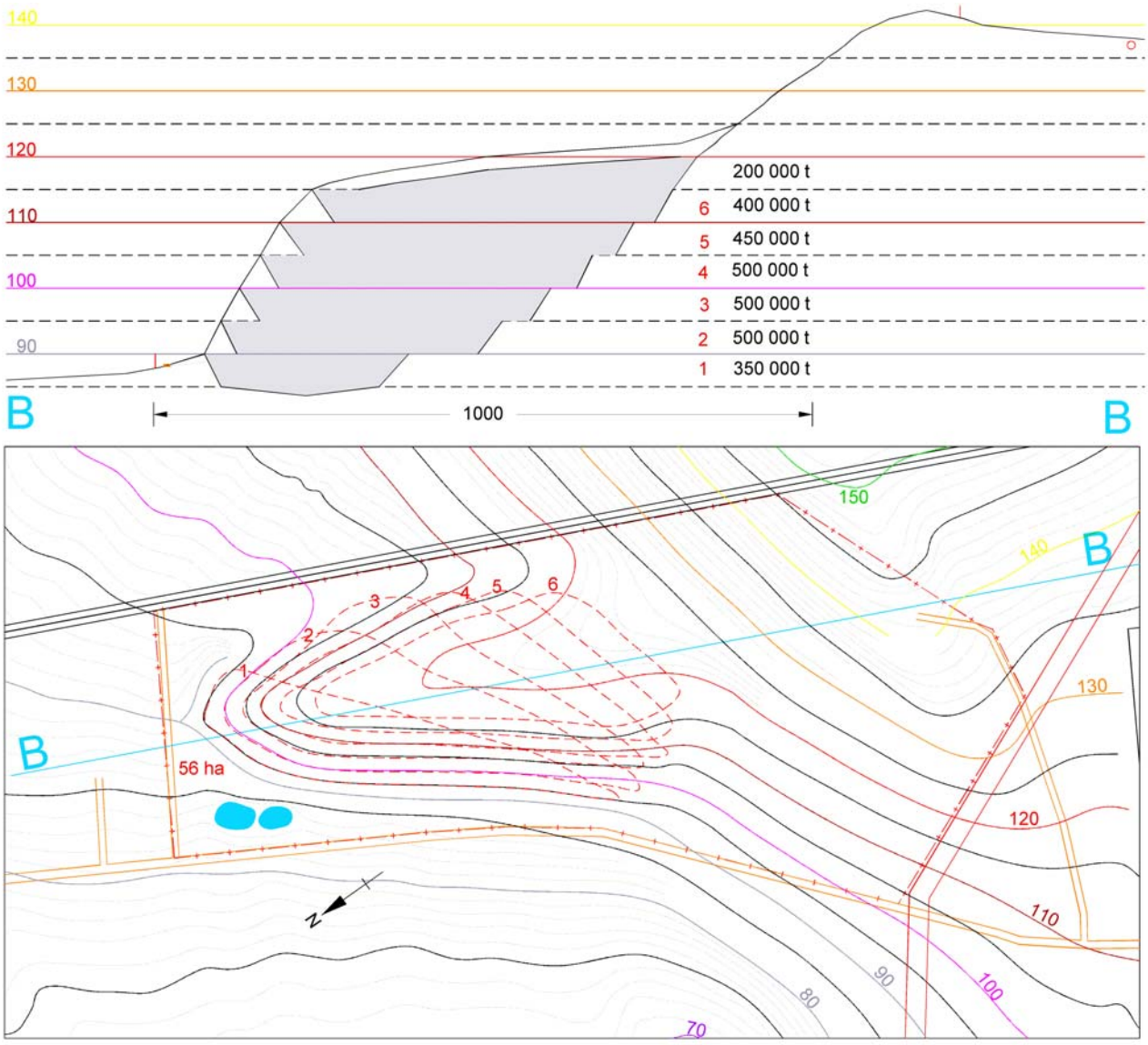
The project C, developed on a surface of 85 ha could receive 6,000,000 tons and even more.

A project A should be limited by the road, the oil pipeline, and the Very High Voltage line and could difficultly receive more than 1,500,000 tons.



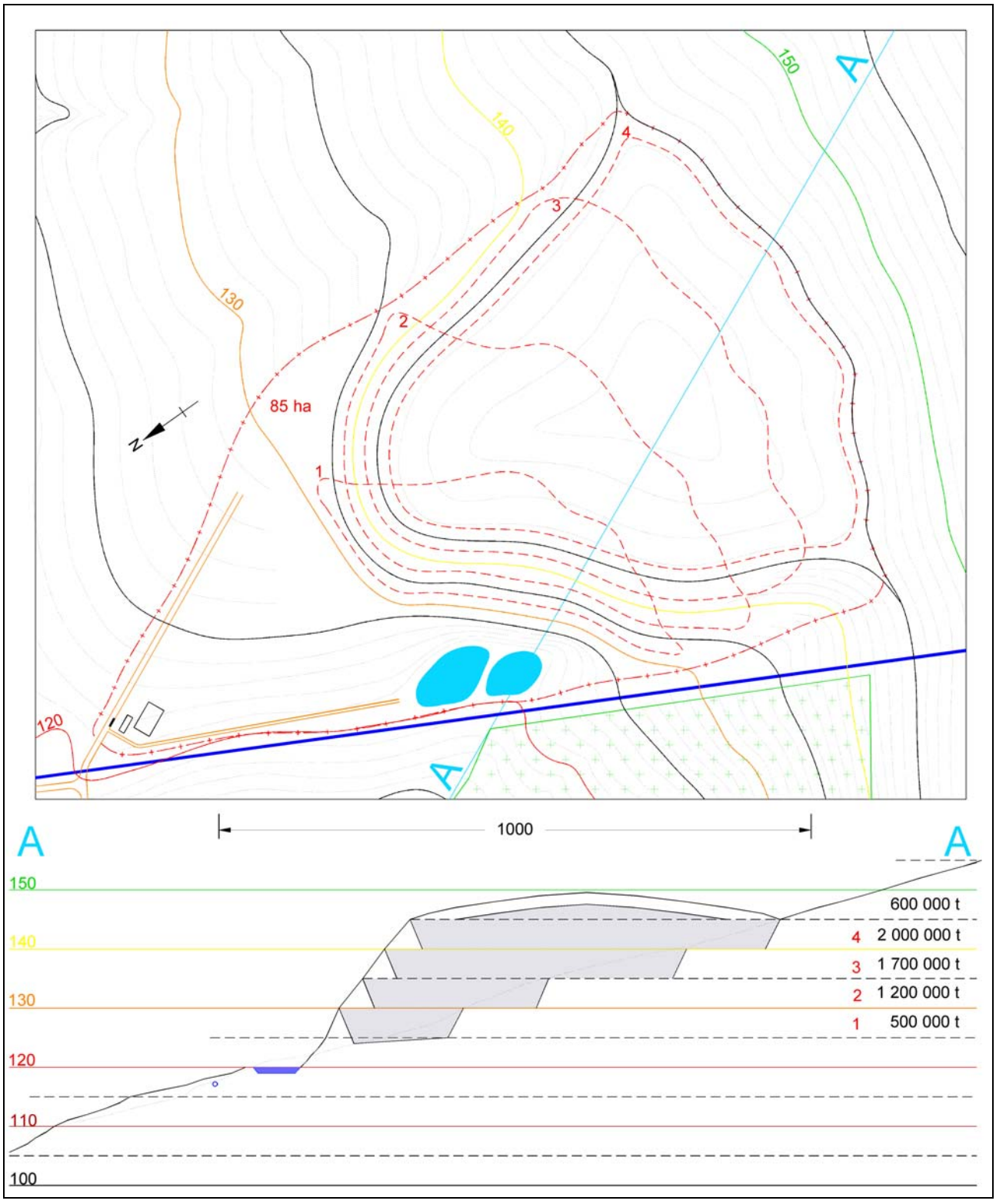
Map 18 Geological estimation

The project B can be summarized by the Map 19. It shows the superposition of the rows, from 1 to 6 and a cut BB (altitude x10). The area of the site can be reduced at 40 ha by keeping only the left part.



Map 19 Project B

The project C can be summarized by the Map 20. It shows the superposition of the rows, from 1 to 4 and a cut AA (altitude x10). It's possible to add levels 5 and 6 in aim to extend the capacity of the landfill.

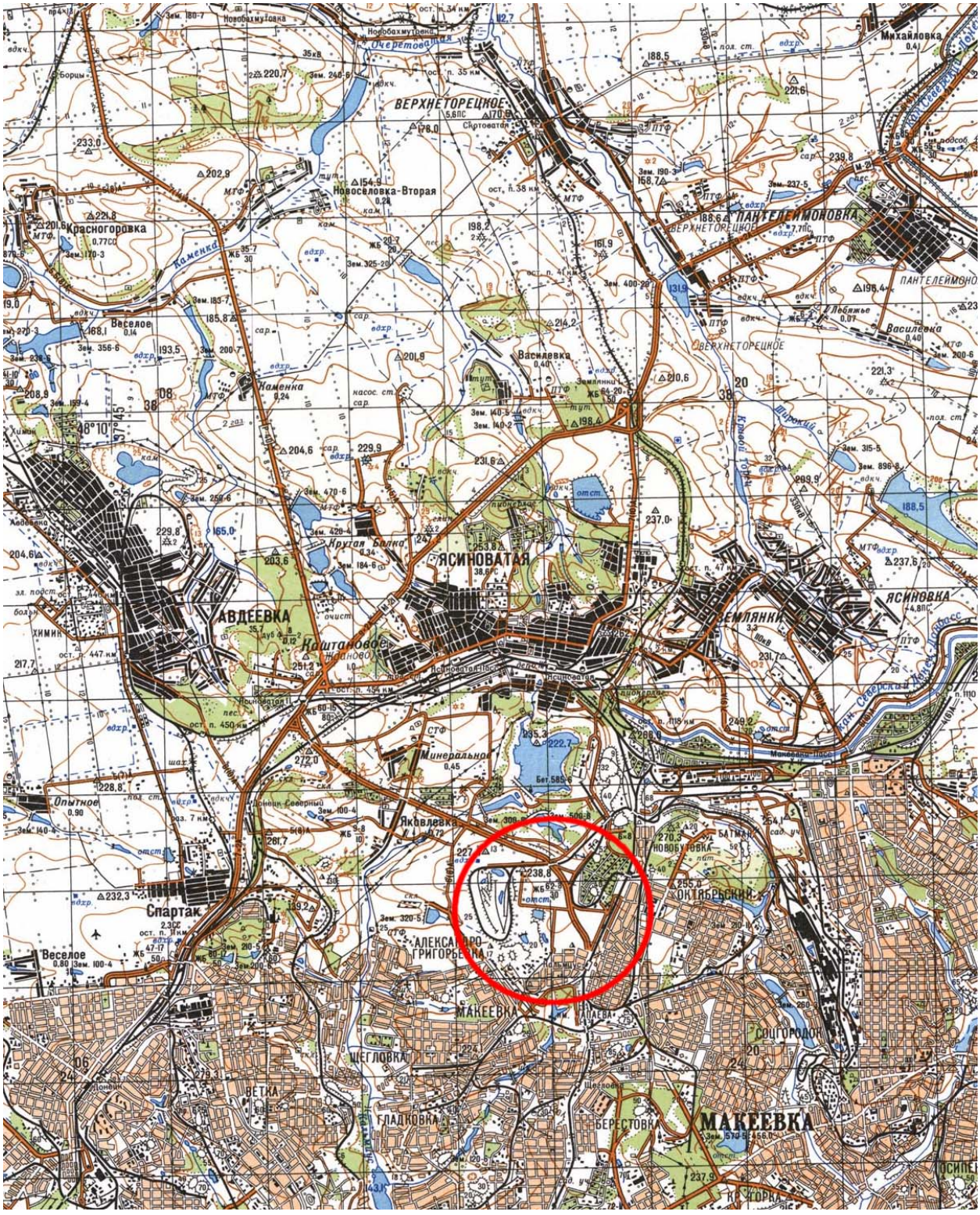


Map 20 Project C

Our conclusion is that the site has a very interesting potential for the construction of a sanitary landfill. The key-points are: the existence of a layer of good clay, but relatively deep; interesting slopes; an easy access from the cities of Slaviansk and Kramatorsk; a large part of the site is not cultivated; the closest neighbours are at > 1 km. It's possible to develop several projects. The project C offers the largest capacity and is far from any sight point. But the local geology must be checked more deeply before to take any decision.

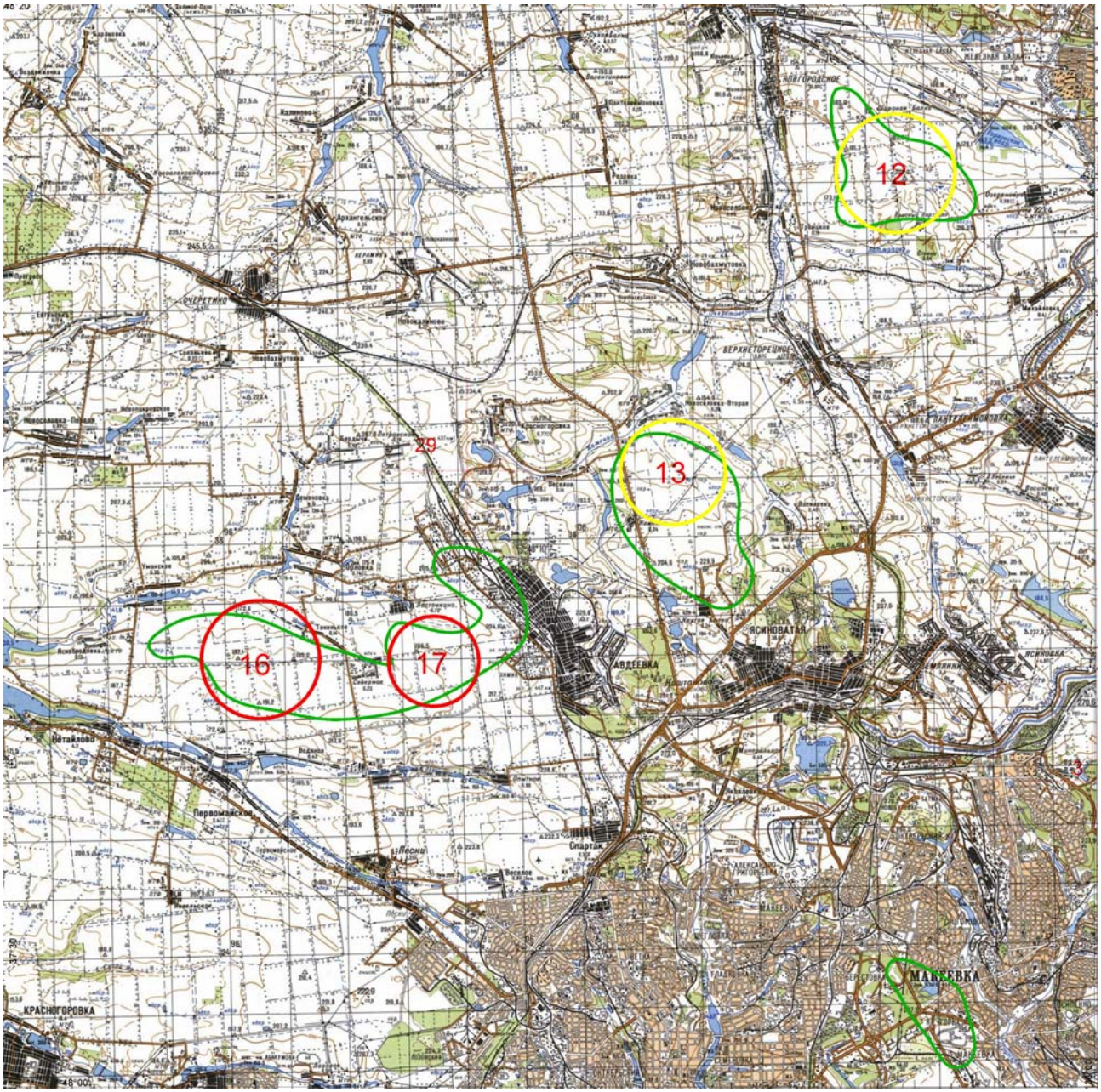
9.7. Particular cases: Grigoryevskiye

9.7.1. Implementation



Map 21 Location of the project

The Regional Administration has proposed a site, in Grigoryevskiye Rayon, for the construction of a new landfill, aiming to satisfy the needs of the City of Donetsk. This site has been proposed as an alternative to the locations proposed by the experts for the siting of new sanitary landfills 12,13,16 & 17 on the following Map 22:



Map 22 Propositions of location

Legend: green lines = areas of clay; 29, 3 = existing landfills audited in 2004; 12, 13, 16, 17 = propositions of location for new sanitary landfills

The experts have considered that the site 13 and 17 were the best choice for new sanitary landfills.

During our visit on 27/02/06, we have seen that it exists already a landfill on the site. We were told that a piece of land has been allocated to a private company for landfilling of waste from Makeyevka. Two years ago, the contract disposed that a permit should be asked and works of construction of a sanitary landfill should be done. Nowadays, nothing of that has been done. The landfill is not permitted and no works are done. There's only a gate and a guardian and a bulldozer. During the visit, around 30 scavengers were sorting the waste.

Picture 5 Grigoryevskiye dumpsite

Picture 6 Grigoryevskiye dumpsite

Picture 7 Grigoryevskiye dumpsite

As we'll see further, this illegal dumpsite offers a high risk for the water resource.

9.7.2. Geology and hydrogeology

Conclusion on geological structure and hydro geological conditions of SHW landfill in Grigoryevskiye (Makeyevka)

The proposed SHW landfill site is located at the North of Makeyevka, 1.4 km NW from the railway stopping point "Kalmius" at the watershed of the Kalmius and the Gruzskaya River. Absolute surface marks make 235-240 m.

Geological cut of the site is represented (from bottom to top) by Paleozoic, Cenozoic and quaternary deposits:

- Paleozoic deposits are represented by the upper level of the coal system (C_3) and are made up by the stratum of cyclically interstratifying terrigenous rock (sandstone, argillite, siltstone with subordinated limestone layers and numerous thin coal layers).
- Cenozoic deposits are represented by Pliocene deposits (vd_1eN_2) of the neogenic system.
- Lithologic deposits are represented by heavy loams and clays. Their capacity is 0 to 3 m.
- Pliocene deposits are the local aquifuge situated next to the surface. Permeability coefficient of the aquifuge under consideration in the vertical direction, found on the adjacent area and based on the results of the field studies made 3.0 10^{-5} m/day (3 10^{-10} m/s).
- Sediments of the quaternary system represented by medium-textured and light loams with the capacity of 1 to 5 m cover Pliocene deposits. Permeability coefficient of loams is 0.03-0.35 m/day (3.5 10^{-7} to 4 10^{-6} m/s)[5].

Underground waters are located in the upper coal deposits (water-bearing horizon of the upper coal deposits C_3).

[5] International norms and regulations recommend the Solid Household Waste landfill is built on a passive barrier made of a layer of clay of thickness > 5 m and permeability < 10^{-6} m/s, surmounted of a layer of clay of thickness > 1 m and permeability < 10^{-9} m/s.

Water containing rocks of the horizon are sandstones, limestone, siltstones and argillites, forming a common water-bearing horizon of the interstitial type with the capacity 30 to 50 m in the area of active weathering.

Permeability design coefficients make 0.38 m/day on the average for watersheds (4 10^{-6} m/s), and their limiting values vary from 0.003 to 218.1 m/day (3.5 10^{-8} m/s to 2.5 10^{-3} m/s).

In a qualitative sense the prevailing types of underground waters of the upper coal deposits are sulphate, sulphate-hydrocarbonate and hydrocarbonate sulphate ones.

Degree of mineralization rates from 0.5 to 9.1 g/dm^3.

Underground waters in the quaternary deposits are characterized by an unstable state: level surface position depends on the volume of precipitation, which is the source of horizon supply.

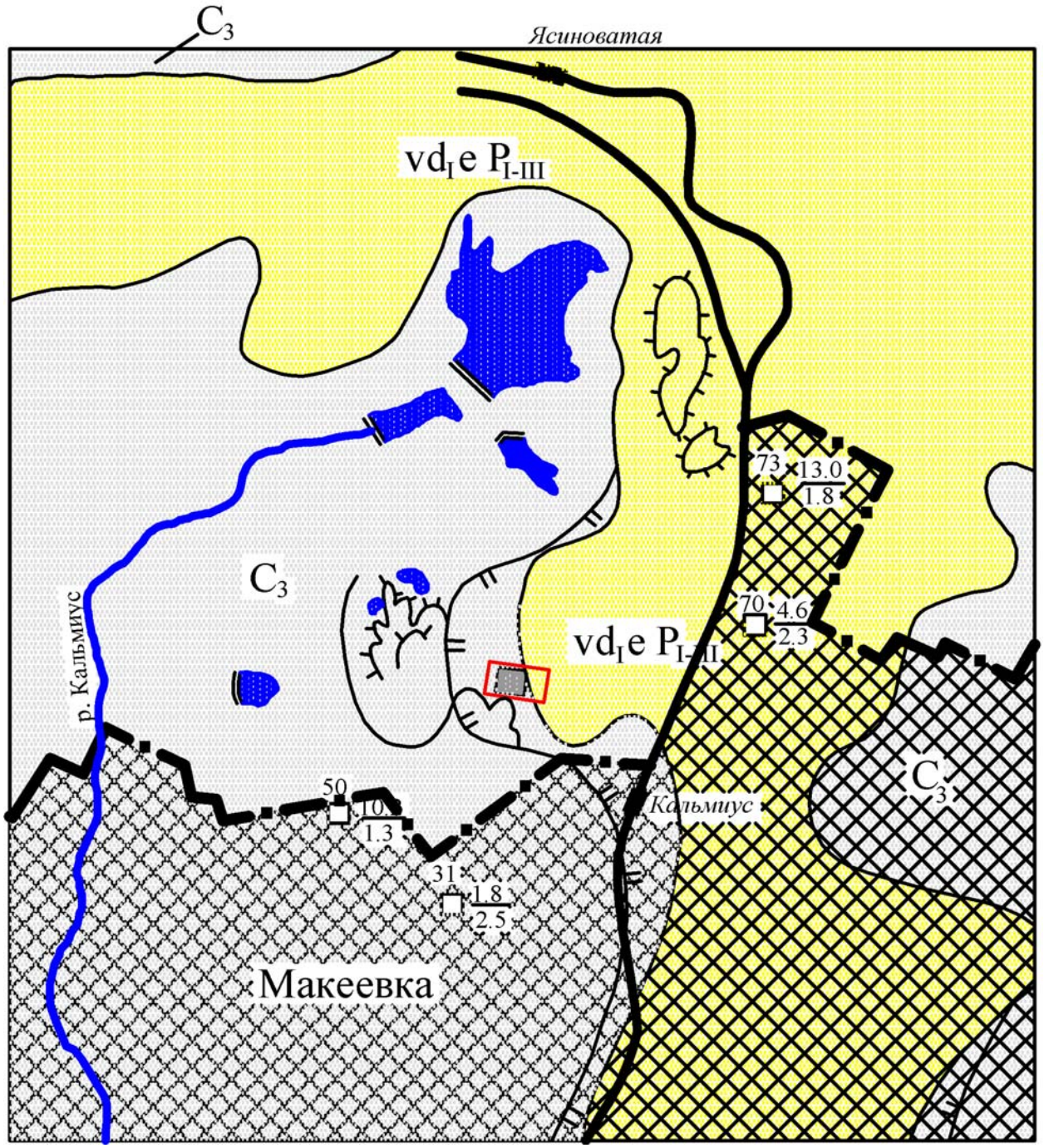
Underground waters are discharged into the hydrographical network.

Considering the geological structure and hydrogeological conditions of a landfill site it is necessary to remark that the nearest environment should be directly affected by the waste disposed on the landfill:

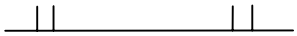
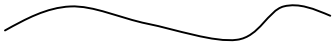
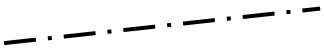
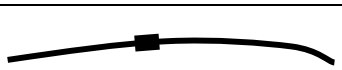
- zone of aeration does not exceed 5 m which results in the superficial waters reaching the level of underground waters quite quickly;
- aeration zone ground is permeable (coefficient to 0.35 m/day), in this case superficial waters (contaminated with chemicals or micro organisms) penetrate into the water-bearing horizon within 15-20 days, which is considerably less than the life time of pathogenic bacteria (100-400 days). In other words contamination of underground waters is possible;
- such conditions allow penetration of the leachate emerging in the sites of household waste disposal into the underground waters which are not protected from chemical or bacterial contamination in this case;
- coal bedding rock is seamy and fosters migration of contaminated waters in the underground stream of the Kalmius River, on which downstream lakes for recreational use for Donetsk population have been constructed. In this case contamination of the river water is sure to take place, since there is a direct hydraulic connection between underground and superficial waters.

The construction of a SHW landfill in such natural conditions excluding the possibility of environment pollution requires developing special measures (as the construction of an artificial passive barrier by bringing on site millions m^3 of clay) that would considerably increase the cost of the SHW landfill construction.

It is more reasonable to transfer the site for SHW landfill construction to the area, where natural conditions ensure minimal influence on underground and superficial waters, soil and vegetation as well as social and human environment.



Map 23 Schematic Hydro Geological Map 1:50,000

First from the surface water-bearing strata and complexes	
$vd_Ie\ P_{I-III}$	Water-bearing horizon of whole lower and upper Pleistocene deposits (medium-textured loams)
C_3	Water-bearing horizon of upper coal deposits (interstratifications of argillite, siltstone, sandstone)
Confining beds (aquifuge)	
	Waterproof stratum of Pliocene deposits (heavy loams and clays)
Other symbols	
	SHW landfill
	Water-bearing strata border
	Populated area border
	Dumps
	Hydro network
	Outline of water withdrawal
	Railway
70 4.6 / 2.3	Well. The number is above, on the right – level of the underground waters is indicated in the numerator, mineralization level is in the denominator (g/dm)

Legend of the Map 23

9.7.3. Project of new landfill

The existing illegal landfill is located at the East of the slagheap of mine steriles. The project is to create a regional landfill at the Northwest of the slagheap. This location offers a light slope as on Picture 8.

The hydrogeological study demonstrates that this site is in the water feeding the Kalmius River. The underground water is at -2 m depth. It means that:

- There's a huge risk of contamination of the Kalmius River in case of leakage of leachates;
- The works necessary to discharge this water and to avoid any trouble on the rows of a landfill should be huge and very expensive;
- There's no natural passive barrier of clay. The creation of such a passive barrier should require to bring something like 1 million m^3 of bentonite.

Picture 8 Potential location in Grigoryevskiye Rayon

9.7.4. Alternative

The City of Donetsk has an existing landfill that is very interesting for the management of the transition between the today's situation and the construction of the future sanitary landfills.

The landfill of Petrovskyi Rayon has been often visited by the experts of the previous Tacis Project.

9.7.4.1. Operations

The operation of the landfill is well driven by ISTOK. The landfill is kept with 2 guardians 24/24, equipped with mobile phone.

The office of the landfill is connected to the water network (even equipped with a shower). A high voltage line is supplying the landfill which has its own transformer. Formerly existed a phone line but it is disconnected.

The lane across the landfill is in a very good state. The area of unloading is flat and clean.

About 50 people are sorting waste on the landfill. They are managed by the operator who buys the secondary raw materials and maintains the discipline.

The waste are nowadays disposed in the middle of the landfill, on a line SW-NE. The waste are unloaded on the sorting area. On afternoon, the 2 bulldozers push and compress the waste.

9.7.4.2. Problems

The landfill is a former quarry of sand. It seems that under the layer of sand, the ground is waterproof, as it is usual to find an alternation of layers of sand and of clay. The indication is that in the bottom of the quarry, there's a marsh. Directly at the bottom of the waste, it can be seen a pond of leachates.

The landfill is very close individual houses and it can be suspected that if some are equipped with wells, the leachate migrates in the sand and contaminates the wells.

There's no fence around the landfill which can be easily used as a playground for the neighbour children.

The key problem is that the landfill is made on a very good layer of clay but in a layer of sand. So the leachates cannot migrate vertically but they migrate laterally and they pollute the neighbour domestic wells.

It's not difficult to solve that. On the sides where waste have been disposed, they must be removed. The lateral slopes must be reshaped with a slope of 1/3 and a lateral layer of clay must be disposed on >5m thickness as on Drawing 7.

An additional option is to put a draining layer in the part without waste today.

Drawing 7 Principles of works

9.7.4.3. Recommendations of Reinhard Knopp[6] (05/02/04)

9.7.4.3.1. Access road

The inner road shall meet a width of minimum 5 m. According necessity the street has to be maintained by the operator to prevent accidents and obstructions of operation.

The construction has to be done according following steps:

- The road has to be realised in the form of a dam to allow access to the landfill even when heavy rainfall occurs;
- Profiling the surface of the road with gravel material and compacting in two layers of 20 cm each;
- The gravel material must be broken in the fraction sizes of 0 – 60 mm mixture;
- Left and right the street a surface drainage ditch shall be built to prevent undermining effects and to guarantee a very fast flow of water from the street surface;
- The gradient of the road has to be (longitudinal and transversal) > 3%;
- Installation of signs indicating the direction to reach the site;
- Installation of simple information signs indicating the responsible authority, the working hours and numbers to be contacted in case of accidents.

9.7.4.3.2. Staff

Disregarded from the size of a landfill, the incoming waste, the collection area or enclosed population, two persons in minimum have to be present during operation time.

[6] Landfills key-expert of Donetsk 1

9.7.4.3.3. Landfill operation

There should be reached some effects like:

- The goal must be to rise the surface of the landfill above the surrounding area to allow rainwater to be drained away by gravity;
- Setting up a simple tipping plan;
- Create a ("all-weather") tipping platform from where the unloaded waste is pushed by the loader/bulldozer to it's final position;
- To profile the tipping sector (5° Gradient in drainage direction);
- To profile the slopes in a gradient proportion of 1/3;
- To profile, close and cover temporary sectors (min. 25 cm demolition waste and topsoil);
- Start of profiling in sector of tipping household waste;
- To define the unloading area in the tipping sector;
- To define the area for sorting in the tipping sector;
- To define the area for placing household waste;
- To define the area storage of demolition waste, to be later one used as cover material or to serve in constructing the inner road;
- To prevent fire on site;
- To prevent slope tipping: NO UNCOMPACTED WASTE!
- To reduce the volume of the waste by compacting;
- To keep record about the daily work;
- Maintenance of the equipment has to be ensured;
- Sufficient funds have to be allocated to the landfill to ensure correct exploitation.

Minimum request: the open tipping place shall not be larger than 600 m² (40 x 15 m).

9.7.4.3.4. Infrastructure maintenance and protection

Following steps shall be done:

- Discharging and compacting the waste at one place;
- Re profiling the landfill;
- Pushing the waste from the low point towards the higher area;
- Bringing of the entrance building to a minimum standard;
- Ensure easy communication (GMS);
- Covering of parts momentary not in use (out of use for more than 10 days);
- Creating ditches to collect leachate;
- Keep the drainage free from waste;
- Fire fighting measures to be introduced;
- Installation of simple information signs;
- Ensure maintenance of all engines.

9.7.4.3.5. Recommendations in brief

Making of the landfill accessible for all types of vehicles at any weather conditions.

Concentrate dumping on one small place only. This means: minimisation of the tipping area in use, just allowing the discharging of the trucks in the peak hour and the movement of the bulldozer.

Take all measures to minimise the transport of mud and dirt out of the site. The creation of a platform could be the answer to this request.

Installation of drainage ditches at both sides of the access and the inner road to facilitate rainwater run off.

Providing uniforms to the personnel on site (to create a visible difference between them and the scavengers).

Definition of the boarders of the property that can be used to landfill waste.

Fixing of the filling line in a distance of 25 m to the boarder of the property.

Creating and in-forcing a tipping plan that shows the steps of reorganisation of the landfill surface, of tipping area for household waste, demolition waste and topsoil, covering with demolition waste, final and covered areas and scrap metal place. The situation of the access road on site has also to be fixed on the plan. A cross section has to show the different levels of the tipping area and the layers relative to the natural underground.

Covering all zones where waste rests without any further input for more than 10 days but the final level is not reached yet.

Posing the final cover in all the parts of the landfill where the final profile is reached.

Re-profiling of the already dumped waste in a way that allows the rainwater to drain off without entering into the mass of waste.

Opening of zones where deep fires are active in the mass of waste, this shall be done by creating ditches with a bulldozer. The form of the ditches must allow in any case the bulldozer to leave the ditch at the lower end.

Re-profiling of the existing steep slopes to a gradient of 1/3

Covering the dumped waste with soil after the re-profiling, about 25 cm of soil, to minimise the infiltration of rainwater, gradient about 5%.

9.7.4.3.6. Future steps of using the actual landfill site: Extension of the lifetime of the site

In general it is recommended to reduce the number of landfills in use to a minimum. The list of landfills to be closed and the landfills to be transformed to a higher standard, has to be discussed and defined in the “Waste Management Plan”. This reduction in number is directly linked with the necessity of inter-communal co-operation and solving of the question of financing.

As far as we could see at our visit, the landfill can still be used for years. Based the following idea: final elevation of the landfill might reach a level quite above the entrance, this means after settlement. As the settlement can be expected at about 20%, the filling will be stopped at a higher level as the final one; gradient of the top of the landfill not less than 5% and the slopes shall have a gradient of 1:3. These figures have to be approved with the real local data.

9.7.4.3.7. Closure measurements

According common standards, the closing strategy for the landfill or even parts of it has to follow as a kind of minimum standard request.

On the top of a final filled landfill, selected fill with a thickness of 10 till 15 cm has to be profiled. The surface of a dumpsite has to meet a gradient of 5 % in the direction of the surface water drainage system. The slopes have to be profiled according a triangle proportion of 1/3.

After final profiling the whole surface has to be covered with 50 cm (0,5 m) clay layer, placed and compacted in two layers, each 25 cm.

The final layer consists of topsoil with a thickness of minimum 40 cm. The surface has to be treated and grass has to be sawn in the two stripe system.

In any case, if the landfill will be closed one day, any further discharging of waste has to be avoided and never close a landfill while no other realistic discharge solution is available.

9.7.4.4. Conclusion

This landfill can offer good conditions for the protection of environment with a minimum of investment. It's very close the city. But the main interest is that the remaining capacity is 3 million m^3, so with a good waste compactor 3 million tonnes, so >6 years of production of SHW of the City of Donetsk.

9.8. Closure of existing landfills

As soon as the capacities of sanitary landfills will be available in an area, it will be to close the existing used landfills.

The method will consist in to cover them with a layer of soil (if possible clay soil), after having re-shape them with bulldozer in aim to give them soft slopes and a dome shape on which rainwater will run.

Nowadays there are more than ten SHW dumps in the Oblast which has been operated for many years by city public utilities, have exhausted their capacities and have been closed, however, no special technical measures have been undertaken for their closure. Only two city dumps (cities of Avdeyevka and Ilovaysk) have developed projects for dump closure including the measures for prevention and restriction of the negative impact on the environment.

10.Cost estimates, financing schemes and financial analysis

This project is not an ordinary project. It's not the construction of one facility for one product on one market. It's a 10-year regional programme including investments in: the daily waste collection, both for renewing the equipment and for extension of the collection; the selective collection and the relevant sorting facilities; the construction of new sanitary landfills; and the creation of a transfer network associating transfer stations and transfer trucks.

The feasibility study will have to detail the concrete investments, facility-by-facility, landfill-by-landfill, and municipality-by-municipality. In the frame of the present pre-feasibility study, the objective is only to estimate if the project is sustainable as a whole.

10.1. PROJECT COSTS

10.1.1. Investment Costs

The updating of the programme of investments of the Regional Strategic Plan can be summarized as Table 18:

mln UAH	TOTAL	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Weighbridges	3.750		2.000	1.750							
Computerization	1.000		1.000								
Put at level of collection											
Trucks	38.400		7.680	7.680	7.680	7.680	7.680				
Tractor + trailer	14.040		2.808	2.808	2.808	2.808	2.808				
Containers	5.000		1.000	1.000	1.000	1.000	1.000				
Development of collection											
Trucks	43.200		9.600	9.600	9.600	7.200	7.200				
Tractor + trailer	28.080		6.240	6.240	6.240	4.680	4.680				
Containers	5.625		1.375	1.375	1.375	0.750	0.750				
Selective collection											
Containers	20.400		1.800	1.800	2.400	2.400	2.400	2.400	2.400	2.400	2.400
Trucks	18.000		2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
Sorting plants	75.000		15.000	15.000		15.000		15.000		15.000	
Transfer											
Semi-trailers	40.000		2.000	5.000	5.000	5.000	5.000	5.000	5.000	4.000	4.000
Transfer station	42.000		2.000	6.000	6.000	6.000	6.000	4.000	4.000	4.000	4.000
Landfills	330.000		30.000	30.000	60.000	30.000	60.000	30.000	30.000	30.000	30.000
Diverse	45.000		5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000
TOTAL	709.495	0.000	89.503	95.253	109.103	89.518	104.518	63.400	48.400	62.400	47.400

Table 18 Investments

10.1.2. Operation and Maintenance (O&M) Costs

Our base is:

- Collection: today the collection cost is 40 UAH/t, half wages and half energy. The maintenance is so poor that the cost is not significant. In the future, the maintenance costs are estimated 10%/y of the investment cost.
- Selective collection: the collection cost is also around 40 UAH/t.
- Sorting plant: the operation and the maintenance are estimated 2 mln UAH/y for 1 sorting plant.
- Transfer by trucks: the transfer is estimated 0.40 UAH/t.km for, at the end of the programme, 50 mln t.km for the transfer.

- Transfer stations: the operation cost is around 1 UAH/t.
- Landfilling: the operation costs are estimated at 15 UAH/t, including maintenance. The amortization is estimated 30 UAH/t.

mln UAH	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Operation costs											
Collection	28.733	36.813	48.698	61.263	70.988	81.242	83.679	86.190	88.775	91.439	94.182
Selective collection	0.040	0.080	0.120	0.200	0.400	0.600	0.800	1.000	1.200	1.400	1.600
Sorting plants			2.000	4.000	4.000	6.000	6.000	8.000	8.000	10.000	10.000
Transfer											
Semi-trailers			2.286	3.876	8.026	10.312	11.799	12.739	15.463	15.463	15.463
Transfer station			0.204	0.346	0.717	0.921	1.054	1.137	1.381	1.381	1.381
Landfills			4.512	8.532	17.013	22.062	27.171	30.518	36.232	38.070	40.138
TOTAL	28.773	36.893	57.819	78.216	101.144	121.136	130.503	139.584	151.051	157.752	162.763
Amortization											
Weighbridges				0.200	0.375	0.375	0.375	0.375	0.375	0.375	0.375
Computerization				0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200
Put at level of collection											
Trucks				1.097	2.194	3.291	4.389	5.486	5.486	5.486	5.486
Tractor + trailer				0.401	0.802	1.203	1.605	2.006	2.006	2.006	2.006
Containers				0.200	0.400	0.600	0.800	1.000	1.000	1.000	1.000
Development of collection											
Trucks				1.371	2.743	4.114	5.143	6.171	6.171	6.171	6.171
Tractor + trailer				0.891	1.783	2.674	3.343	4.011	4.011	4.011	4.011
Containers				0.275	0.550	0.825	0.975	1.125	1.125	1.125	1.125
Selective collection											
Containers				0.360	0.720	1.200	1.680	2.160	2.640	3.120	3.600
Trucks				0.286	0.571	0.857	1.143	1.429	1.714	2.000	2.286
Sorting plants				1.500	3.000	3.000	4.500	4.500	6.000	6.000	7.500
Transfer											
Semi-trailers				0.286	1.000	1.714	2.429	3.143	3.857	4.571	5.143
Transfer station				0.133	0.533	0.933	1.333	1.733	2.000	2.267	2.533
Landfills			9.024	17.063	34.026	44.124	54.342	61.036	72.464	76.140	80.276
Diverse				1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000
TOTAL	0.000	0.000	9.024	25.264	50.898	68.112	86.256	99.375	115.050	121.472	129.713

Table 19 Costs of operation

10.1.3. Working Capital

10.2. REVENUES

10.2.1. Disposal fees

Actually the incomes of the SHWM are:

- The fees paid by the inhabitants and the organisations with contract with the SHWM companies. Usually the landfill is managed by the SHWM company and there's no particular fee for the disposal of these waste.
- Industrial companies may manage by themselves their common waste and bring them directly to the landfill. In such a case, they pay a fee for the disposal.

According to the § 12.2.4.3 the projected fees paid by the inhabitants are:

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Private sector Amount M UAH	3.300	6.600	9.900	13.200	14.850	16.500	16.995	17.504	18.026	18.563	19.126
Collective H. Amount M UAH	6.800	12.240	16.660	23.120	30.600	40.800	42.024	43.282	44.574	45.900	47.294
TOTAL M UAH	10.100	18.840	26.560	36.320	45.450	57.300	59.019	60.786	62.600	64.463	66.420

Table 20 Evolution of the fees

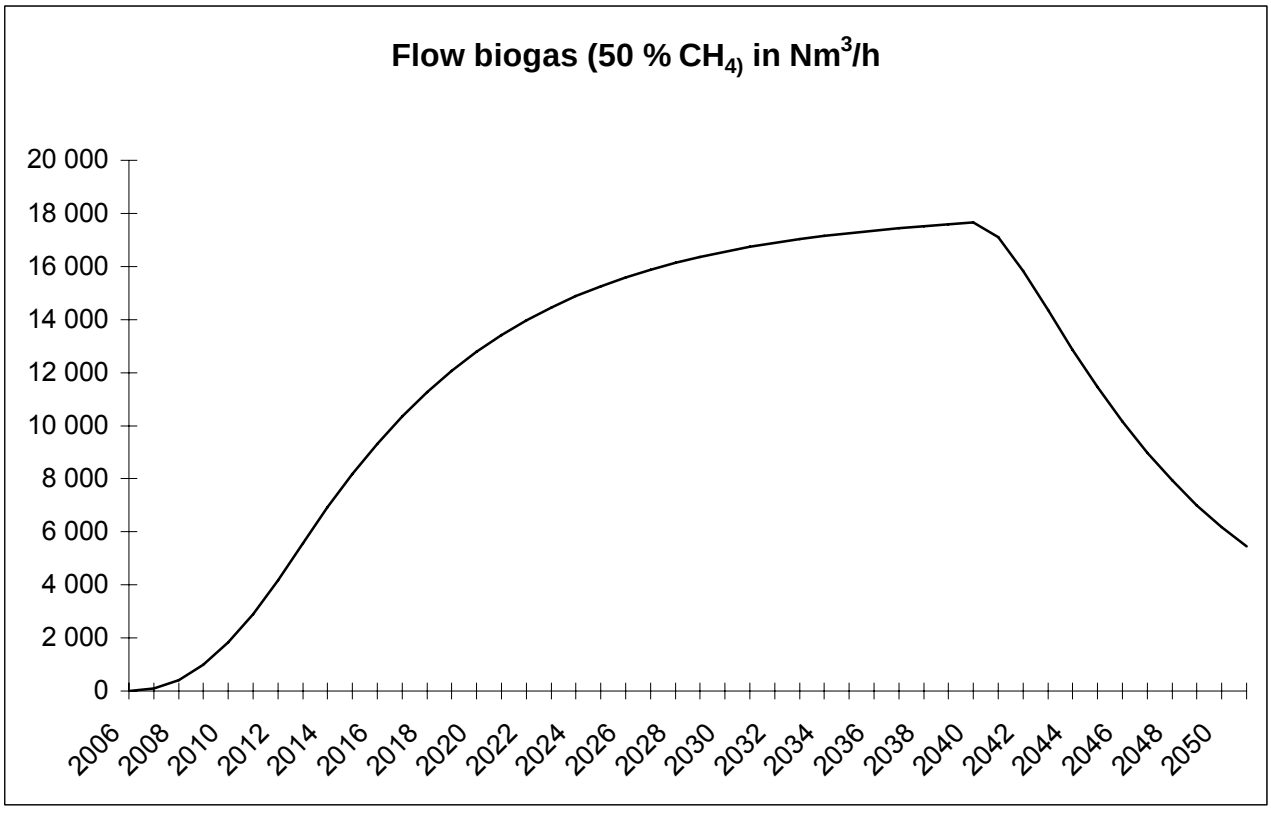
In parallel, the enterprises should be progressively obliged to dispose their waste in the new sanitary landfills with a payment of 60 UAH/tonne. The corresponding incomes can be estimated as:

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Tonnage 1000 t	0	0	80	160	320	400	560	640	720	800	880
Amount mln UAH	0.000	0.000	4.800	9.600	19.200	24.000	33.600	38.400	43.200	48.000	52.800

10.2.2. Other revenues

The collecting of the biogas of landfills of household waste is considered as a way to fight against the greenhouse effect. The fermentation of organic waste produces methane. The methane is classified as harmful for greenhouse effect with a coefficient of 22 in proportion to carbon dioxide.

Supposing all the SHW of Donetsk Oblast will be progressively disposed in such sanitary landfills, the model of production of biogas gives the following figures in Nm^3/h of biogas with 50% methane, in equivalent tons of carbon dioxide per year, in produced kWh of electricity per year (Table 21).



Graph 8 Potential collecting of biogas

Année	Production CH_4 m^3/an	Collection CH_4 m^3/h	CO_2e kg/y	Thermal Power kW	Potential Production of Electricity kW	Projected Production of Electricity kWh/y
2006	0	0	0	0	0	
2007	891,000	102	13,365,000	1,017	339	
2008	3,688,800	421	55,332,000	4,199	1,400	12,264,000
2009	8,713,200	995	130,698,000	9,923	3,308	28,978,080
2010	15,972,900	1,823	239,593,500	18,181	6,060	53,085,600
2011	25,346,400	2,893	380,196,000	28,852	9,617	84,244,920
2012	36,660,300	4,185	549,904,500	41,737	13,912	121,869,120
2013	48,835,500	5,575	732,532,500	55,599	18,533	162,349,080
2014	60,670,500	6,926	910,057,500	69,073	23,024	201,690,240
2015	71,670,600	8,182	1,075,059,000	81,599	27,200	238,272,000
2016	81,666,600	9,323	1,224,999,000	92,978	30,993	271,498,680
2017	90,635,100	10,346	1,359,526,500	103,181	34,394	301,291,440
2018	98,619,900	11,258	1,479,298,500	112,276	37,425	327,843,000
2019	105,694,200	12,066	1,585,413,000	120,334	40,111	351,372,360
2020	111,942,000	12,779	1,679,130,000	127,445	42,482	372,142,320
2021	117,448,800	13,407	1,761,732,000	133,708	44,569	390,424,440
2022	122,296,500	13,961	1,834,447,500	139,233	46,411	406,560,360
2023	126,561,000	14,448	1,898,415,000	144,090	48,030	420,742,800
2024	130,311,600	14,876	1,954,674,000	148,358	49,453	433,208,280
2025	133,610,100	15,252	2,004,151,500	152,108	50,703	444,158,280
2026	136,512,000	15,584	2,047,680,000	155,419	51,806	453,820,560
2027	139,066,200	15,875	2,085,993,000	158,321	52,774	462,300,240
2028	141,315,900	16,132	2,119,738,500	160,884	53,628	469,781,280
2029	143,298,900	16,358	2,149,483,500	163,138	54,379	476,360,040
2030	145,048,500	16,558	2,175,727,500	165,133	55,044	482,185,440
2031	146,593,800	16,734	2,198,907,000	166,888	55,629	487,310,040
2032	147,960,300	16,890	2,219,404,500	168,444	56,148	491,856,480
2033	149,169,900	17,029	2,237,548,500	169,830	56,610	495,903,600
2034	150,242,100	17,151	2,253,631,500	171,047	57,016	499,460,160
2035	151,194,000	17,260	2,267,910,000	172,134	57,378	502,631,280
2036	152,040,000	17,356	2,280,600,000	173,091	57,697	505,425,720
2037	152,793,000	17,442	2,291,895,000	173,949	57,983	507,931,080
2038	153,464,100	17,519	2,301,961,500	174,717	58,239	510,173,640
2039	154,063,500	17,587	2,310,952,500	175,395	58,465	512,153,400
2040	154,599,300	17,648	2,318,989,500	176,004	58,668	513,931,680
2041	149,733,000	17,093	2,245,995,000	170,468	56,823	497,769,480
2042	138,722,400	15,836	2,080,836,000	157,932	52,644	461,161,440
2043	125,749,500	14,355	1,886,242,500	143,162	47,721	418,035,960
2044	112,685,700	12,864	1,690,285,500	128,293	42,764	374,612,640
2045	100,316,400	11,452	1,504,746,000	114,211	38,070	333,493,200
2046	88,957,200	10,155	1,334,358,000	101,276	33,759	295,728,840
2047	78,699,300	8,984	1,180,489,500	89,597	29,866	261,626,160
2048	69,531,600	7,937	1,042,974,000	79,156	26,385	231,132,600
2049	61,391,700	7,008	920,875,500	69,891	23,297	204,081,720
2050	54,195,600	6,187	812,934,000	61,703	20,568	180,175,680
2051	47,851,500	5,463	717,772,500	54,482	18,161	159,090,360
TOTAL	4,636,430,400		69,546,456,000			15,410,127,720
Average	103,031,787	11,762	1,545,476,800		39,100	342,447,283

Table 21 Potential collecting of biogas

The landfilling should spare on average 1.5 mln tons CO_2e per year.

The landfilling should produce on average 340 mln kWh per year that can be sold on the network.

So in the next years, these additional incomes can be estimated as size order as:

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Carbon rights Amount M UAH				0.773	3.201	7.562	13.862	21.997	31.816	42.382	52.654
Electricity Amount M UAH				0.000	3.311	7.824	14.333	22.746	32.905	43.834	54.456
TOTAL M UAH	0	0	0	0.773	6.512	15.386	28.195	44.743	64.721	86.216	107.11

10.2.3. Sales of secondary raw materials

Nowadays the waste are sorted by scavengers, directly in the collection containers or on the landfills. A Ukrainian specificity is the brewery contract: bars, restaurant, food shops are delivered at the condition they return 95% of the beer glass bottles. It seriously decreases the quantity of glass to be recycled.

So we can only consider what the sorting plants can produce as secondary raw materials.

mln UAH	TOTAL	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
New sorting plants	5		1	1		1		1		1	
Glass	29.000		1.000	2.000	2.000	3.000	3.000	4.000	4.000	5.000	5.000
PET	108.750		3.750	7.500	7.500	11.250	11.250	15.000	15.000	18.750	18.750
Paper	9.860		0.340	0.680	0.680	1.020	1.020	1.360	1.360	1.700	1.700
Textile	4.930		0.170	0.340	0.340	0.510	0.510	0.680	0.680	0.850	0.850
Metal	10.875		0.375	0.750	0.750	1.125	1.125	1.500	1.500	1.875	1.875
TOTAL	168.415	0.000	5.635	11.270	11.270	16.905	16.905	22.540	22.540	28.175	28.175

10.2.4. Total potential incomes

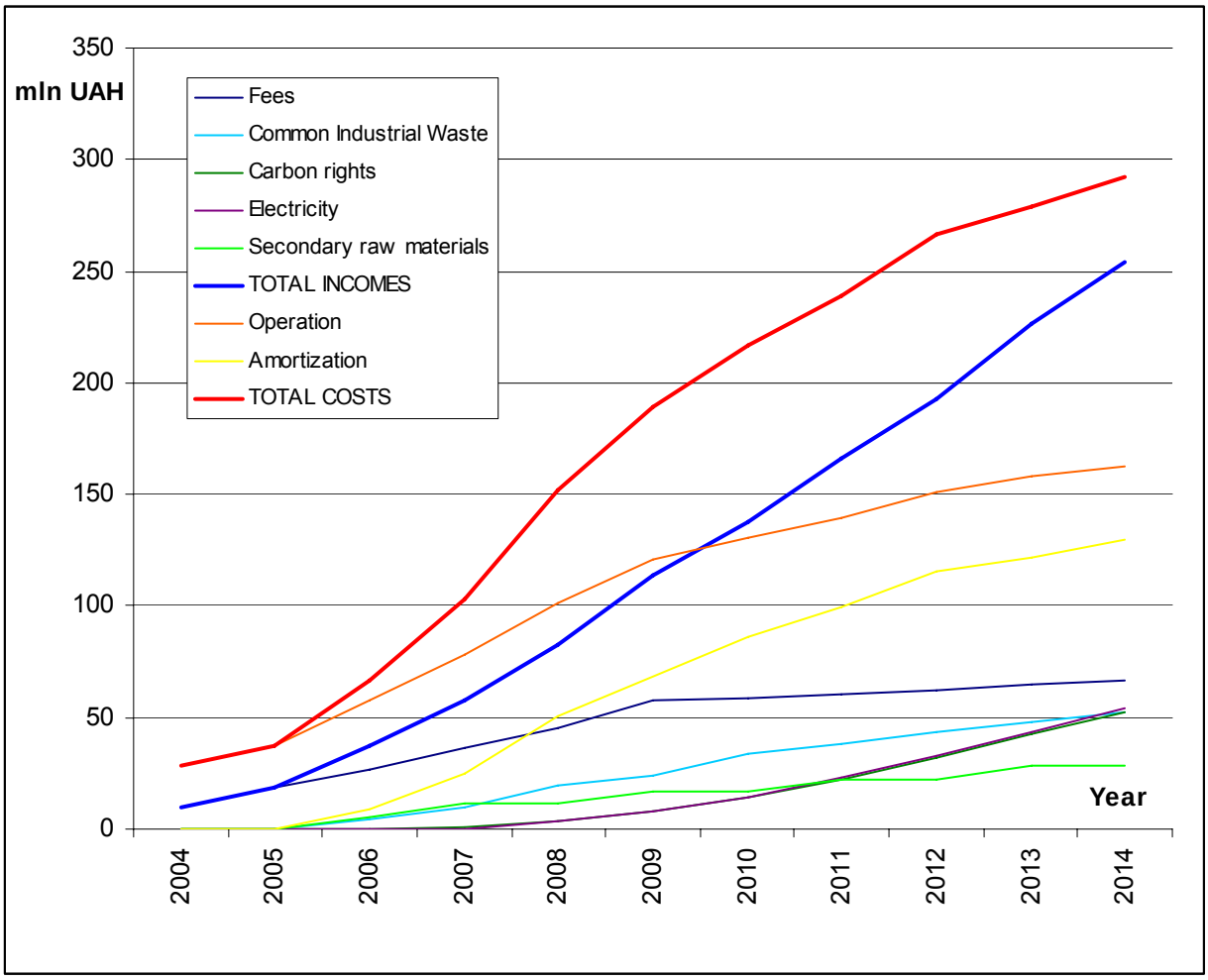
mln UAH	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Fees	10.100	18.840	26.560	36.320	45.450	57.300	59.019	60.786	62.600	64.463	66.420
Common Industrial Waste	0.000	0,000	4,800	9,600	19,200	24,000	33,600	38,400	43,200	48,000	52,800
Carbon rights	0.000	0.000	0.000	0.773	3.201	7.562	13.862	21.997	31.816	42.382	52.654
Electricity	0.000	0.000	0.000	0.000	3.311	7.824	14.333	22.746	32.905	43.834	54.456
Secondary raw materials	0.000	0.000	5.635	11.270	11.270	16.905	16.905	22.540	22.540	28.175	28.175
TOTAL	10.100	18.840	36.995	57.963	82.432	113.591	137.719	166.469	193.061	226.854	254.505

10.3. FINANCIAL ANALYSIS

All the previous figure can be summarized as on Table 22 and Graph 9.

mln UAH	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Fees	10,100	18,840	26,560	36,320	45,450	57,300	59,019	60,786	62,600	64,463	66,420
Common Industrial Waste	0,000	0,000	4,800	9,600	19,200	24,000	33,600	38,400	43,200	48,000	52,800
Carbon rights	0,000	0,000	0,000	0,773	3,201	7,562	13,862	21,997	31,816	42,382	52,654
Electricity	0,000	0,000	0,000	0,000	3,311	7,824	14,333	22,746	32,905	43,834	54,456
Secondary raw materials	0,000	0,000	5,635	11,270	11,270	16,905	16,905	22,540	22,540	28,175	28,175
TOTAL INCOMES	10,100	18,840	36,995	57,963	82,432	113,591	137,719	166,469	193,061	226,854	254,505
Operation	28,773	36,893	57,819	78,216	101,144	121,136	130,503	139,584	151,051	157,752	162,763
Amortization	0,000	0,000	9,024	25,264	50,898	68,112	86,256	99,375	115,050	121,472	129,713
TOTAL COSTS	28,773	36,893	66,843	103,480	152,041	189,248	216,759	238,958	266,101	279,224	292,476

Table 22 Key-figures



Graph 9 Key-figures

10.3.1. Profitability Analysis

The curve of the Incomes crosses the curve of the operation costs between 2009 and 2010. It means that the actual practice of compensation of the losses of the municipal companies by the municipal budget should continue, at least to continue to increase the tariffs, specifically the tariffs applicable to the enterprises.

This event is also linked to the new incomes of the production of electricity from biogas and the carbon rights. The quantities are strictly depending of the investment of sanitary landfills. We have applied very pessimistic tariffs: 0.25 UAH/kWh and 20 UAH/CO_2 ton. It means that a large part of the incomes are very sensitive to the evolution of energy prices: electricity should increase but if the developed countries reduce their energy consumption, the value of the carbon rights could decrease.

There's also an hysteresis effect of these incomes. In 2025, the incomes from electricity should be 120 mln UAH and the incomes from carbon rights should be 116 mln UAH, although the operation costs and the amortizations should be constant.

10.3.2. Cash Flow Analysis

We have considered that whatever is the duration of the amortization, the amortizations should stay constant because the equipment should be replaced. The incomes should cover the amortizations around 2015-2016.

It's obvious that there's a transition period to manage. A strict application of the polluter pays principle should request that all the investment should be funded by loans and the reimbursement and the interests should be included in the price of the service. Such a policy would seriously delay the implementation of the programme. Two solutions can help a quick implementation.

Until now, the investments for the SHWM were funded by the budget without any amortization of the equipments. These funds are coming from the State budget and the Ekofund. Throughout these two funds, the Oblast is able to invest 30-50 mln UAH/y.

Some grants should be welcome to initiate a virtuous circle for the SHWM.

11.Socio-economical and financial aspects

11.1. Purchasing power

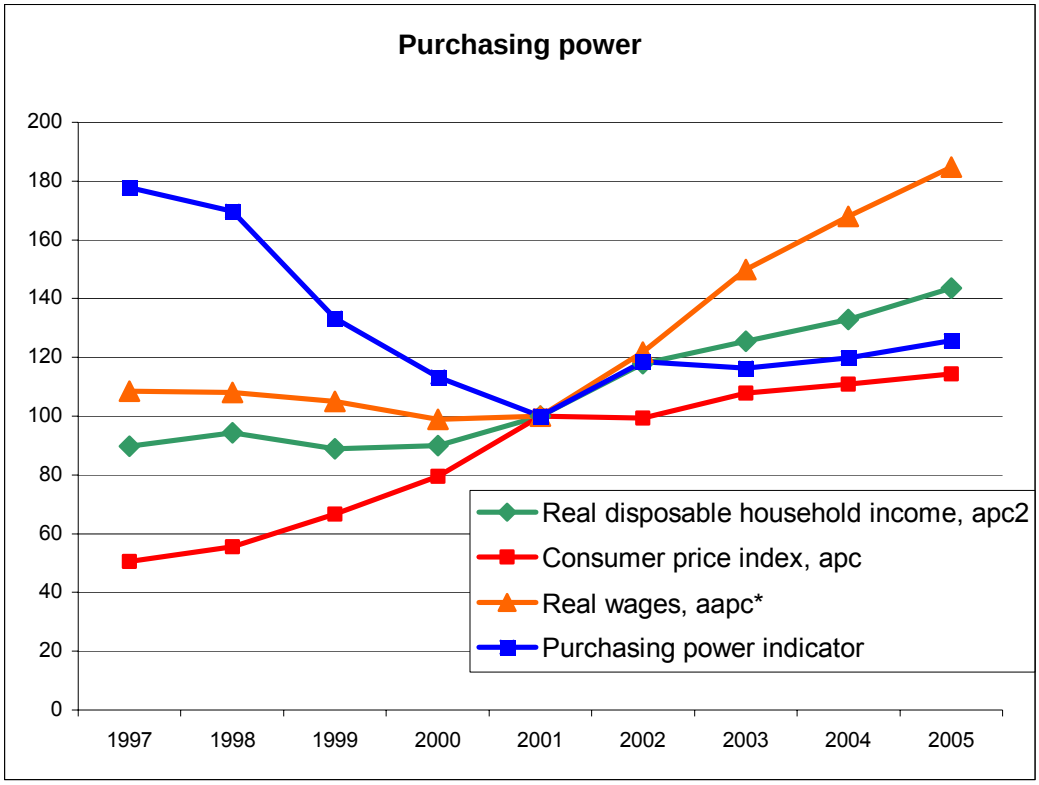
The Oblast of Donetsk is one of the richest of Ukraine, notably for the reason of its performing industry. The economic growth in the Oblast has been quite high recently and resulted in the growth of wages. In 2002, the average income by inhabitant is officially up to 450 UAH/month (note: 70 €/month). However, the existence of a sector of informal economy relatively important let to suppose major real incomes. On the other hand, since 2003, the nominal wages quickly grew but the official figures of unemployment seem always increasing.

	1995	2000	2001	2002
Average salary of working people, UAH	95.91	292.39	383.05	451.53
Number of people engaged in economic activities, thousands	2,480.7	2,125.6	2,078.3	2,033.3
Number of registered unemployed people (end of the year), people	8,472	95,132	72,140	75,974
among which: women	7,300	65,259	50,783	54,292

It must be noticed that if the rate of unemployment officially registered on January 1, 2003 is 2.8%, the rate calculated for 2002 according to the methodology used by ILO is 9.4%.

The economical recovery of Ukraine maintains for some years at a strong level. The mid term perspectives are favourable. Particularly the economists are expecting a durable increase of the prices of the steel and the steel coke, now these are today the main industrial productions of the Oblast.

This economic recovery appears as a progression of the purchasing power of the households, which is an interesting indicator for the production of the household waste. It can be seen on the Graph 10 that since 2001, the purchasing power (calculated in index Real disposable household income / consumer price index) started again to grow. Between 1997 and 2001, this indicator had fallen of about 45%. Since 2001, it should have progressed of >20%.

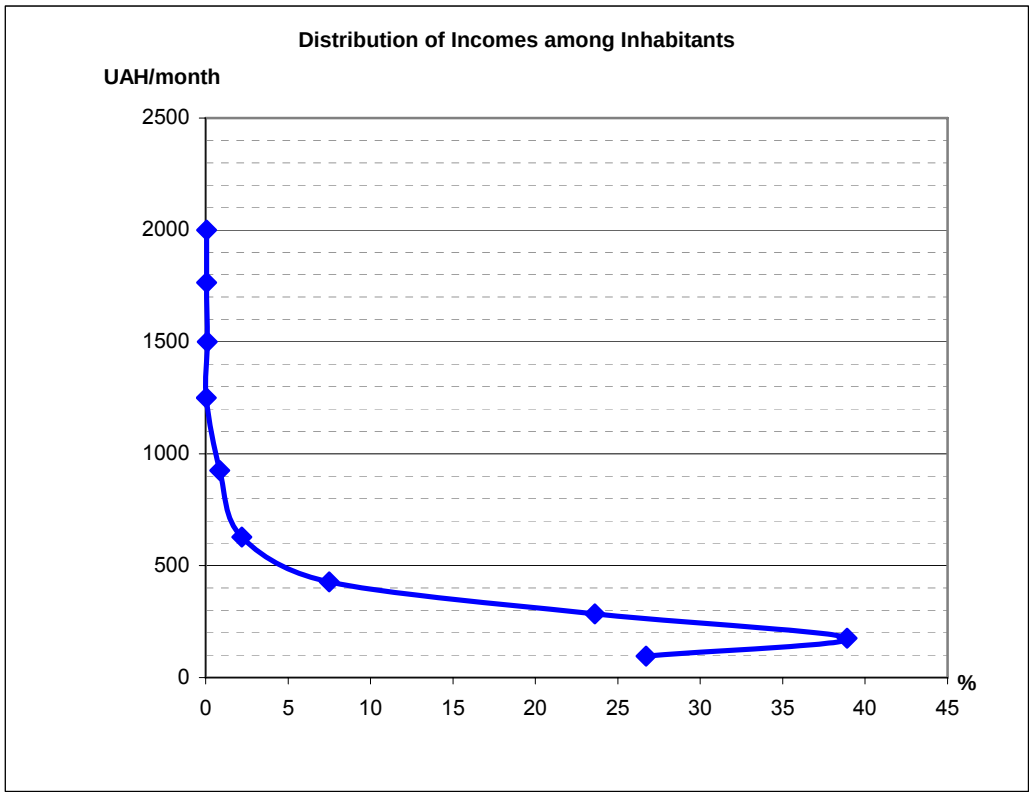


Graph 10 Incomes, prices, salaries and purchasing power of the households *(Base 100 in 2001)*

It can be expected for the next years that the particular situation of the Oblast of Donetsk will be better that the Ukrainian average. Experts are forecasting a boom on the world market of steel, and to a minor extent, of coal. A large part of the regional economy is set on these two productions. This expected increasing of the regional richness should improve the purchasing power of the inhabitants.

11.2. Distribution of incomes and consumption behaviours

In June 2003 within the framework of the project an opinion poll was done by the Donetsk analytical information centre with 1120 families of the Oblast of Donetsk. The processing of the answers about the incomes of each household shows the following distribution in UAH per month and per inhabitant (not per family) as on Graph 11:

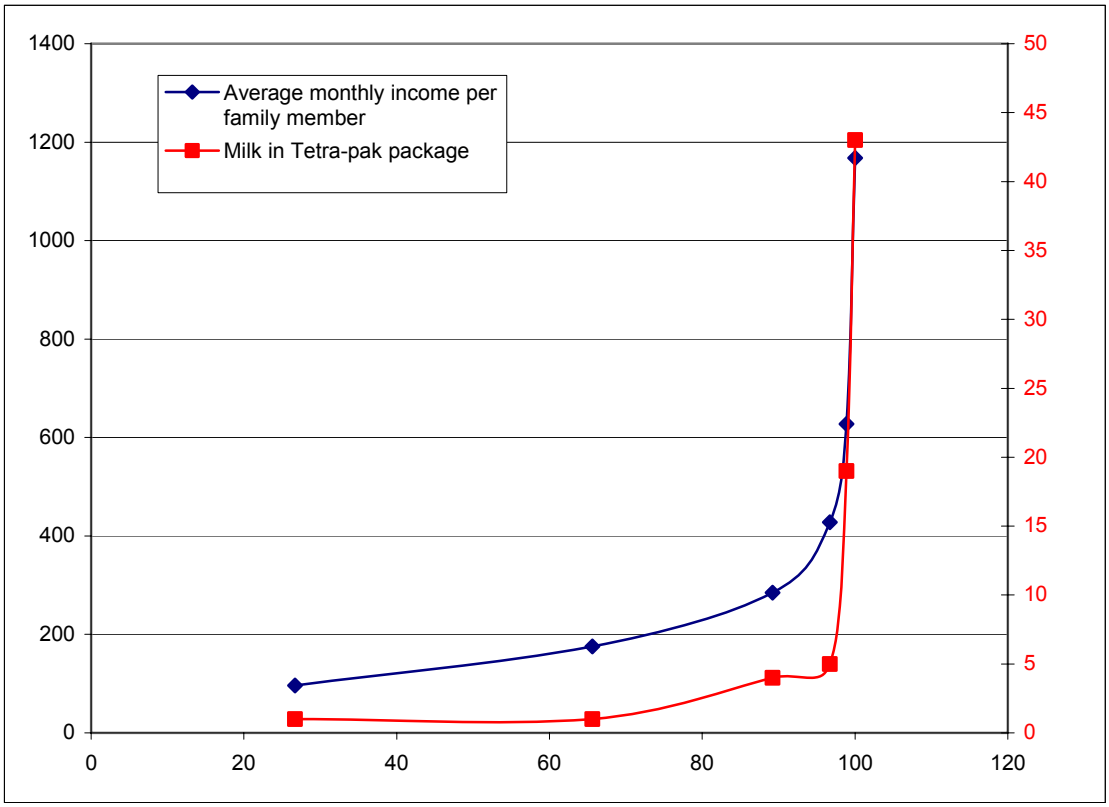


Graph 11 Distribution of incomes within the Oblast

This distribution is typical of a bubble of prosperity in an ocean of poverty. This curve is quite an hyperbole with a very strong inflection. The catching up of wages and real incomes will redress this curve, showing the recovery of a middle class.

In correlation with economics recovery, the consumption of the households increases and changes of nature. It must be kept in mind that huge differences of incomes within the people bring notable differences of consumption ways. So, not only the consumption, and so the relevant quantity of produced waste, increases with the incomes, but very high incomes are also synonymous of changes in consumption habits, with noticeably a growth of packaging and the appearance of new packages as Tetrapak for example.

That can be seen on the Graph 12, which shows the distribution of incomes per inhabitant and per month and the rate of Tetrapak in milk purchases.



Graph 12 Correlation of incomes and milk consumption in Tetrapak

(In abscissa: sum of cases, in % - In ordinate, on left: incomes per month per inhabitant – on right: frequency of milk purchases in Tetrapak)

Another fact must be taken into account. Ukraine knows a "baby-boom" after 15 years of very low birth-rate. It's usually a sign of confidence of the inhabitants in their economical future. But for the waste management, a baby produces during 2 years >2 kg/day of diaper.

12. Affordability + willingness to pay

12.1. Financing management of waste

A tariff system includes several components:

- The general framework of the tariff;
- The organization of the relationships between the collector and the customer (usually under a contractual form);
- The modes of calculation of the invoice;
- The modes of recovery;
- The administrative organization for the execution of these functions.

Nota bene: In aim to simplify, it will be use forward the terms:

Private sector to speak about the sub districts of individual housings

Collector to speak about the enterprise of collection of household waste

Consumer to speak about the customers of the collection company, whatever it concerns indistinctively the inhabitants of the private sector, of the collective housings or other customers as enterprises (commerce, …).

12.1.1. Description of the existing system

The existing system of tariff and payment for the household waste disposal is built upon three major principles. These principles, which may have an implicit character, fund the finance relationships between the City, the Collector and the Consumers:

1. *direct payments* - the consumer or his representative pays directly to the company for waste collection services;

2. billing for service delivery based on the factual volumes of waste collected from collecting housing, expressed in m^3;

3. billing for service delivery based on SHW accumulation norms **established by local authorities** in m^3 (for the residents of private houses).

12.1.1.1. Analyse

For historical reasons bound to the crisis of non-payment (wages and bills), the system of tariff and payment of the disposal of household waste became by the same **complex** and **inefficient**[7].

By practice, the relationships are done in fact essentially between the customers and the collectors. By the fact, the City doesn't intervene in the tariff if not on only three points:

- Definition of tariffs used by the public utility responsible for waste disposal: price per m^3 of collected waste and m^3 of waste disposed at the landfill (for residential buildings and budget organizations)
- Definition of regulated volumes (norms of household waste accumulation in m^3 per year per person for residential sector and for other facilities per calculated unit), on the basis of which there are calculated the tariffs for inhabitants of the private sector.
- Approval of a type-contract.

[7] *The improper functioning of the present system results from the inconsistency or inefficiency either of its principles or their implementation. It can be stated that the system that is formally based on the principle "the polluter pays" transforms, however, into the system where "the non-payer pollutes".*

12.1.1.2. Direct payment

The payment of the service is directly done from the consumer to the collector, out of that the City or any administrative structure help as intermediary. The direct payment is an ancient tradition, going back to the communist period.

It must be distinguished three cases:

5. Collective housing;
6. Private sector;
7. Enterprises and other organizations.

The direct payment takes two aspects:

8. For the private sector and the enterprises, payment by the consumer to the collector by a money transfer in the hands of the Spare Bank ("Ochadny Bank");
9. For the collective housing sector, the system includes two stairs: payment of the charges by the inhabitants to the JEK, then payment by the JEK to the collector.

12.1.1.3. Tariffs

Applied tariffs are so of two natures:

	Paid by:	To:	Unit of payment	Average tariff	Average annual payment for the family of 3 persons
Residents of collective housing, represented by JEK, enterprises and other organisations					
Collective housing	JEK	Public utility	Number of m^3	8 UAH/m^3	24 UAH (assuming that 1 m^3 is per person)
Enterprise	Enterprise	Public utility	Number of m^3	9 UAH/m^3	Non pertinent
Residents of private sector					
Private sector	Inhabitants	Public utility	Number of residents	1 UAH/ month/ person	36 UAH/year
(The figures provided in the table represent average values)					

Table 23 Tariffs

A detailed state of the tariffs has been dressed in date of July 1st, 2003. It shows a large dispersion for the tariffs managed by the Cities.

Before 2004 the fee for waste collection for the residents of multi-storied buildings has been included into an apartment fee paid for technical maintenance of the building. The apartment fee has been calculated in accordance with tariffs set for m². JEK was free to use this money depending on the relevant needs.

As an example, let's take a family of 3 persons living in collective housing and occupying a surface of 54 m² (18 m² per person on the average).

Collective housing	Inhabitants	JEK	Number of m²	Tariff for SHW collection included into apartment fee	Amount of payment for a family of 3 persons
			54 m², i.e.18 m² per person on the average	0.02 – 0.05 UAH m²/month	13-32 UAH/year

Table 24 Fees per family

The analysis of the above-mentioned table allows to speak about the following difficulty run across by JEKs: they should pay to waste collection utility on the basis of UAH 24 (see Table 23) per family but can receive from a family from 12 UAH to 32 UAH.

In order to improve the tariff policy in the field of solid household waste collection the Oblast has adopted the resolution issued by the Chairman of the Regional State Administration on 09.09.2003 N°563 “On Tariffs for Housing Maintenance”, in accordance with which the powers for tariff-setting has been transferred to executive committees of village, settlement and city councils. The resolution has provided recommendations for tariff-setting for housing maintenance services, for singling out waste collection payments and establishment of a separate tariff for waste collection. The work in this direction has already been started in a number of cities of the Oblast. For instance, in Donetsk the amount of payment for waste collection per person is UAH 0.68 per month, allowing to collect UAH 24 per year from the family of 3 persons.

12.1.2. Recovery

12.1.2.1. Collective buildings

As it is shown by the table provided above, the load by inhabitant is around 4 UAH per capita and per annum, based on an average rental surface of 18 m² per capita, and 0.02 UAH/m²/month. This amount is perceived by the JEK among with the whole of the charges for apartment and transferred later on to a public utility that delivers the services. There exist other forms of payment as well. For instance in Donetsk an instalment (5% of the amount of the charges) has been used to be transferred to the Saving Bank directly on the account of the collector.

This amount is insufficient if it’s based upon official values. Within one year, an inhabitant in collective housing produces 1 to 1.5 m^3 waste, whose the official cost is 6 to 8 UAH/m^3. He pays barely half the official price.

12.1.2.2. Private sector

For an average theoretic quantity of 1.5 m^3 for the private sector, the payment is UAH 12 per capita per annum or UAH 8 per 1 m^3. This price is the average price of the company for the whole of the collection activities. For a dense sub-district of individual houses, on the base of a weekly collection, it covers the costs of collection and disposal in landfill.

The calculation should show that in case of a 100% collection, the real cost should be UAH 6 with the existing technology: collection in 10 litres buckets, with a tipper truck and 2 loading helps.

By the contrary it is insufficient to face the real expenses of collection in a low density sub-district or when a large part of the houses are not under contract.

Last, it is appalling for the enterprise, which has not any motivation to do the collection, clearly more costly than in the collective housing sub-districts.

12.1.2.3. Enterprises

Budget organizations and institutions pay for waste collection services by contract based on factual volumes and in accordance with the tariff established by city authorities. The procedures for definition of the volumes of waste are the same as the ones used by JEKs. For non-budget companies a public utility can fix higher tariffs than the ones used for JEKs, however, the profit margin cannot exceed 20%.

It should be noted that many companies collect household and common industrial waste by themselves paying only for waste disposal at the landfill.

There is no control of the factual contents of containers. That means it is not possible to identify hazardous waste, which can be among the waste of companies, and they can be only revealed during the disposal at the landfill.

12.2. Financing of the plan

The financing system of the SHW Management must be improved in the next 5 years. It aims the objective of a self-sufficient SHWM system and the truth of costs. This objective covers 2 domains: exploitation costs and investments. To pass form the on going situation to the wished situation supposes also to manage a transition period.

12.2.1. To base the system on sound principles

12.2.1.1. Principles

The European system leans on several basic principles.

1. **Universal Service**: the picking up of the waste must be done at 100% because it's a question of public hygiene. Territorial communities should be responsible for provision of 100% of overall services (and not only for organisation of SHW collection).
2. **Solidarity at municipal size**: each one must pay the same price for the same service wherever is the place of his home. It is necessary to refuse from privileged tariffs of private sector users and from payments based on the quantity of waste collected.
3. **Equalization**: the tariff is adjusted by some "socio-economical indicators" to the situation of each home (for example: surface of the housing, level of comfort, rental value, level of incomes).
4. **Take in charge of low-income groups**: a system of subsidies (to the organization) or of allocation (to the person) compensates for the gap between the means of the person and the tariff applied to him.
5. **Separation of the functions**: the local authority establishes and recovers the fee (or the tax) of disposal of household waste; it contracts the operation with a public (local utility but with a separate accounting) or private entity.

It is what allows the local authority to assume the responsibility of the application of the previous principles.

These principles have proven, even in liberal economy, in Europe as in USA.

At least, it must be done as simple as possible. All complication entails administrative over costs and darkens the relationship between the user, the service and the authority.

12.2.1.2. Organization of the payment of the service

12.2.1.2.1. Calculation of the fees

The existing system of calculation of the fees obeys to these principles. The Ukrainian standards define the norm of production of waste of the inhabitants according to 6 categories of housing (see Table 5). Each self-governing body has to fix the rate by m^3 and the fees are calculated by this unit price and the norms of production of waste. It must be noticed that these norms of waste production are only recommendations for the calculation of the fees.

12.2.1.2.2. Payment of the fees

The existing system is shared between the local utilities for the private sector of housing, via direct contracts, and the JEKs which perceive the fees among the rent and other maintenance charges.

The management of the payment of the fees will be computerized with a standard software. It will allow to simplify the production and the transmission of statistics.

For the private sector, the collection of the fees will be entrusted to the Service for Communal Payments Collection. This task can go on to be entrusted to the JEKs for collective housing, and the money transferred to the Service for Communal Payments Collection.

12.2.1.2.3. Operation contracts

The Service for Communal Payments Collection will pass contracts with the operator(s) of the collection and the operator(s) of disposal. These operators can be public (as existing local utilities) or private. They may be several as for example the rough waste collection in different areas, the selective collection, the sorting of waste, the disposal in landfills, …

These contracts fix clearly the tasks to be done, the objectives of performance and the way to control that, and the price to be paid.

The operators are paid by the Service for Communal Payments Collection.

12.2.1.2.4. Subsidies

The Service for Communal Payments Collection will receive the subsidies from the state for the low income people.

Remark: the establishment of the subsidies files toward the social services must be simplified in aim to allow each one having right to benefit of it. Particularly, once registered, the beneficiary should not have to renew his file each year but to fill a simple form about the modified elements. The existing process consists in to make difficult the delivery of the right in aim do discourage the cheating. It will be to progressively pass to a system of mutual trust, guaranteed by a raising of the penalties for fraud.

12.2.2. Funding the investments

12.2.2.1. Objectives

Until now the investments have been financed only by the state and regional subsidies and the local budgets. The means are the property of the self-government bodies. They are put at disposal of the local utilities which themselves are the property of the self-government bodies.

The objective is a self-sufficient system. That means that the local utilities should be managed as commercial companies, owning their means and paying them with their capital, their spared resources, or loans. It is also a condition for a fair competition with private companies providing the same services.

But it is also necessary to break the vicious circle and to reboot the investment. The SHWM projects are now (or near to be) economically viable. The funding of the first 5-year investment programme must associate grants and loans coming from the State budget, Ekofund, UkrEkoKomResurcy, IFIs.

12.2.2.2. Transition management

The prices of the contracts of the operators must cover all the costs, including direct exploitation costs, but also amortization of the investments, capital costs, provisions for remediation, margin.

The first condition is that the regular incomes of the system cover these complete costs. In this case, the investment projects should become “bankable”.

It’s necessary to make so many investments that the allocation of subsidies by the State cannot be sufficient in the term wished to apply the improvement of the SHW management.

For the big projects as the sanitary landfills and their network of transfer stations, the sorting plants, the financing can be, partially or totally, provided by International Financing Institutions as the World Bank or the EBRD. The condition is that such projects should be “bankable”. That means that the incomes should be enough to cover the reimbursements of the loans, that a first demonstration project should prove the feasibility, and that a system of warranty of the reimbursements should be set up.

12.2.2.3. Setting up a regional equalization

The finances of the local self-government bodies are not sufficient to constitute a reliable warranty for the needed loans. This problem will be solved by the creation of a Regional SHWM Warranty Fund, itself guaranteed by the State.

12.2.2.4. Management of the Ekofund

A part of the funds of Ekofund will be allocated to the Regional SHWM Warranty Fund to constitute the reserves of this fund.

12.2.2.5. Creation of a regional leasing company

The objective to collect 100% SHW supposes a quick investment in collection trucks and containers. On the other hand, the existing park of trucks and containers is exhausted.

A regional leasing company will be created whose the purpose will be to buy trucks and containers and to rent them to the local utilities.

The project of the creation of such a company will require loans from banks and IFIs, so this project must prove it's "bankable".

12.2.3. Legal aspects

The payment for the household waste collection and disposal is an obligation (Law on waste, Article 15, §b). The system of free contracts for the private sector will be abolished.

A particular attention will be paid to prosecute the bad payers in front he Court.

The case of the destitute will be treated between the Service for Communal Payments Collection and the social services of the municipality.

12.2.4. Financing projection

12.2.4.1. Investments

The needed investments corresponding to the described Strategic Plan are today estimated as upper (see Table 18).

12.2.4.2. Resources

Out of the budget and of the grants and loans described elsewhere, the Plan can also account on the following resources (Table 25):

/thous. UAH/

Name of sources	Period when the money will be received				
	2005	2006	2007	2008	2009
Part of payments for import and production of goods in containers and packages (Resolution of the CMU as of 26.07.2001 N° 915).	6,000	7,000	8,000	9,000	10,000
Part of payments for import and production of car tyres, oils, accumulators of CMU as of 17.03.2004 N° 324).	5,000	10,000	12,000	15,000	18,000
Part of profit of companies engaged in collection and recycling of waste for re-investments	3,000	4,000	4,500	5,000	8,000
TOTAL	14,000	21,000	24,500	29,000	36,000

Table 25 Sources of financing for implementation of the Regional Plan of Solid Domestic Waste Management in the Donetsk Oblast for 2004-2009

12.2.4.3. Estimation of the average cost per inhabitant and per year within 5 and 10 years

According to the data of § *12.1.2*, the actual fees are around **12 UAH/inh/year** in private sector and **4 UAH/inh/year** in collective housing.

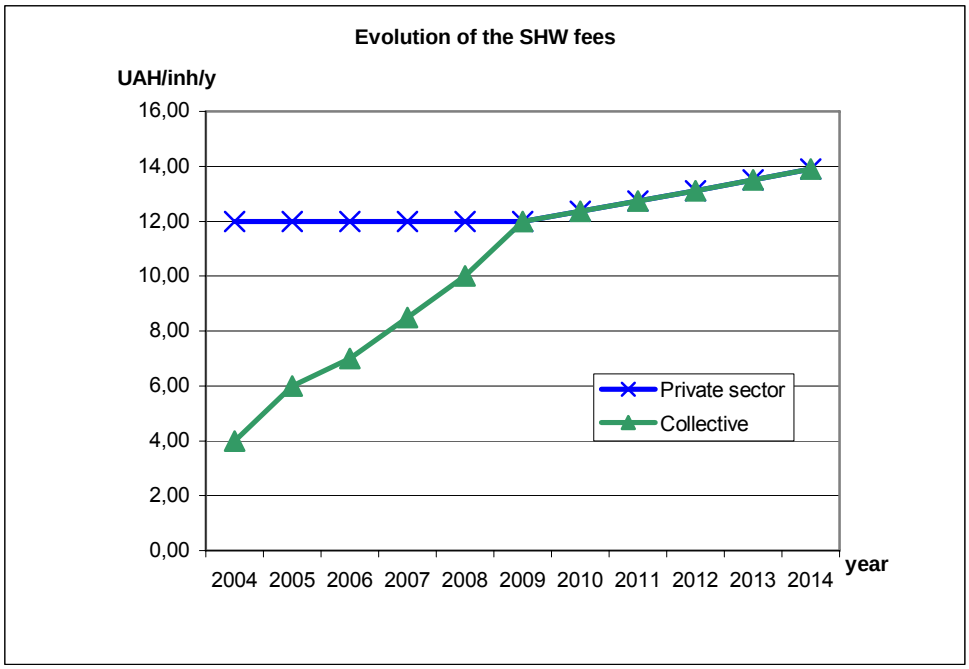
The strategy of the Plan is on both axles:

- to create during the first 5 years similar conditions for payments for similar services provided that would not depend on the place a person lives. In such a way the amount of a payment/year/person for inhabitants of the private sector and collective housing will become the same and should not exceed the average payment per year calculated on the basis of 5 years, i.e. 12 UAH/inh/year, then to increase the unique fee by 3% a year;
- within 5 years to collect 100% of the fees.

On this base, the figures should be as on Table 26 and on Graph 13.

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Private sector											
Population M inh	1.375	1.375	1.375	1.375	1.375	1.375	1.375	1.375	1.375	1.375	1.375
% paid	20	40	60	80	90	100	100	100	100	100	100
Fee UAH/inh/y	12.00	12.00	12.00	12.00	12.00	12.00	12.36	12.73	13.11	13.50	13.91
Amount M UAH	3.300	6.600	9.900	13.200	14.850	16.500	16.995	17.504	18.026	18.563	19.126
Collective H.											
Population M inh	3.400	3.400	3.400	3.400	3.400	3.400	3.400	3.400	3.400	3.400	3.400
% paid	50	60	70	80	90	100	100	100	100	100	100
Fee UAH/inh/y	4.00	6.00	7.00	8.50	10.00	12.00	12.36	12.73	13.11	13.50	13.91
Amount M UAH	6.800	12.240	16.660	23.120	30.600	40.800	42.024	43.282	44.574	45.900	47.294
TOTAL M UAH	10.100	18.840	26.560	36.320	45.450	57.300	59.019	60.786	62.600	64.463	66.420

Table 26 Evolution of the fees



Graph 13 Evolution of the fees

It must be noted what represents such an effort in % of the incomes. If we take into account a progression of the wages of 10% a year, the weight of the SHW fee in proportion of the incomes should evolve as:

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Fee/incomes	0.07%	0.10%	0.11%	0.12%	0.13%	0.14%	0.13%	0.12%	0.11%	0.11%	0.10%

For comparison, the fee/incomes rate in western Europe is around 0.5%.

Thus, thanks to rationalisation of the tariff policy and the system of payments the amount of payments collected might increase by 47 mln. UAH thus increasing the incomes of companies.

12.3. Implementation of the plan

12.3.1. Status of the plan

The implementation of the Regional Plan of SHW Management is one of the ways of implementation of the national “Programme of SHW Management” where it is stated that:

"The problems existing in the field of household management require immediate solutions which should be financed both at the national and local levels. The questions concerning investments in this sector should be solved in a comprehensive manner through employment of all possible sources of financing (national and local budgets, funds of enterprises (upon agreement) in charge of sanitary cleaning of populated areas). For this ***purpose it is necessary to develop and approve in the established order local programmes of solid household waste management*** *as well as schemes of sanitary cleaning of populated areas".*

12.3.2. Monitoring

Creation of a Waste Monitoring Centre ("Observatory of Waste") is important for assessment of the existing situation, forecasts, planning and improvement of the SHW management system.

During the first stage of the SHW management programme (2005-2006) implementation it is planned to "ensure monitoring of solid household waste".

The main role of the Waste Monitoring Centre is to collect all data about waste, to actualise them, to provide to the services all data and figures about SHW. The Centre publishes an annual report about the situation of SHW management within the Oblast.

The Tacis Programme has created the basements of the household waste monitoring for the Donetsk Oblast: waste production inquiry (Questionnaire), SHW composition study, implementation of a geodatabase, audit of the biggest SHW landfills and dumps and even an opinion poll.

According to the Article 23, Competence of the Ministry of Environment Protection and Nuclear Safety of Ukraine in the Field of Waste Treatment and its local offices, of the Law of Ukraine "On Waste", the Department of Ecology of Donetsk is in charge of the *"f) creation of information and analytical systems and data bases about volumes of waste generation and waste treatment*". So the Domestic Waste Observatory should be placed under the authority of the Department of Ecology of Donetsk.

The SHW Monitoring Centre is the permanent structure aimed to produce annual data about the household waste management. With the tools the Tacis Programme provided, it's now only necessary to allocate the budget for 3 permanent people (1 economist, 1 ecology engineer, 1 computer worker) and the necessary equipment. This SHW Monitoring Centre will be created as a department of an existing structure as the Hazardous Waste Centre or Department of Housing and Public Utility Services, etc.

12.3.3. Role of the administration

12.3.3.1. Figures and statistics

The Inspection of Environment will provide any information about the used landfills as: remaining capacity, decisions of (temporary of definitive) closure, decisions of extension, construction of new facilities…

The Regional Department of Housing and Public Utility Services and the department of waste of the State Department of Ecology will provide the monthly figures of the SHW received by each landfill.

The local self-government bodies, cities, rayons and associations of them, in charge of the SHW management, will provide the monthly figures of the collected SHW and of the fees.

The different administrations (regional level of state, regional, local) will provide any information or figures required for the updating of the data of the Plan.

12.3.3.2. Means

The Department of Housing and Public Utility Services will develop a software for the establishment of the fee statements and their recovery and the provision of the statistics asked by the different administrations. This software will be implemented in the self-government administrations and the JEKs.

The Department of Housing and Public Utility Services will equip the self-government administrations with the necessary hardware.

12.3.3.3. Financing

The Regional Administration will gather the finances necessary for the implementation of the Plan, in co-ordination with the Regional State Administration, State Department of Ecology and regional department “DonetskEkoKomResurcy”.

The Regional State Administration will negotiate with the IFIs (World Bank, EBRD, EBI) the financing of an investment programme for the implementation of the Plan.

13.Environmental impact and risks; preliminary assessment

See the report: **Choice of the sites for the Regional Landfill Programme**

Annexes

Annexe 1 Regional Strategic Plan for Solid Household Waste Management of the Oblast of Donetsk 2005-2009, *Tacis Programme "Improvement of Solid Household Waste Management in Donetsk Oblast"*, July 2004, adopted by the Regional Administration and the Regional Parliament

Annexe 2 Landfill Reference Manual, *Tacis Programme "Improvement of Solid Household Waste Management in Donetsk Oblast"*, February 2004

Annexe 3 Choice of the sites for the Regional Landfill Programme, *Tacis Programme " Capacity Building in Donetsk Oblast for Waste Management - Ukraine "*, October 2005

Annexe 4 Landfills Inventory – Final Report, *Tacis Programme "Improvement of Solid Household Waste Management in Donetsk Oblast"*, September 2004