The European Union's Tacis programme

Black Sea Investment Facility

Solid Household Waste Management of the Autonomous Republic of Crimea

Pre-Feasibility

Report

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THALES

SOGREAH CONSULTANTS

GKW CONSULT
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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

ARC	Autonomous Republic of Crimea
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

The data on SHWM in ARC are particularly poor. We found figures as 700,000 m^3/y although our calculation ended on around 1,100,000 t/y. A key-problem remains the tourism and the production of household waste generated by the tourism activity. The impact is not so the yearly produced tonnes than in some resort areas the daily production in summer may be 4 times the winter's one.

The economy of ARC is fast recovering. For one century it's the resort region of Russia and nowadays a lot of "new Russians" are massively investing in Crimea.

The Government of ARC doesn't pay attention to the SHWM, even if there are the usual "paper tigers" of programmes, resolution of the minister, and so, which are never applied nor followed-up. The Law says the Government has to organise the waste management, so they made a call for tender. There's a dream that people will come and invest and manage the household waste free of charge.

Today a proposition seems to hug the rails. It's made by Moscovite people (?). They propose a fabulous plan: they will manage all the SHW of Crimea free of charge. They only ask as preliminary condition the Government gives them free of charge 80 million$ premises.

Perhaps as a consequence of all that, we found often at the top level some unwillingness. The best example is the map of clay areas for the siting of sanitary landfills. After 1 year of fight, we discovered that the map exists since 2000 but it is secret and we were not allowed even to take a photo nor to handcopy the legend of the map!

In this ocean of nonsense, there's an island. The SHW is very well managed in Yalta by a private company, ALFATER. Any demand of funding for Yalta should be carefully studied.

For the rest, the municipalities do what they can and for some they do their best. The City of Simferopol manages quite well its situation but the problem of the landfill of Simferopol is unsolvable. Someone allowed Tatar migrants to build houses within the protection perimeter of the landfill and now they are complaining of the neighbouring of the landfill. The territory of the city is very limited and there's no place to build a new landfill. So the municipality cannot solve its problem without a Regional Plan.

1. Context

1.1. Terms of reference of the study

Terms of Reference

UKRAINE

Pre-feasibility studies for solid household waste management in the Autonomous Republic of Crimea

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 waste sector in the Ukraine. It will focus on the background of the solid waste sector in the Ukrainian region of Crimea, 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 preliminary audit of the main existing landfills done by BSIF in July 2005 concludes that there's a priority to solve the problems of Evpatoria, Kerch and Simferopol. Three landfills must be proposed for these areas.

According to the studies already done in Ukraine, some items will ask a specific study of the Crimean situation, even if the accumulated experience has provided guidelines for the SHWM pre-feasibility studies. Specifically, the research of sites for new sanitary landfills will require geological and hydrogeological data and sometimes investigations that may need several weeks if not months and can only be provided by the Crimean Geology Service.

The studies are to be carried out during the first half-year 2006 and the work required is expected to require a total of 3 man-months.

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)

For all these 4 Tacis Projects the author has been or is the key-expert Solid Waste Management.

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 (in several cases there's no collection company and it must be created)
    - Improvement of the recovery of the fees in aim to pass from 30% to 100% fees paid in time
- To implement a park of 5-7 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

Within the frame of the Tacis Project Black Sea Investment Facility, the experts made a visit to the 6 main landfills of Crimea in July 2005.

1.3. Principles of the study

Crimean Academy of Science and Russian Academy of Natural Sciences have worked out strategy of hard wastes gathering and processing in 2005, but this study inventoried only 700,000 m^3/y disposed in the landfills of ARC[1].

In 2004 COWI published his report: "Ukraine National Municipal Solid Waste Management Strategy - Existing Situation and Strategic Issues Report" (study funded by DANCEE). It states:

"It is not possible to collect detailed data and will not be possible to make detailed strategy evaluations for all regions of Ukraine. Instead it has been decided to study the following four representative pilot oblast in detail:

- *Kharkiv Oblast - a large, urban industrialised oblast*
- *Chernihiv Oblast - an average oblast*
- *Chernivtsi Oblast - a small, rural, agricultural oblast*
- *AR Crimea - a tourist region"*

In fact of details about Crimea, there's only the figures for the city of Kerch:

City/town	Urban population, thousand persons	Population, using services of enterprise, %	Availability of alternative enterprises, No	Actual amount of MSW collected in 2002, 000. m^3	Distance to the landfill, km	Number of waste trucks,' No	Vehicles use coefficient, %	Employees, persons
Kerch, AR Crimea	156.0	89.0	..	249.1	11	26	46	147

(Data from Ukrainian Association of Sanitary Cleaning Motor Enterprises. Kiev, Kyivspetstrans, 2003)

Out of that the study gives the national statistics:

Administrative-territorial division, oblasts	Amount of collected MSW				Number of enterprises providing MSW collection and transportation services				Manning level in companies providing MSW collection and transportation services				Number of waste trucks				Wear-out of motor vehicles, %
	Total, mill. m^3	Including			Total N°	Including			Total Persons	Including			Total N°	Including			
		Municipal companies	Mixed ownership companies	Private companies		Municipal companies	Mixed ownership companies	Private companies		Municipal companies	Mixed ownership companies	Private companies		Municipal companies	Mixed ownership companies	Private companies	
AR of the Crimea	2.10	2.10			46									126			82.0

Administrative-territorial division	Population, 000. persons			Amount of MSW collected		Normative MSW generation, 000. tonnes		
	Total	Urban	Rural	Total, mln. m^3	Total, 000. tonnes	Rural areas	Urban areas	Total for oblast
AR of the Crimea	2033.7	1274.3	759.4	2.10	451.5	440.452	305.832	746.284

Amount of MSW, delivered to waste landfills and dumpsites (data of Derzhzhytlokomungosp) and normative MSW generation (calculated using waste generation norms according to the KTM of Ukraine KTM 204 012-95)

In July 2005, we were told that there was no data about the number of tourist in Crimea although everybody knows that it may be >2 millions each year!

The present study is based on the experience developed in Donetsk Oblast by a dozen of EU experts during 3 years. It's not possible to draw a Regional Strategic Plan for Solid Household Waste Management of the Autonomous Republic of Crimea with 3 man.months but to precise as acutely as possible the size of the problem and the main guidelines for a strategic plan.

[1] Letter of Victor Tarasenko President of Crimean Academy of Sciences, Doctor of geological and mineralogical sciences, professor April 11, 2006

The City of Sevastopol is a subject of right of the Republic of Ukraine with a particular statute. It doesn't belong to the ARC but the city has not the territory for building its own sanitary landfill. So the waste management of Sevastopol cannot be disconnected of the Crimean problem. In fact, in the past, the city of Yalta was sending its household waste to Sevastopol. So we'll try to give the figures of Sevastopol all along the study.

2. Problem analysis

2.1.1. Relevant Project Context

In 2004 EU, having implemented a tender, entrusted to the consortium Thalès EC – GKW - Sogreah the Tacis Project Black Sea Investment Facility. The objective is to help to the funding of projects aiming at the reduction of the pollution of the Black Sea. It includes the waste management as waste are a main source of pollution. The beneficiaries of the project are the IFIs.

At the beginning of the project, the Consultant refreshed former contacts with the Government of Crimea and the question of the SHWM appeared as a key problem for the authorities, specifically with the management of the waste generated by the tourists. Some cities of Crimea see their population multiplied by 5 during summer. The Government of Crimea asked help from BSIF for the funding of the SHWM.

The EIB started its activity in Ukraine in 2005 and declared interested by the funding of the SHWM.

In the meantime, the Government received a lot of propositions for the SHWM about: recycling, collection, incineration, biogas collection on existing landfills, and so. On 18 August 2005, it decided to launch a "t*ender of investment projects on the construction of the waste treatment plants in ARC at the expense of the investment funding*".

Five projects were submitted and assessed by the Ministry of the Construction Policy, Architecture and Housing and Municipal Economy.

The general purpose of this project is to improve the sanitary and ecological state of the region, considered as highly polluted, mainly due to the tourism and also by some 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.

The lack of awareness of the political sphere remains today. The position of the Government is that the cities and rayons must find by themselves private investors for the SHWM and there's no regional management of the problem and there's no regional programme of investment.

2.1.2. 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 recent decentralisation of the solid waste management at the municipality level has been applied in Yalta with the participation of private initiative. Some other municipalities are looking for private companies initiatives.

2.1.3. Impact on environment and health

The on going situation is that >1,000,000 t of solid household waste are yearly produced on the territory of the ARC, and that only 300,000 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

3.1.1.1. Population

The ARC accounts 2,063,600 inhabitants (the data as of 01.01.05).

63% of the population of the ARC live in urban areas. 37% of the inhabitants of the ARC house in individual houses.

The population of ARC is relatively stable between 1989 and 2005. If as everywhere in Ukraine there's a relatively weak rate of fertility (1.3 child per woman)[2], Crimea has known a specific phenomenon of migration with the offer to "back homeland" to the Tatar people displaced in Eastern USSR by Stalin after the 2nd world war.

The ARC accounts 25 administrative units, 11 Cities and 14 Rayons. The population of these administrative units that are in charge of the solid household management within their territory is from 25,200 inhabitants to 363,300 inhabitants. These figures are recapped in Table 1.

	Population (1000)		Among which				Variation (%) 2005 /1989	Area (km²)	Density of Population
	1989	**2005**	Urban	%	Rural	%			
Sevastopol[3]	**395.0**	**377.8**	**358,1**	**95**	**21,4**	**6**	**95.6**	**900**	**420**
AR Crimea	**2,063.6**	**1,994.3**	**1,254.0**	**63**	**740.3**	**37**	**96.6**	**26,081**	**76**
Cities	**1,175.2**	**1,091.7**	**1,047.9**	**96**	**43.8**	**4**	**92.9**	**2,291**	**477**
Simferopol	364.7	363.3	363.2	100	0.1	0	99.6	107	3,395
Alouchta	60.7	52.6	36.3	69	16.3	31	86.7	600	88
Armiansk	27.3	25.2	22.9	91	2.3	9	92.3	162	156
Dzhankoy	49.9	40.5	40.5	100		0	81.2	26	1,558
Evpatoria	126.1	121.7	121.7	100		0	96.5	65	1,872
Kerch	174.4	152.6	152.6	100		0	87.5	108	1,413
Krasnoperekopsk	31.1	30.8	30.8	100		0	99.0	22	1,400
Saki	32.0	27.1	27.1	100		0	84.7	29	934
Sudak	28.0	28.6	15.6	55	13.0	45	102.1	539	53
Feodossia	117.8	106.6	95.9	90	10.7	10	90.5	350	305
Yalta	163.2	142.7	141.3	99	1.4	1	87.4	283	504
Rayons	**888.4**	**902.6**	**206.1**	**23**	**696.5**	**77**	**101.6**	**23,790**	**38**
Bahchysaraiskiy	86.0	90.7	32.8	36	57.9	64	105.5	1,589	57
Bilohisrkiy	61.3	64.8	25.3	39	39.5	61	105.7	1,894	34
Dzhankoiskiy	83.0	78.8	5.9	7	72.9	93	94.9	2,667	30
Kirovskiy	55.6	55.8	17.1	31	38.7	69	100.4	1,208	46
Krasnohvardiyskiy	89.2	91.7	21.8	24	69.9	76	102.8	1,766	52
Krasnoperekopskiy	28.7	30.9		0	30.9	100	107.7	1,231	25
Leninskiy	77.3	66.3	23.8	36	42.5	64	85.8	2,919	23
Nyzhniohirskiy	54.0	53.5	9.9	19	43.6	81	99.1	1,212	44

[2] Sevastopol figures

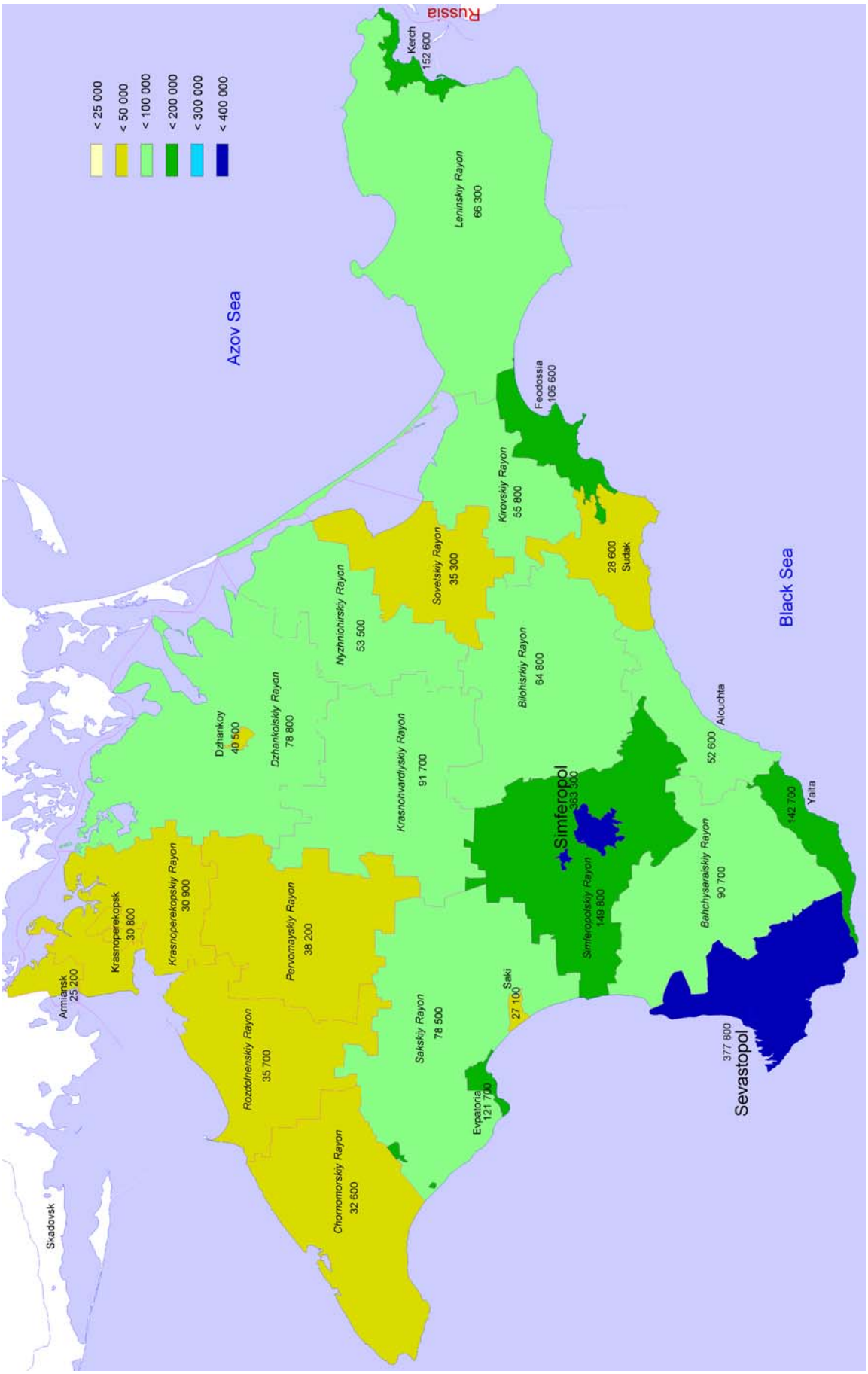
birth-rate (per 1000 persons)(01.01.2003) – 2.8 persons;

death-rate (per 1000 persons)(01.01.2003) – 4.1 persons.

[3] Figures of 2001

	Population (1000)		Among which				Variation (%) 2005 /1989	Area (km²)	Density of Population
	1989	**2005**	Urban	%	Rural	%			
Pervomayskiy	39.9	38.2	9.2	24	29.0	76	95.7	1,474	26
Rozdolnenskiy	36.1	35.7	10.8	30	24.9	70	98.9	1,231	29
Sakskiy	78.9	78.5	6,3	8	72.2	92	99.5	2,257	35
Simferopolskiy	128.8	149.8	22.0	15	127.8	85	116.3	1,753	85
Sovetskiy	35.3	35.3	10.1	29	25.2	71	100.0	1,080	33
Chornomorskiy	34.3	32.6	11.1	34	21.5	66	95.0	1,509	22

Table 1 Population of the administrative units of ARC



Map 1 Population of administrative units

3.1.1.2. Urbanisation

Ukraine distinguishes:

- Cities: governed by an elected Mayor and an elected City Council;
- Rayons: governed by a named President of Rayon and an elected Rayon Council;
- Municipal districts: part of a city with an elected district council;
- Settlements of urban type: towns depending of a city or a rayon;
- Village councils: towns or villages with an elected council;
- Rural settlements: towns, villages, and hamlets.

	Districts	Total number of cities	Including cities with special status, republic subordination and regional subordination	Municipal districts	Settlements of urban type	Village councils	Rural settlements
Sevastopol		**2**	**1**	**4**	**1**	**4**	**29**
Sevastopol		1	1	4	1	4	29
Inkerman							
AR Crimea	**14**	**16**	**11**	**3**	**56**	**243**	**956**
Cities		**12**	**11**	**3**	**35**	**14**	**62**
Simferopol		1	1	3	4		1
Alouchta		1	1		1	5	24
Armiansk		1	1			1	3
Dzhankoy		1	1				
Evpatoria		1	1		3		
Kerch		1	1				
Krasnoperekopsk		1	1				
Saki		1	1				
Sudak		1	1		1	6	14
Feodossia		1	1		5	2	11
Yalta		2	1		21		9
Rayons	**14**	**4**			**21**	**229**	**894**
Bahchysaraiskiy	1	1			3	15	81
Bilohisrkiy	1	1			1	17	79
Dzhankoiskiy	1				2	26	111
Kirovskiy	1	1			1	11	39
Krasnohvardiyskiy	1				2	18	83
Krasnoperekopskiy	1					12	38
Leninskiy	1	1			2	24	68
Nyzhniohirskiy	1				1	18	58
Pervomayskiy	1				1	16	41
Rozdolnenskiy	1				2	10	39
Sakskiy	1				1	23	81
Simferopolskiy	1				3	18	104
Sovetskiy	1				1	11	39
Chornomorskiy	1				1	10	33

Table 2 Administrative organisation of the territory

Concerning the waste management, there's an atomisation of the housing with very little settlements (≈100 inhabitants) spread in the campaign. We give the figures of the local settlements in.

3.1.1.3. Nationalities

[4]The peculiarity of the national structure of the population of Autonomous Republic of Crimea is its multinational composition. According to the data of All-Ukrainian census of the population, the representatives of more than 125 nationalities and ethnic groups lived on the territory of Autonomous Republic of Crimea.

Biggest nationalities and ethnic groups Autonomous Republic of Crimea it is resulted below **:

	Number (000 inh.)	% 2001	% 1989	% 2001/1989
Russians	1,180.4	58.5	65.6	88.4
Ukrainians	492.2	24.4	26.7	90.5
Crimean Tatars	243.4	12.1	1.9	6.4 times more
Belarussians	29.2	1.5	2.1	68.9
Tatars	11.0	0.5	0.5	116.2
Armenians	8.7	0.4	0.1	3.7 times more
Jews	4.5	0.2	0.7	30.2
Poles	3.8	0.2	0.3	70.9
Moldavians	3.7	0.2	0.3	68.8
Azeris	3.7	0.2	0.1	1.7 times more
Uzbeks	2.9	0.1	0.0	4.6 times more
Koreans	2.9	0.1	0.1	122.6
Greeks	2.8	0.1	0.1	112.0
Germans	2.5	0.1	0.1	116.3
Mordva	2.2	0.1	0.2	55.2
Chuvashi	2.1	0.1	0.2	57.1
Gypsies	1.9	0.1	0.1	113.1
Bulgarians	1.9	0.1	0.1	103.7
Georgians	1.8	0.1	0.1	121.9
Mariytsi	1.1	0.1	0.1	62.2
TOTAL	**2,024.0**	**100.0**	**100.0**	**99.4**

**) In the table are included nationalities, percentage them of total population Autonomous Republic of Crimea not less 0.1%

Table 3 Nationalities of Autonomous Republic of Crimea

The highest proportion is Russians in Autonomous Republic of Crimea - 1180,4 thousand persons, or 58.5% of total population. During the period between the last population censuses 1989 and 2001 the number Russians has decreased by 11.6%.

The peculiarity of the **national structure** of the population of Sevastopol is its multinational composition. According to the data of the All-Ukrainian Population Census, the representatives of more than 97 nationalities and ethnic groups live on the territory of Sevastopol city council.

The part of Russians in the national structure of population of Sevastopol' city council is the largest, it accounts for 270,000 people, or 71.6% of the population. During the years that have passed since the census of the population of 1989, the number of Russians has decrease by 2.8%.

Ukrainians are the second numerous nation of Sevastopol' city council, it accounts for 84.4 thousand people, or 22.4%. Since 1989 their number has increase by 2.7 thousand people, or 1.7%.

Data about the most numerous nationalities of Sevastopol' city council are shown in the table:

	Number (000 inh.)	% 2001	% 1989	% 2001/1989
Sevastopol' city council	377.2	100.0	100.0	95.4
Russians	270.0	71.6	74.4	91.8
Ukrainians	84.4	22.4	20.7	103.3
Belarussians	5.8	1.6	1.9	78.0
Tatars	2.5	0.7	0.3	2.1 times more

[4] www.ukrcensus.gov.ua/eng/

Crimean Tatars	1.8	0.5	0.1	5.9 times more
Armenians	1.3	0.3	0.1	3.2 times more
Jews	1.0	0.3	0.7	36.2
Moldavians	0.8	0.2	0.3	70.0
Azerbaijanians	0.6	0.2	0.1	2.5 times more

*/ The table includes data about nationalities whose part in actual population of the region was not less than 0.2%.

Table 4 Nationalities of Sevastopol' city council

This question of nationalities appears also with the native languages.

Linguistic composition of population Autonomous Republic of Crimea, according to the data of the All-Ukrainian census:

Defined as the native language (%)	Number (000 inh.)	Russian	Ukrainian	Tatar	language of their the nationality	other language
Russians	1,180.4	99.7	0.2			0.1
Ukrainians	492.2	59.5	40.4			0.1
Crimean Tatars	243.4	5.9	0.5	93.0		0.6
Belarussians	29.2	81.8	0.9		17.1	0.2
Tatars	11.0	25.0	0.1	67.8		7.1
Armenians	8.7	46.1	0.3		52.9	0.7
Jews	4.5	96.7	1.1		1.9	0.3
Poles	3.8	74.6	20.4		4.1	0.9
Azeris	3.7	37.9	0.7		55.8	5.6
Moldavians	3.7	66.0	1.9		31.0	1.1
Koreans	2.9	78.8	0.1		20.1	1.1
Greeks	2.8	71.8	1.1		23.8	3.3
Bulgarians	1.9	77.6	3.1		18.4	0.9

Table 5 Languages of Autonomous Republic of Crimea

The analysis of the indicated **native language** shows that 10.1% of the population of Autonomous Republic of Crimea have indicated **Ukrainian** as their native language and 77.0% of population indicated **Russian** as their native language and 11.4% of population indicated **Crimean-Tatar**. This fact will be important for the policy of communication of the improvement of the SHWM.

3.1.2. Geography and equipment

3.1.2.1. Crimea

The surface of the ARC is around 26,100 km^2. The density of 78 inhabitants per km² is relatively low.

Crimea may be considered as an island linked to the continent. At the South, it's a mountain massif culminating at 1629 m close Yalta. All roads are mountain roads and the main communication paths are along the shore. The North part is a large alluvium plain. It's flat but weakly populated. The link with the continent is not an isthmus but a marsh area with lakes allowing only two communication passages toward Kherson and Melitopol. The flat part is prolonged to East by a peninsula toward Russia, ending by the channel connecting Azov Sea to Black Sea. The longest river of the Crimean Peninsular is the Salgir (220 km), the most full-flowing rivers is the Belbek (1,500 l/sec). There are over 50 salt lakes in the ARC. The largest one is Sasyk (Kunduk) - 205 km².

The ARC is located on the margin of the mild and subtropical geographic belts, characterised by soft climate and much sun (2180-2470 hours a year).

The local communications are radiating from the capital, Simferopol. Dzhankoy is the node of the communications with the rest of Ukraine.

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

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

The railway network is weakly dense, designed to connect the continent to the main ports: Evpatoria, Sevastopol and Kerch.

3.1.2.2. Sevastopol

The city of Sevastopol is situated on the south-western cost of Crimean Peninsula. Almost subtropical climate, combined with large number of sand and pebble beaches, warm sea and picturesque landscapes, is the most valued component of the city territory.

The territory, where the central part of the city is located, is mountainous with large number of deep sea, well protected bays, that have favourable navigable waterways and transport landfalls.

The average temperature is +12°C; the record of maximum temperatures: in summer +38°C, in winter -22°C. Annual rain for the period of 2001 – 473.9 mm/year.

Sevastopol borders on Autonomous Republic of Crimea, the frontier goes through the city territory. It is 152 km long (marine line).

- Surface

864 km², which consists 0.143% of Ukraine's territory:

  - 12% – are inhabited;
  - 38% – agricultural zone;
  - 50% – timber and mountains;
  - 57 km² – are occupied by military units of both fleets.

- Distance from Sevastopol to Kiev
  - railway – 948 km;
  - macadamised road – 1100 km.

3.1.2.3. Transports

Crimea is insulated from the continent by a glacis of lakes, lagoons, islands. So there are only two links with the continent: throughout Armiansk or Dzhankoy. The two main railways and the two main roads are connected in Dzhankoy.

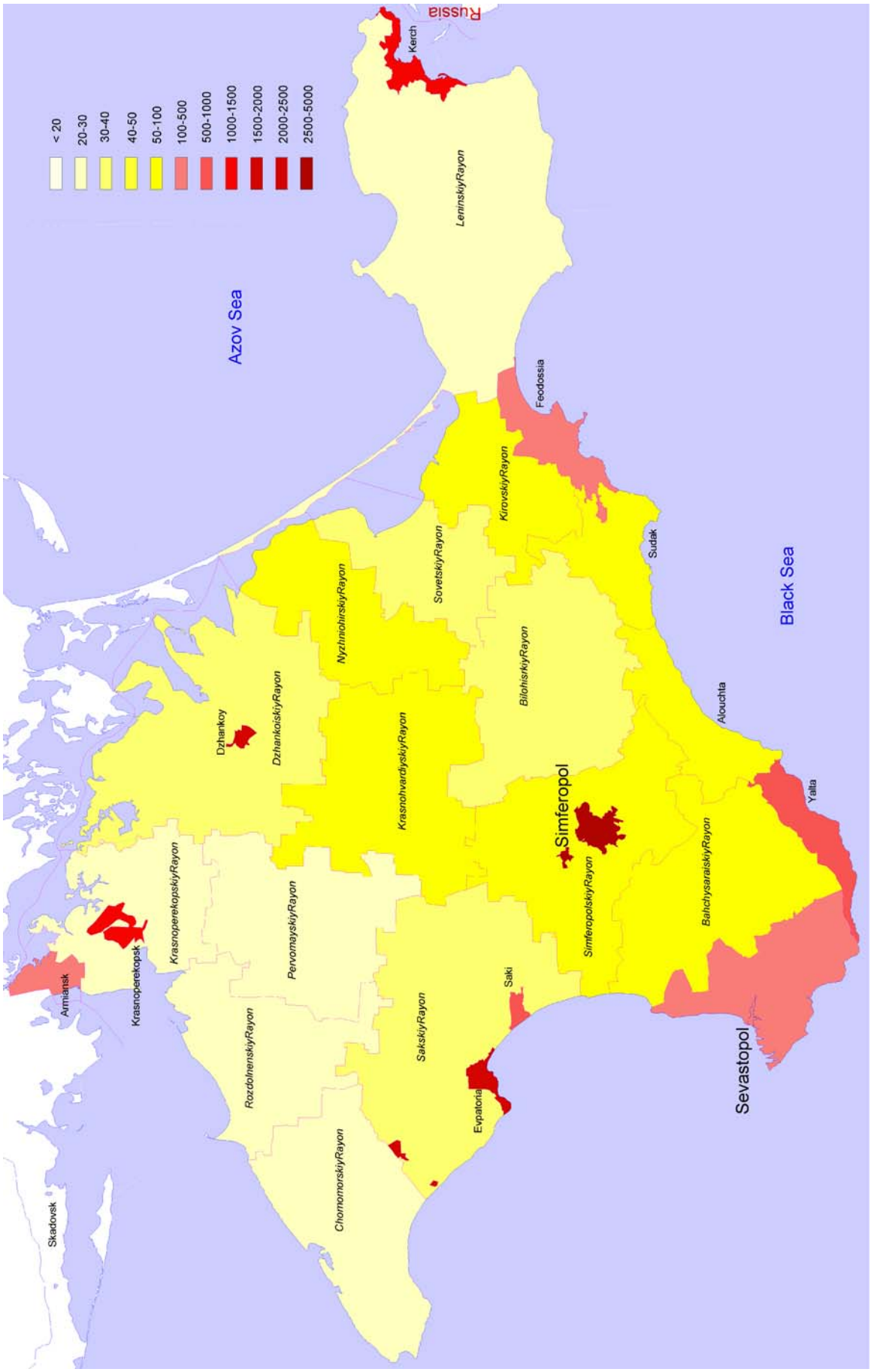
From Dzhankoy, the railway deserves toward East Feodossia and Kerch, toward West Simferopol and Sevastopol, with a subsidiary line toward Saki and Evpatoria.

The main road axis are organised from Simferopol to Armiansk, Dzhankoy, Feodossia-Kerch, and a loop Sevastopol-Yalta-Alouchta (red on Map 3). Regional roads are Simferopol-Saki-Evpatoria and Alouchta-Sudak-Feodossia (orange on Map 3).

All the villages are connected by a local road (yellow on Map 3).

The mountain part of Crimea put problems for the transportation. The south coast is relatively densely populated and it's also the area that receives >1 million tourists. All communications must be done by the coast road from Sevastopol to Feodossia; on the axis North-South, there's only the road from Alouchta to Simferopol.

Evpatoria, Sevastopol, Yalta, Feodossia and Kerch are ports on Black Sea.



Map 2 Density of Population of Administrative Units

Map 3 Communication Ways

3.1.3. Economy[5]

3.1.3.1. Presentation

3.1.3.1.1. Crimea

The main characteristics of the economy of the ARC are set out in Table 6

Parameter	Unit	1999	2000	2001	2002	2003	2004
Gross value added (actual prices)	mln UAH	3,350.3	4,085.3	5,491.8	6,033.1	7,309.0	…
per capita	UAH	1,576	1,937	2,691	2,979	3,633	...
Fixed capital at the end of the year (actual prices)	mln UAH	34,870.3	34,553.2	36,467.2	40,121.9	42,340.3	
Income of the population	mln UAH	2,138	2,812	5,833	6,558	8,135	10,022
Consumer price index (December to December of the previous year)	%	124.6	116.7	107.2	98.3	108.5	110.7
Industrial producer price index (December to December of the previous year)	%	108.5	124.2	108.4	94.2	111.1	111.9
Agricultural products sales price index (compared to the previous year)	%	130.4	132.9	108.4	92.6	113.1	109.0
Budget							
incomes	mln UAH	616.0	895.3	1,122.6	1,227.7	1,639.1	1,934.9
expenses		801.7	895.7	1,132.9	1,234.3	1,599.0	1,904.0
Ordinary financial results before tax	mln UAH	224.0	172.8	168.2	-107.3	54.1	353.7
Industrial products (actual prices)	mln UAH	1,971.4	2,607.1	3,361.1	3,25.2	3,983.4	x
Agricultural products (in the prices of 2000)		1,811.7	2,050.9	2,023.2	1,914.8	1,855.8	2,090.8
plant growing	mln UAH	953.3	1,210.7	1,115.7	897.6	845.6	952.5
livestock farming		858.4	840.2	907.5	1,017.2	1,010.2	1,138.2
Investment in the main capital (actual prices)	mln UAH	688	784	1,208	1,483	1,913	2,740
Commissioning of residential buildings	1,000 m²	250	179	205	226	196	274.3
Cargo shipment by separate transport means	mln t	25.3	25.1	26.6	26.3	28.2	28.2
Passenger transportation by public transport	mln	300.3	307.1	286.3	269.3	241.2	221.9
Retail sales turnover (actual prices)	mln UAH	764.4	946.0	1,215.0	1,411.5	1,762.7	2,434.3
Foreign trade							
export	Mln USD	127.3	173.4	218.3	220.5	318.0	274.9
import		122.2	146.2	125.7	120.9	153.9	149.3
Natural reduction of population	x1,000	-11.7	-13.6	-13.7	-13.8	-13.1	-12.2
Employment	x1,000	805.0	772.9	774.3	809.6	803.5	...
Registered unemployment (at the end of the year)	x1,000	33.4	26.2	27.8	42.1	41.1	40.8
including women		23.3	18.8	20.2	29.6	28.1	28.0
Registered unemployment level	%	2.8	2.2	2.3	3.5	3.4	3.4
Average monthly wages of workers	UAH	168	225	301	358	433	543

Table 6: The main characteristics of the social-economic development of the ARC

The economy of the Autonomous Republic of the Crimea has been shaped by the peculiarities and riches of its nature, as well as beneficial geographical location of the peninsula. The Crimea has advantageous natural conditions for development of agriculture, recreational industry, and certain extractive industries, such as gas extraction, iron ore and fluxing limestone mining, construction materials, soda and bromide production.

The Crimea is also known as supplier of food industry equipment, TV sets and radio equipment, pneumatic devices, electric welding equipment and agricultural machinery, tankers, floating cranes, and hydrofoils.

The Crimean economy's special profile is in labour-intensive engineering and metal-working.

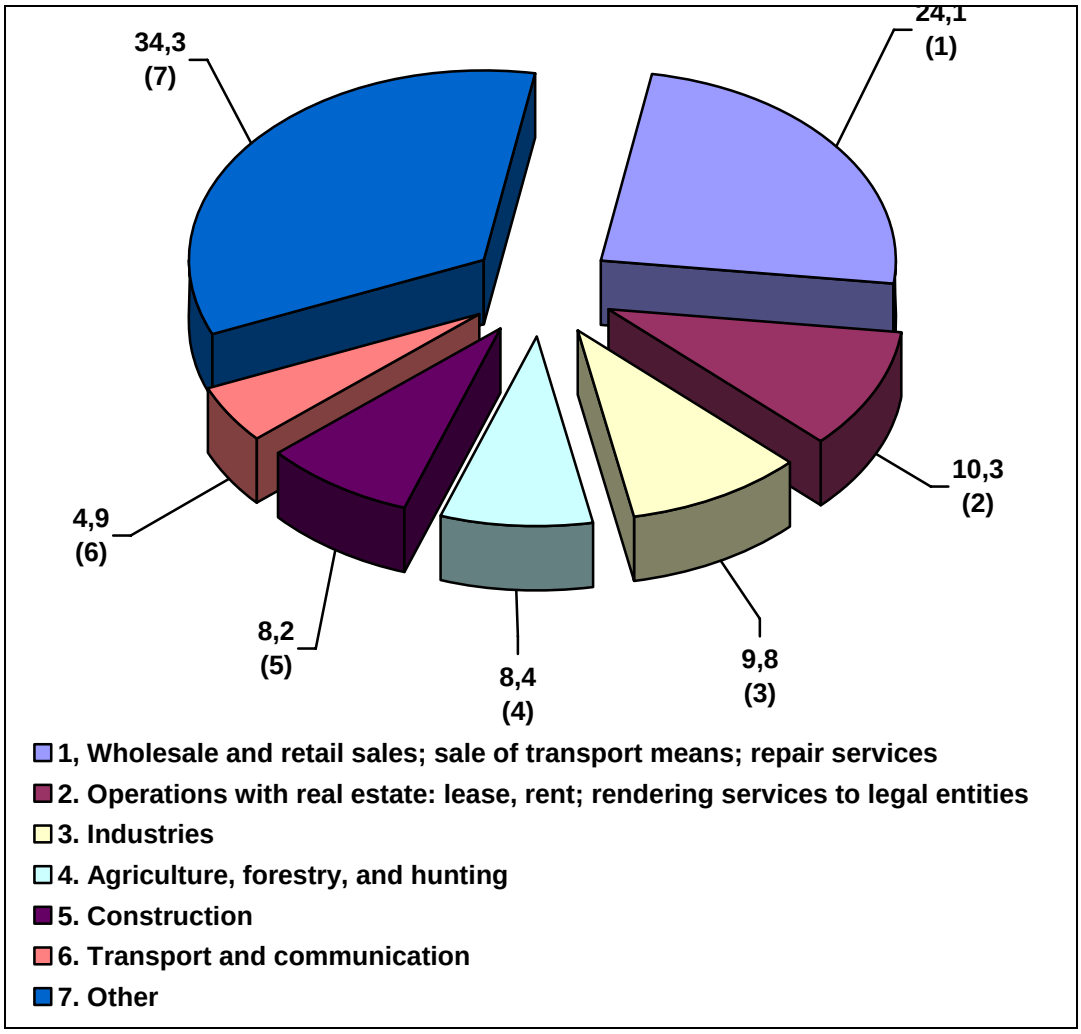
Historically, agriculture in the Crimea has focused on plant farming. It specializes in viticulture, horticulture, growing of tobacco, essential oil crops, and grain. The republic's animal husbandry includes dairy and meat cattle breeding with well-developed livestock breeding, and such a special sector as poultry industry.

[5] from Ukrainian documents

The factories manufacturing consumer good occupy a special place in the Crimean economy. They specialize in the production of clothing, footwear and knitted garments, haberdashery and furniture. The Crimean steel mills, machine building factories, and chemical plants contribute significantly to the production of consumer goods. The Kerch Integrated Steel Plant produces enamelled steel kitchen utensils; machine building factories in Simferopol and Sevastopol produce telecommunications equipment; chemical plants in Krasnoperekopsk and Saki - textile dyes, potassium permanganate, chemical plant in Simferopol - detergents.

Well known on world markets are the products of Crimean wine-makers, such as vintage dessert and sparkling wines. The Crimean essential oils enjoy a well-deserved authority.

As of 01.01.05, there are 43,371 industrial enterprises and organisations on the territory of the ARC. The distribution of main economic activities is shown in Graph 1.



Graph 1: The main economic activities

The distribution of the enterprises by the pattern of ownership is as follows:

	2000	2001	2002	2003	2004	2005
Total	**32,287**	**34,661**	**37,233**	**39,409**	**41,729**	**43,371**
Ownership pattern						
State	1,315	1,367	1,409	1,463	1,513	1,562
Communal	2,372	2,863	2,996	3,072	3,185	3,299
Private	10,583	11,194	12,075	12,739	13,431	38,510
Collective	17,700	18,918	20,429	21,801	23,250	x
Joint with foreign capital	317	319	324	334	350	x

Table 7 Ownership of enterprises

In order to implement radical transformation in the national economy a comprehensive long-term program of socio-economic development and restructuring of the economy of the Autonomous Republic of the Crimea has been developed covering the period until 2010.

Proceeding from the problems of republic's socio-economic development, its climatic and resource potential, peculiarities and specialization of the region, and its place in the social division of labour, and approaches to structuring the economy, the program identifies the following long-term priorities:

- development of the resort and recreational complex, its shaping as the key industry within the economic complex;
- development of the fuel, energy, and water economy sectors to the levels that would allow to provide for the needs of the population and the whole economy;
- reforming and developing the agricultural and processing sector in order to satisfy the needs of residents and guests in foodstuffs, and provide the processing industry with raw materials, so as to increase the traditional Crimean exports;
- further development of all means of transportation, including sea ports, and expanding the transport and distribution functions;
- creating a high-tech competitive industrial complex, adapted to market conditions and capable of satisfying the needs of the region and participate in economic relations of Ukraine and other countries;
- reception and resettlement of the deported peoples returned to the Crimea for permanent residence.

The measures applied to all areas include the requirement of establishing environment-friendly production, minimizing technological pressures on the environment, assuring the transition to a balanced use and restoration of recreational and other natural and resource factors for providing basic services.

3.1.3.1.2. Sevastopol

It may be measured by the figures:

Finance tax and other obligatory payments – 315.4 mln. UAH;

Payments in Pension Fund – 235.4 mln. UAH

3.1.3.2. Export

3.1.3.2.1. Sevastopol

Foreign economic relations with other countries are constantly widening. There are up to 100 joint ventures registered in the city. The city enterprises export to 50 countries of the world and import from 48 countries.

The structure of exports combines fish and fish products (55%), canned fish (34%), the balance being the produce of ferrous metallurgy, ship engines and spare parts, etc. The imports include goods of non ferrous metallurgy, varnishes, paints, cable, plastic goods, video equipment, measuring instruments, perfumes, cosmetics, oil and diesel fuels, lubricants, etc.

- Foreign trade turnover of goods and service (01.01.2003):
  - Total – 115.4 mln. USD;
  - Export – 82.3 mln. USD;
  - Import – 33.1 mln. USD;
  - Balance of trade – 49.2 mln. USD.
- Foreign trade turnover of goods:
  - Total – 75.6 mln. USD;
  - Export – 45.5 mln. USD;
  - Import – 30.0 mln. USD;
  - Balance of trade – 15.5 mln. USD.

- Foreign trade turnover of service:
  - Total – 39.8 mln. USD;
  - Export – 36.8 mln. USD;
  - Import – 3.1 mln. USD;
  - Balance of trade – 33.7 mln. USD.

3.1.3.3. Industry

3.1.3.3.1. Crimea

The characteristics of industrial production are set out in Table 8.

	Unit	2000	2001	2002	2003
Mineral fertilisers	x1,000 t	8.4	22.9	7.2	17.6
Cement	x1,000 t	183.7	281.1	372.5	408.3
Fabrics	x1,000 m²	221.3	312.0	332.0	335.3
Shoes	x1,000 pairs	131.4	153.0	79.2	76.3
Cooked meats	x1,000 t	3.7	2.1	1.8	2.4
Animal oil	x1,000 t	3.8	4.4	3.5	2.3
Butter	x1,000 t	5.8	2.4	1.5	1.7

Table 8 Main industrial products

The Crimea's key manufacturing industries are represented by machine building, metalworking, food, and chemical industries.

Machine building plants staffed with stable and skilled workforce are highly technology-intensive. They supply, abroad included, the shipbuilding products, equipment for food-processing industry, electrical and pneumatic devices, electric welding equipment, and agricultural machinery.

The Open Join-Stock Company "Zaliv Shipbuilding Plant" produces vessel hulls. The level of production equipment and processes conforms to the European standards. The high quality of workmanship has been recognized by such international ship quality and classification companies as German Lloyd's and others.

The Feodossia Production Association "More" has launched the production of an innovative design of the high-speed 200-seat catamaran "Superfoil-30" with titanium hydrofoils and a system of interceptors.

The Open-end Stock Company "SELMA" is persistently working towards improving the competitiveness of its products. The performance of its welding equipment conforms to international standards and is exported to many countries throughout the world. The company has introduced and certified the quality-assurance system ISO 9001.

In order to develop state-of-the-art and perspective technologies in electric welding, the company is collaborating closely with the leading foreign manufacturers of welding equipment, including Polish OZAS, Swedish ESAB Concern, and Finnish KEMPPI.

The Open-end Stock Company "Factory Fiolent" is the leading Ukraine's and CIS producer of control systems for the technical and navigational facilities for commercial and naval vessels, precision micro-machinery, sensors and indicators, controlling security systems for nuclear power industry, and the leading Ukrainian manufacturer of household and industrial power tools.

The Crimea's most promising industries are related to the use of its natural resources.

The scope of reserves and the share of the fields prospected allows to use only natural gas as technological fuel at present. Natural gas fields began to be explored in the Crimea from mid-80s at the Tarkhankut peninsula, on the Arabat point, and near the city of Dzhankoy. The fields on the continental part of the Crimean peninsula were jointed in the late 70s, by the shelf reserves of natural gas at the Black Sea and Azov Sea reservoirs. The Golitsyn gas condensate field is the largest supplier of organic fuel. The field is located at the Black Sea, 72 km off the Tarkhankut peninsula at depths of 40 m. In general, the recoverable reserves of gas and gas condensate in the Crimea are as follows: gas – 8,948 bn m^3; gas condensate – 2.12 bn tons.

The oil deposits in the Black Sea and Azov Sea aquatory, as well as in the vicinity of the Kerch peninsula present a promising group of Crimean resources. The prospected oil reserves amount to 1.492 mn tons.

The Saki State Chemical Plant and Open-end Research and Production Association “Iodobrom” use local raw materials. Two plants in the town of Krasnoperekopsk – the Open-end Stock Company “The Crimean Soda Plant” and the Open-end Stock Company “Bromine” use the brine drawn from the Syvash bay and from salt lakes. These enterprises are monopolists on the Ukrainian and CIS markets, and produce unique products, being quite competitive on the European and world markets.

The Mining and Concentration Works “Titan” produces more than a half of the country’s titanium dioxide and ammophos. The Open-end Stock Company “The Crimean Soda Plant” produces 90% of soda salt in Ukraine. The OSC “Brom” is the only domestic producer of liquid bromine, iron bromine, dipropanebromide, and bromine salts. The Saki State Chemical Plant occupies the monopoly position on the CIS market in the production of potassium permanganate and methyl bromine.

The metallurgy in the Crimea is represented by the OSC “The Kerch P. Voikov Metallurgical Plant”, which manufactures steel enamelled kitchen utensils, and railway points.

The construction materials industry in the Crimea is represented by well-developed facilities based on abundant reserves of non-ore raw materials (about 200 deposits): saw limestone (45% of Ukrainian reserves), cement stock, including marls. The annual output of construction materials approaches 13 mln m^3. The leading role in the industry is occupied by the production of wall materials made of the saw limestone mined at the Inkerman, Bodrak, and other deposits.

The Crimean cement industry is based on well-explored marls of the Bahchysarai deposit, which features significant reserves and uniformity of composition. The production of facing tiles is concentrated at the Alminsk, Inkerman, and Prymorsk Plants. The production reject is used to make gravel, shall-and-concrete wall panels, and asphalt concrete.

Bottling of natural mineral water is one of the promising areas of the Crimean food industry. The Crimea enjoys a great variety of mineral waters, including table and curative water with a wide range of applications.

The most promising food industry enterprises are wine-making enterprises and distilleries, such as the Industrial-Agricultural Association “Massandra”, Sparkling Wine-Making Plant “Novy Svet”, State Farm Plant “Koktebel”, and company “Soyuz-Victan LTD”.

From the moment of its founding in 1894, the IAA “Massandra” has been producing only high-quality wines for over 100 years now. Starting in 1900, the Massandra wines have been taking part in international exhibitions and wine-testing competitions.

“Massandra” can boast the largest wine-collection worldwide. Its cellars contain about one million bottles of various wines. This collection is also one of the oldest. The “Massandra” museum fund stores Jerez de la Frontera of the 1775 vintage, which is still a living wine. There are also other wines, which are over a hundred years old and continue getting top grades for their quality. The company Internet site is: www.massandra.crimea.com.

3.1.3.3.2. Sevastopol

The basic industries in the city are engineering, metalworking, light industry and food production. Sevastopol is now the biggest Ukrainian centre of fish, refrigerator and scientific research fleet with a well developed ship repairing and radio electronic industry. There are almost 5,000 industrial enterprises within the city, the largest being large fishing and fish processing plants. Annual production capacity of floating and coastal canning ships is millions cans and tons of smoke, stock, and pickled fish. Practically, the whole Ukrainian transport refrigerator fleet is concentrated in Sevastopol, and makes up 4% of the world total. Six plants, capable of repairing ships of all classes and types constitute ship repairing potentials of the city. The most powerful sea floating cranes of the former USSR with carrying capacity from 100 to 1,600 t were constructed at the Ordzhonikidze Sea Works. The biggest in Europe dry dock (250 m) is also located at these works.

Significant share of the city's industrial output relates to the defence radio electronic and instrument making enterprises.

A noticeable role is played by Balaclava Ore Plant which produces metallurgical limestone and building materials: crushed rock, marble crumb, rubble stone, etc. Some city enterprises receive building stone from Inkerman; the products are often exported to many countries of the world.

Clothing and textile industries are also available, their goods suiting markets of many oblasts of Ukraine.

3.1.3.3.2.1. Industrial complex

The quantity of enterprises – 88

The volume of industrial manufacture in real costs – 533.8 mln. UAH

Consumer goods food goods – 123.1 mln. UAH

- food goods – 62.3 mln. UAH;
- alcoholic drinks – 47.8 mln. UAH;
- textile goods – 13.0 mln. UAH;
- with in goods of light industry – 7.2 mln. UAH

3.1.3.3.2.2. Manufacturing of basic kinds of industrial goods

- electronic power – 18.0 mln. kW;
- heating power – 745.4 th. Gcal;
- wall materials – 10.8 mln. pieces;
- building materials –1,785.7 th. m^3;
- facing issue of natural stone – 6.7 th. m^2;
- lime flour – 9.1 th. ton.;
- pre-fabricated reinforced concrete – 12.3 th. m^3;
- building brick – 5.0.

3.1.3.3.2.3. Structure of industrial manufacture (in % to the volume of city manufacture)

- extractive industry – 6.2;

  Mineral raw materials are represented by flux, powdered and marble limestone.
- manufacturing industry – 69.5;
- food industry and conversation of agricultural goods – 28.3;
- light industry – 1.6;
- production of wood and products of wood – 0.1;
- pulp and paper industry – 0.6;
- chemical and oil-chemical industry – 0.1;
- production of other mineral goods – 1.4;
- metallurgy and manufacturing of metal – 3.9;
- mechanical engineering and repair service – 32.3;
- production and distribution of electric power, gas, water and heat – 24.3.

3.1.3.4. Agriculture Production

3.1.3.4.1. Crimea

The agricultural sector is represented by such major industries as livestock farming and plant growing. The major crops are cereals and vine (Table 9).

	2000	2001	2002	2003	2004
Total	**2,050.9**	**2,023.2**	**1,914.8**	**1,855.8**	**2,090.7**
Plant growing	**1,210.7**	**1,115.7**	**897.6**	**845.6**	**952.5**

Cereals	468.8	604.3	475.3	295.5	519.4
Industrial crops	56.7	57.8	34.1	29.5	51.7
Potato, vegetables, melons and gourds	288.6	270.9	227.1	198.5	221.6
Small fruits and vine	320.2	133.7	129.0	283.6	115.7
Fodder crops	42.3	37.1	31.2	24.0	26.9
Other products	34.1	11.9	0.9	14.5	17.2
Livestock farming	**840.2**	**907.5**	**1,017.2**	**1,010.2**	**1,138.2**
Cattle and poultry	438.1	481.9	571.3	584.4	728.5
Milk	266.1	280.7	287.0	270.7	247.8
Eggs	107.0	118.4	139.4	131.1	131.1
Wool	2.2	2.1	2.1	2.1	1.9
Other products	26.8	24.4	17.4	21.9	28.9

Table 9: Agricultural products by types (x1,000 UAH)

The main vector in the development of the Crimean agro industrial complex lies in its orientation towards the best possible utilization of the peninsula's unique natural and bio climatic potential.

The climatic conditions and fertility of soil in the republic are conducive for the development of diversified agriculture.

The Crimea's agricultural and climatic resources allow growing of numerous crops of the temperate and even subtropical zone. The frost-free period duration in the flatland Crimea is 170-200 days, and 240-270 days at the South coast. The abundance of warmth and sunshine, however, is accompanied by insufficient precipitation. The average annual precipitation amounts to 300-400 mm in the most of the Crimea. During arid years, the amount of precipitation declines twofold, which has an extremely negative impact on agriculture. Therefore, irrigation projects are being implemented in the region. Every hectare of irrigated area yields four times more crops than a dry one. The main irrigated areas are located in the North-Crimean Canal area.

The current agricultural priorities are grain, horticulture, viticulture and wine-making, poultry industry, and food-processing industry.

The Crimea is also famous for its essential oils. Lavender, sage, and rose are grown commercially.

Private farms produce over 70% of meat and milk, over a half of eggs, and nearly all potatoes.

The formation of a socially-oriented economy requires a powerful food industry to be developed in the Crimea, capable of ensuring normal life of the population, restoration and preservation of its health, and expanding the Crimean exports.

Meat, dairy, and canning factories have a significant potential, which consists, specifically, in establishing close collaboration with agricultural producers in order to expand the raw material base.

Integration processes will be facilitated by reforming the land and property relations, which would develop real owners of land and means of production.

The Crimean network of fruit and vegetable canneries could satisfy the wide needs of the population in various types of canned fruit and vegetables, provided the plants are modernized and upgraded.

The Closed-end Stock Company "Maybel" produces six types of juices made of Crimean fruits and various nectars of exotic fruits. The company is interested in expanding its exports to the Russian Federation.

The production of a wide range of baby-food is increasing, with the OSC "The Simferopol Cannery Named After the 1st of May" being the main producer. Various fruit juices prevail: apple, plum, apricot, grape.

The republic's agricultural producers need agricultural machinery, mineral fertilizers, pesticides and herbicides.

3.1.3.4.2. Sevastopol

Agricultural complex of the region specializes in gardening, vine and vegetable growing. Sevastopol is one of the most important vine growing regions of Ukraine. High quality and variety distinguish the local varieties of grape. 1/3 of all the Crimean vineyards is concentrated in Sevastopol. The rich facilities for wine making as well as experience in this branch make the city the supplier of the best table and sparkling wines in Ukraine.

The quantity of agricultural enterprises – 9;

Square of agricultural lands (all commodity production, including home farm) – 24.7 th. ha.;

Volume of agricultural production – 22.0 mln. UAH;

The structure of agricultural production:

- plant-growing – 98.0%;
- stack-breeding – 2.0%.

Main trends of production in plant-growing: vine-growing; fruit growing.

3.1.3.5. Construction

3.1.3.5.1. Crimea

3.1.3.5.2. Sevastopol

- basic funds – 187.4 mln. UAH;
- investments in basic capital – 261.8 mln. UAH;
- apartments built – 61.7 th. m²;
- number of constructional companies – 48;
- construction-repair service – 1,695.5 mln. UAH

3.1.3.6. Recreational and tourist complex

3.1.3.6.1. Crimea

Tourism is one of the main economic activities in the ARC.

The data on the number of resort hotels and visitors are set out in Table 10

Region	Number of resort hotels	Maximum bed-space	Number of visitors, total		Organised visitors, total		Registered unorganised visitors, total	
			2004	2005	2004	2005	2004	2005
Yalta	144	37,594	3,341	4,033	16,789	17,865	3,380	2,600
Alouchta	84	23,747	633	1,627	2,540	2,117	340	0
Evpatoria	71	30,540	5,231	3,338	7,800	5,000	250	24
Sudak	24	6,706	680	112	920	720	0	20
Feodossia	64	13,064	271	0	661	0	114	0
Saki	14	5,103	830	1,168	1,954	2,207	89	102
Kerch	36	4,559	66	79	66	100	317	766
Bahchysaraiskiy	21	6,849	0	0	0	0	0	0
Leninskiy	49	5,697	0	0	0	0	0	0
Rozdolnenskiy	16	2,726	0	0	0	0	0	0
Chornomorskiy	40	5,131	0	0	0	0	0	0
Simferopolskiy	45	5,624	70	82	140	167	0	0
Sakskiy	25	4,136	0	0	0	0	0	0
Total for the region	**633**	**151,476**	**11,122**	**10,439**	**30,870**	**28,176**	**4,490**	**3,512**

Table 10: Tourism

The number of unorganised visitors greatly differs from the official figures. The representatives of almost all cities of the Southern Coast said that during the holiday season the population of the coastal cities and towns increases by a factor of 3-4.

The Crimean recreational sector has 632 sanative and preventive healthcare facilities. Sanatoriums are concentrated mainly at the Crimea's South coast and the Evpatoria resort. The Crimea's South coast specializes in treatment of adults, whereas Evpatoria is intended for recreation and treatment of children. The mountainous Crimea has a network of tourist bases and camps. Hotels Yalta, Oreanda, and camping motel Fairytale Glade are located at the peninsula's South coast.

The present tourist and recreational potential of the Crimean peninsula can be described as follows:

- historical and cultural resources:

  There are over 11,500 historical, cultural, and architectural monuments in the Crimea, related to various historical epochs, civilizations, peoples, and religions. The most unique of them, e.g., the complex of cave towns and monasteries, Genoa fortresses, sacred places of various denominations, and others are used as tourist attractions.

- landscape resources:

  Five state reserves, 33 game reserves, including 16 national ones, 87 natural monuments, including 13 national ones, 10 reserved tracts, etc.

- curative and mineral resources:

  The Crimean peninsula has an extremely rich recreational potential. The Crimean mineral (mud-bath) resources, its beaches, and coastal plots of land are very highly rated according to the world standards.

  The peninsula has 26 deposits of curative mud and brine, as well as over 100 mineral water springs of various chemical compositions. 15 mud deposits and 13 major mineral springs have been recognized as curative by a special decree of the Ukrainian Cabinet of Ministers.

- territorial resources:

  Over 90% of recreational facilities are concentrated on a narrow 3 km coastal strip. Inland territories (mountains and foothills) have only small (less than 100 beds) facilities with only basic amenities, even though this "Crimean Switzerland" has all the necessary conditions and resources for a high-level recreational development.

In addition, prospective business partners will be impressed by the opportunities of developing the infrastructure of rural ecological and social tourism; systems of resort service in the new coastal areas of recreational development; system of service for non-organized vacationers; show business and entertainment industry; developing the infrastructure for the elite kinds of sport; and introduction of unique treatment methodologies.

The Crimea is presently providing a third of tourist services in Ukraine for the foreign tourists who arrive for rest and a half of the provided excursion services.

Russia and Ukraine account for the greatest part of the CIS tourists. The Crimea is visited by tourists from non-CIS countries. The main partners, as before, are Germany and Turkey.

The availability of tourist resources, the specifics of the existing infrastructure provide opportunities to develop in the Crimea some non-traditional forms of tourism, such as: speleology, rock-climbing, horse-riding, hang-gliding, mountain hiking, wine and hunting tours, helicopter rides, yachting trips, scuba-diving, scientific and motor tourism.

The Aquasport tourist company is working in the area of underwater tourism in the Crimea. The extracurricular training and educational institution "Diving Centre" is intended for children of 6 to 16 years old, Onyks-Tour and Kizil-Koba organize speleological tours, Karyer and Burulcha offer horseback tours.

All these tours can be combined with other activities and intended both for groups of tourists and individuals, be accompanied by a wide range of additional services, various classes of accommodation, transportation, and service.

Of late, the pilgrim tourism is developing in the Crimea rather rapidly. One-day tours have been developed and prepared, including visits to all the renewed holy shrines of the Crimea: monasteries, temples of Simferopol, Sevastopol, and Greater Yalta.

Tours have been developed for the German, Bulgarian, Greek, Crimean Tatar, and Czech citizens whose ancestors used to live in the Crimea to come to their historical motherland with visits to architectural and religious monuments of the peninsula.

The green (rural) tourism is a new and promising trend in the development of the Crimean tourist industry. The Crimea has all the conditions for this: a combination of picturesque mountains and wide plains, forests,

steppes, seas, lakes, unique flora and fauna, a wide-ranging network of natural, historical, and ethnographical monuments. Each of the Crimean cities has its own monuments and presents a tourist region in itself.

Sevastopol. Founded in 1783. Population: 378,000 of people. Navy port.

Sights: A memorial to commemorate the heroic defence of Sevastopol in 1941-1942. Count's Quay, monument to perished sailors of the destroyer "Svobodny", communal grave of the defenders of Sevastopol, Konstantynivsky and Mykhailivsky forts, aquarium of the Institute of Biology of Southern Seas of the Ukrainian National Academy of Sciences, cape Crystal with an obelisk in honour of the hero-city, St. Volodymyr's Cathedral, Museum of the Black Sea Fleet, Panorama "Defence of Sevastopol 1854-1855", Malakhy's Hill.

Museums:

- Museum of the Heroic Defence and Liberation of Sevastopol. Tel.: 52-29-26, 52-05-16;
- Panorama "Defence of Sevastopol in 1854-55". Tel. 52-40-06, 52-05-15;
- Diorama "Storming of the Sapun Hill on 7 May 1944";
- Museum of the Black Sea Fleet. Tel. 522-289;
- National Reserve "Khersones Taurica". Tel. 24-14-15;
- Sevastopol Art Museum.

Evpatoria – an ancient town with a history extending for 25 centuries. A major seaside resort in the Western Crimea. Distance from Simferopol 65 km. Population: 106,000 people.

Sights: remains of a fortress wall of the ancient Greek town of Kerkinitida, Greek and Scythian settlement site, medieval Dzhuma-Dzhami mosque, Turkish bath of XVIth century, dervish takiye of VIth-XVth centuries, Karaim kenassa of XVIIIth century, St. Nicholas Cathedral, Evpatoria Regional Museum, Tel. 312-80.

Feodossia – a cultural and tourist centre of south-eastern Crimea, one of the oldest European towns. Feodossia celebrated her 2500th anniversary in 1971. Population 74,000 people. Distance from Simferopol 120 km.

Sights: monument to the landing party of the Kerch-Feodossia operation in 1941-1942, St. Constantine's Tower, Quarantine Hill, Greek Church of Introduction, Armenian Church of St. Serge (Sury-Sarkiz) XIVth century, Mufta-Dzhami mosque of XVth century, former Stamboli's dacha.

Museums:

- The I.K. Aivazovsky Feodossia Picture Gallery, Tel. 302-79;
- The A.S. Grin Literary and Memorial Museum, Tel. 352-20;
- The State Museum of Hang Gliding and Paragliding, Tel. 320-28;
- The M. Voloshin Museum (settlement Koktebel).

Hero-City Kerch was founded in the VIth century BC. Distance from Simferopol 300 km. Population: 157,000 people. The city is located on the Black Sea and Azov Sea coast.

Sights: Mountain Mitridat, Church of John the Baptist, Royal Burial Mound of IVth century BC, Melek-Chesmen Burial Mound of IIIrd century BC, Scythian Burial Mound Kul-Oba, remains of the ancient town Panticapei, Turkish fortress Eni-Kale, Eltigen.

Museums:

- The Kerch History and Archaeological Museum, Tel. 216-136;
- Picture Gallery;
- "The Heroic Defence of the Adzhimushkai Quarry in 1942";
- The Museum of the Eltigen Landing Party.

Yalta – an international resort and tourist centre at the South coast of the Crimea. It is a popular Ukrainian resort known world over. It is also a large Black Sea port. Distance from Simferopol 86 km. Population: 81,000 people.

Sights: bell tower of the St. John the Evangelist, Memorial of Glory with Eternal Flames, Memorial at the Polikurovsky Hill, Armenian church, Uchan-Su waterfalls, Massandra park, Pear-tree glade, Botkin recreational trail, Nikitsky Botanical Gardens, Children's Camp "Artek", Baidarsky Gate, the Ascension Church, Roman fortress "Kharaks", the Devil's Ladder pass, Mountain Koshka, Bear Mountain, Mountain Ai-Petri, Cross Mountain.

Museums:

- The Yalta State Combined History and Literature Museum. Tel. 32-55-25; "Fairytale Glade";
- The A.P. Tchekhov Memorial Home. Tel.. 32-50-42.;
- Livadia – a residence of the last Russian emperor, venue of the Crimean (Yalta) Conference conducted on 4-11 February 1945;
- The Massandra Palace of Alexander III;
- Massandra wine-testing hall.

Alouchta – a well-known resort and tourist town. Distance from Simferopol 45 km.

Sights: tower of medieval Alouchta fortress, settlement Partenit, Mountain Chatyr-Dag with the Marble Cave, Mountain Demerdzhi with the Valley of Ghosts and Dzhur-Dzhur water falls.

Museums:

- The S.N. Sergeyev-Tsensky Literary and Memorial Museum.

Bahchysarai ("Garden palace") – a former residence of the Crimean Girey khans.

Sights: the khan palace Khan-Sarai, Dilyary-Bikech Mausoleum, khan mosque Biyuk-Khan-Dzhami, Fountain of Tears celebrated by A.S. Pouchkine, the Assumption Monastery, cave cities of Mangup-Kale, Chufut-Kale, and Tepe-Kermen.

Museums:

- the Bahchysarai Historical and Architectural Reserve.

Simferopol – the capital of the Autonomous Republic of the Crimea, an administrative, cultural, and scientific centre, founded in 1784. Population: 343,000 people.

Sights: obelisk in honour of V.M. Dolgorukov, Kebir-Dzhami Mosque, Chokurcha cave – a site of the Mustyr culture man, settlement Scythian Neapolis, Red and Marble caves.

Museums:

- the Crimean Republic Regional Museum, Simferopol Art Museum.

Alongside with the tourist industry, the sanatoria and health resorts present another priority for the Autonomous Republic of the Crimea at present. This sector is based on using mineral waters (with a potential capacity of 14,000 m^3 per day), curative mud (with reserves of 22.4 mln m^3), beaches (517 km long), climatic and landscape resources, sea and mountain air, etc.

There are a total of over 600 sanatoria and resort facilities used for both year-round and seasonal treatment and recreation. The sanatoria and rest-homes providing treatment services are located predominantly at the Crimean South coast, as well as within resorts of Evpatoria and Saki. The South coast specializes in treatment of adults, whereas Evpatoria is a children's resort.

All the Crimean sanatoria have a certain specialization, depending on the peculiarities of curative factors of their location.

According to their specialization, the sanatoria are divided into tuberculosis, respiratory, locomotoric, neurological, gynaecological, ophthalmologic, cardiovascular, general therapeutic, and multipurpose sanatoria.

The Crimean Tourism Development Centre was set up with the support of the international TACIS program. The Centre has become a link between the tourist enterprises, the government, and customers. Publication of booklets, newsletter, an active collaboration on a number of joint publications, building of an information network, these are just some examples of Centre's promotional activities. Financial support has been granted to 31 tourism development projects. The majority of these projects have already been successfully completed.

NGO Crimean Association of Travel Agencies (CATA) was founded in January 1997. The NGO's main objective is advertisement and promotion of the national tourist product. The Association presently has a membership of over 120 members.

In April 1999, the Yalta and Evpatoria NGOs established the Crimean Republican Resort Association "Krym-Kurort" aimed at coordinating efforts of the Association members to improve competitiveness of the resort and recreational complex at the domestic and foreign markets. "Krym-Kurort" is a non-profit organization for social protection of the resort.

The executive branch of the Autonomous Republic of the Crimea undertakes concentrated efforts to improve the quality of the Crimean tourist product and resort services, to promote them on the international market, implements improvements of resort areas: embankments and beaches are improved, the network of retail, service establishments, and other infrastructure facilities is expanding.

3.1.3.7. Trade and service

3.1.3.7.1. Crimea

3.1.3.7.2. Sevastopol

3.1.3.7.2.1. Retail trade turnover

- Total – 465.5 mln. UAH;
- Per one person – 1,226.6 UAH

3.1.3.7.2.2. Service paid by people

- Total – 332.0 mln. UAH;
- Per one person – 874.8 UAH

3.1.3.7.2.3. Service of life conditions

- Total – 32.0 mln. UAH
- Per one person – 84.3 UAH

3.1.3.8. Transport and communication

3.1.3.8.1. Crimea

3.1.3.8.2. Sevastopol

Transportation system of the city includes 6 railway stations with 35 km of approach lines capable of handling up to 600 freight cars per day. Traffic capacity is 46 trains in both directions daily. Railway roads and cul-de-sac stations are connected with almost all Sevastopol bays, through which cargo transfer is carried out.

Two main automobile highways Sevastopol-Simferopol (traffic capacity is 18,000 units a day), and Sevastopol-Yalta of the same traffic capacity link Sevastopol with all the regions of the Crimea. A 30 km mooring line is well developed and it includes more than 100 berths in the city, part of which are deep water piers equipped to load large capacity vessels with 10-12 m. draft.

Sevastopol sea trade and fish ports carry out different cargo transfers, including 1 million t of petroleum products a year.

Two first class airports (with 3.2 km runways) are situated within the city and can serve air liners and carriers of all types. Belbek Airport (UKFS) can handle 500 t of cargo and 500 passengers per day.

3.1.3.8.2.1. Public transport

Exploited length:

- railways – 0.2 th. km;

- trolleys' connections – 0.134 th. km;
- state, republic, local roads – 0.759 th. km;
- Specific gravity – 78%
- bridges of automobiles – 8

3.1.3.8.2.2. Connection of general use

- telephones (per 100) – 34.

3.1.3.9. Science, Research, Education, Healthcare

3.1.3.9.1. Crimea

There are about 100 various scientific, research, and design institutes and offices, experimental stations, independent research departments and branches, including 40 higher educational institutions, of which nine are state-owned institutions.

The most representative groups of scientific institutions are as follows:

- Agrarian science. This includes the Crimean State Agrarian University; institutes: “Magarach”, Institute of Essential Oil and Medicinal Plants; Institute of Horticulture; “Plodmashproekt”; the National Research Centre “Nikitsky Botanical Gardens”; a number of pilot stations, etc.
- Medical scientific institutions: the Crimean Medical University; Institute of Physical Treatment Methods and of Climatology named after Sechenov; and the Ukrainian Institute of Children’s Balneology.

The group of design and research institutes and offices includes about 30 organizations, branches or independent departments. The largest of these are: KrymNIIproekt, Krymproektrekonstruktsia, the Crimean Branch of the Institute UkrGINTIZ, the Crimean Branch of the Institute UkrNIIGIM, KrymGIPROVODKHOZ, the Crimean Branch of the Institute “Ukrzemproekt”.

The Crimean Branch of the State Geological Prospecting Institute, NIPIShelf, and others are involved in the research of natural resources and problems of their utilization.

The Institute of the Biology of South Seas named after Kovalevsky, the Marine Hydrophysical Institute, the Southern Research Institute of Marine Fisheries and Oceanography, the Kerch Marine Technological Institute, the Sevastopol Research and Production Enterprise “Yugrybtekhtsentr”, and others are involved in researching the problems of seas and fisheries.

Over 20 organizations are involved in the research and design for the machine-building and instrument-making industries, including the major institutions, such as: the Sevastopol State Technical University; NPP “Orgtekhavtomatizatsia”, NPO “Selection Equipment”, Design Office “Domen” of the Tavria National University named after V.I. Vernadsky, the Simferopol Central Design Technological Office, NPO “Iodobrom”, and others. In addition, these problems are addressed by nearly all state higher educational institutions, numerous agricultural, civil engineering, and other organizations.

A large group of shipbuilding research and design organizations is based in Sevastopol. These are the Black Sea Scientific and Research Institute of Shipbuilding, the Black Sea Scientific and Research Institute of Shipbuilding Technology, Central Design Office “Chornomorets”, Central Design Office “Tavria”. Design Office “Sudokompozit” is based in Feodossia.

In addition, one should also mention large former defence industry research institutions: the Scientific and Research Institute of Aeroelastic Systems, Sevastopol Institute of Nuclear Energy and Industry, State Aviation Research and Testing Centre, Scientific and Research Centre “Vertolet”, and others.

In recent years, the largest contribution in the development, dissemination, and use of scientific and technological knowledge in all areas of science and technology was made by the Institute of Grapes and Wine “Magarach”, Nikitsky Botanical Gardens, Institute of Essential Oil and Medicinal Plants, OSC Research and Production Association “Iodobrom”, Crimean Astrophysical Observatory, State Enterprise KTB “Sudokompozit”, YUGNIRO, which account for about 65% of the scope of research and design services.

The fundamental research is implemented by 20 organizations. A significant part of these studies has been implemented by the Crimean Astrophysical Observatory, Institute of Grapes and Wine “Magarach”, and YUGNIRO.

3.1.3.9.2. Sevastopol

There are more than 18 various scientific, research, project and design bureaus, research stations, independent scientific department and branches.

3.1.3.9.2.1. Education

- Higher educational institutions – 28;
- Departments (branches, consultation centres) – 25;
- Professional schools – 14;
- Nursery schools – 75.

3.1.3.9.2.2. Social-culture sphere

- Medical institutions – 49;
- Including Hospitals – 13;
- Theatre – 4;
- Cinemas – 45;
- Historical and cultural monuments – 2066;
- Museums – 4.

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, one of the main issues to address in the SHWM is 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 ARC Government.

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 a developed Regional SHW Management Plan for the ARC should be within the competence of the ARC parliament.

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

3.2.3.2.1. Regional Committee 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 **Regional Committee of Ecology and Natural Resources in ARC** 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.

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 ARC are exercised by the **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.

But in 2006, the state company “UkrEkoKomResurcy” should be transferred to the Ministry of Ecology and Natural Resources, and we don't know what will be the future organisation for the collection of packaging fees and for the use of the collected funds.

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 (SHW) disposal that would fully comply with the Ukrainian environmental legislation. The available SHW landfills do not comply with the sanitary-ecological norms and are almost exhausted. Environmental monitoring is theoretically carried out but with insufficient means. There's a noticeable exception with the new row of the landfill of Yalta.

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 form 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 Fund for Environmental Protection.

The control over the completeness and quality of the Register is put upon Committee of Environment and Natural Resources of the ARC.

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 ARC 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 ARC sanitary-epidemiological services;
b. State Labour Protection Inspectorate;
c. ARC Department of Water Resources;
d. ARC Regional Geological Company "KrimGeologia"

Having approved the draft passports, the WDS owners submit them for consideration to Committee of Environment and Natural Resources of the ARC (ResKomPrirod Crimea).

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 ARC Administration for further approval and entering into the register.

The creation and keeping of the Register in ARC is assigned to Committee of Environment and Natural Resources of the ARC (ResKomPrirod Crimea) (Decree of the Cabinet of Ministers of Ukraine N° 216 of 03/08/98).

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

Basing on the WDS passport data ResKomPrirod Crimea 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. Current Methods Used While Producing WDS Passports in ARC

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.

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 leachate 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 analysis of quality of the produced passports shows the following weak points: neither passport, develop by commercial enterprises, was approved by the Committee of Environment and Natural Resources of the ARC (ResKomPrirod Crimea) in the first draft. This indicates that approach to the process is too formal.

3.3.4. 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.

At present the **registry of waste disposal sites** contains only the data of 8 passports of SHW dumpsites.

While auditing SHW 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 SHW 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 SHW 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 SHW 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).

3.3.5. Regional Environmental Monitoring

To speak about a potential danger presented by SHW 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 environmental monitoring is carried out by:

3.3.5.1. Committee of Environment and Natural Resources of the ARC (ResKomPrirod Crimea)

- Sources of industrial air emissions (concentration of pollutants (hereinafter referred to as 3B), including radionucleides);
- Sources of waste water discharge (concentration of 3B, including radionucleides);
- Surface water (concentration 3B, including radionucleides);
- Water bodies within environment protection areas (background quantity of 3B, including radionucleides);
- Surface and sea ecological systems (background quantity of 3B, including radionucleides); industrial and domestic waste landfills (waste composition, concentration of 3B, 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).

3.3.5.2. 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).

3.3.5.3. Regional Geological Company "KrimGeology"

- 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).

3.3.5.4. 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.).

3.3.5.5. 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).

3.3.5.6. Regional National Station of Plants Protection in the ARC

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

3.3.5.7. National Forestry Association

- 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).

3.3.5.8. Crimean 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).

3.3.5.9. 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 3B, including radionucleides);
- Surface water in cross-border zones and areas of its intensive use for industrial and household purposes (concentration of 3B, including radionucleides);

3.3.5.10. Institute of Land Management

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

3.3.5.11. 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).

3.3.5.12. Department of Housing and Public Utility Services

- Green plants in towns and town-like settlements

3.3.5.13. Water utilities of the populated areas

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

3.3.5.14. Company of Water Supply

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

3.3.6. Registry of Information to Assess Danger Presented by SHW Landfills

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 SHW 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 SHW landfill owner should submit 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.

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

The Crimean strategy originates in a number of documents or decisions issued by the authority from the year 2003.

3.4.1. Resolution of the Supreme Council of the ARC on waste management for the year 2003-2007

The resolution N° 699/3/03 is dated October 22nd 2003

The implementation of the program is requested from the Council of ministers together with the executive committees of the cities councils, while financing the program is of the responsibility of the council of Ministers.

In Brief the resolution calls for:

- Construction of waste processing plants in Simferopol, Kerch, Feodossia, Evpatoria, and of a complex plant in Alouchta and Yalta;
- Construction of waste sorting plants in towns and settlements (The list of which is not given)
- Reconstruction of public company Polyvtor
- Organise collection of packaging and a network of collecting points
- Working on the issue of medical waste treatment with possibly international cooperation as needed
- Processing of agricultural toxic waste at a plant in Simferopol
- Processing of animal carcasses at a plant in Krasnogvardiskoye after it is reconstructed

- Implementation of a strategy for waste minimization, reuse and recycling
- Construction of sanitary landfills

The agencies responsible for implementation of the program or the sources of funds are unclear. The annex states the program direction and in some cases defines a budget as follows:

- For the design of the landfill of Belogorsk, Kirovskoye, Kerch, Sudak, Stary Krym, Feodossia and Dzhankoy, and the construction of the landfills of Simferopol, Yalta, Armiansk, Azovskoye, Volnoye, Krasnogvardeiskoye, Chornomorskoye, and
- Krasnoperekopsk a total budget of 8.7 million UAH was foreseen with implementation in 2003 and 2004.

For the construction of the medical waste thermal treatment plant a budget of 660,000 UAH was foreseen with implementation in 2003 and 2004.

The management and storage of unidentified pesticides planned at a cost of 418,000 UAH in Dzhankoy and Bahchysarai funded by the Ukrainian budget and at a cost of 50,000 UAH in Krasnoperekopsk to be financed locally.

Designing of the waste-processing plants of Simferopol, Kerch, Feodossia, Evpatoria, Sudak, Alouchta, and Yalta was intended in the period 2003 2007 at a cost of 150,000 UAH per site on local budgets, while the construction of the waste processing plant in Simferopol was planned in 2004 2005 through an unspecified investment of 14.5 million €.

It is not known whether the program has been executed or monitored. See English translation in Annexe 1.

3.4.2. General plan of sanitary cleaning of South Coast of Autonomous Republic of Crimea from Solid Domestic Waste

This document is dated 2004. The version is presented as a draft version. It is not known from which institute the document is issued.

It comprises mainly three parts. The first part suggests technologies of treatment which could be applied to the treatment of waste.

The second part relates to the demography and generation of waste in South Crimea coast, including the surplus of quantities generated by tourists.

The third part develops on the laws regulating concession agreement in Ukraine in a general manner with no specific references to waste management.

The technologies proposed call for a sorting of mixed waste in order to recover material followed by baling of the residues (80%) in packets with a density of 1.2.

It is suggested the bales are temporarily stored or transported by sea to incineration plants where they can be treated. Two companies are cited in east Crimea for such treatment:

- The Kamish-Burun Iron ore industrial complex
- The Kamish-Burun co generation heating power plant

The document suggests the site of Kamish-Burun is advisable in order the incineration plant created supplies energy to the district heating network already supplied by the existing power plant. It suggests the ashes and slag produced could be filled in cement or lime clinker manufacturing lines.

An estimation of population per city, with seasonal variations is submitted. Some consequences are inferred for waste treatment choices. This is going to be discussed in the paragraph related to population and waste generation. See English translation in Annexe 2.

3.4.3. Decision of the permanent commission of the Council of Ministers of the Republic dated September 2005

The ministry of construction was to report to the council on the state of execution of the policy defined in October 2003 and reminded above, and to propose an estimate of funds needed within 2006 budget.

The ministry of economy of the ARC (Department of foreign affairs and inter regional cooperation) are to organize a tender calling for investment in waste treatment technologies and organize the supervision of the procedure.

Executive committees of Simferopol, Kerch, Yalta and Feodossia are to define the proposed location of the treatment plants.

The self government are to do the necessary in order:

- the landfill comply with environmental rules and
- to develop waste management methods in order to minimize waste generation, organize a separate collection of recyclable waste and set up four waste treatment plants based on sorting and disposal (Cities of Simferopol, Yalta, Kerch, Feodossia and Evpatoria);
- To develop the marketing of recyclable products by KrymEkoKomResurcy through implementation of fixed and mobile purchasing locations.

The ministry of Construction policy is to report to the council on the fulfilment of the program. See English translation in Annexe 3.

3.4.4. Minutes of meeting on August 18th 2005 on tendering procedures hosted by the Council of Ministers of The Autonomous Republic of Crimea

The meeting basically organized the tendering procedures and extended the delivery of the bids to September 16th 2005.

The analysis of bids submitted dated September 27th 2005 is appended.

Some municipalities had their tender elaborated in parallel, for instance the municipality of Simferopol. See English translation in Annexe 4.

3.4.5. Crimean regional strategy of solid domestic waste management dated January 10th 2006

(Crimean resort territories without waste)

The strategy is elaborated by a number of technical institutes and academies in Ukraine and in Russia:

- The Crimean Academy of Sciences
- The Russian Academy of Natural Sciences
- The Crimean Republican Association “Ecology and World”
- The State Unitary Company “Ecotechprom”, RF, Moscow
- CJSC “Rusutilsyryio”, RF, Moscow
- “Krymtransvtorpererabotka”, Ltd

This strategy is endorsed by Crimea Council of Ministers and Ministry of building policies and architecture and published on January 10th 2006.

It follows the model adopted in the city of Moscow.

The document points out the idle condition of the landfills in Crimea:

- More than 240 uncontrolled landfills in villages
- 28 Municipal landfills which do not follow environment requirements in terms of leach ate control or of maximum storage capacity.

The strategy proposes the following measures:

A first stage of emergency measures

- Organise waste collection in every city block;
- Introduce separate collection of waste in shopping areas with containers for plastic, paper and cardboard;

- Install container for plastic collection in residential areas;
- Develop for the major cities waste treatment plants close to the landfill and based on sorting the waste, marketing the recyclables (Plastic, paper, cardboard and metals are considered) and pressing 80% of residual waste into bales at a density of 1.5 prior to landfilling;
- Create sanitary landfill sites to receive the pressed residues from the sorting centres. It is also suggested it receives bales processed from landfill mining of old critical sites;
- Organize a transfer by sea or by heavy trucks (36 tons payload) of the bales generated in the above process from the south Crimea region to a Western landfill. This landfill is to be located to the border of the Simferopol and Saki rayons on the Simferopol elevation;
- Organize the closure of the village's landfills;
- The program is supported by the company Krymtransvtorpererabotka of Simferopol which is a candidate as an investor.

The second stage proposed is as follows:

- Creation of a waste treatment plant in Western area adjacent to Western landfill with a capacity of 278,000 tons per year to serve the needs of South cost (100,000 tons), of Simferopol (120,000 tons), Saki (18,000 tons) and Evpatoria (40,000 tons). This plant would implement waste to energy treatment. It is suggested the process would be coupled with the local limestone quarrying industry and that ashes from incineration would be mixed with limestone in order to manufacture concrete stones.
- Creation of a Northern waste treatment plant in the clayey geosynclinals area of Armiansk and Krasnoperekopsk. It is mentioned that waste is buried at present in the sites of Razdolnoye and Pervomayskoye in addition to the sites above. It says that a common process should be implemented to care for the household waste and industrial waste produced here (Phosphate gypsum and sulphuric acid sludge) but does not elaborate.
- Creation of a north eastern waste treatment plant in the litho logical area between Dzhankoy and Nizhnegorsky. The quantity of household waste produced here is estimated to 70,000 to 100,000 tons per year. It is proposed to extend the life of local landfills and to implement later a common process of domestic and industrial organic waste by anaerobic digestion. The document does not elaborate further.
- Creation of an eastern waste treatment plant in the Kerch peninsula to serve Kerch and Leninskiy rayon (70,000 to 100,000 tons of domestic waste, and 100,000 tons of industrial waste yearly). It is proposed to create an eastern sanitary landfill with a similar concept than the one developed for the western area. It is then proposed to create an incineration plant with the possible use of electricity and heat to process the ferriferous sludge from the Kamysh Burun iron industrial complex into an iron ore concentrate. This is proposed to be done through a pyrolysis process which would use the organic waste and process the metallic sludge with as outputs a reduced powdered iron, pyrocarbon and crude oil.

See English translation in Annexe 5.

3.4.6. Decision of the Council of Ministers dated February 24, 2006, N° 85

Treatment of waste in Crimea tends to be further organized under this decision of the Council of Ministers of The Autonomous Republic of Crimea, which calls for the implementation of waste sorting centres in:

- Alouchta,
- Armiansk,
- Dzhankoy,
- Evpatoria,
- Kerch,
- Krasnoperekopsk,
- Saki,
- Simferopol,
- Sudak,

- Feodossia,
- Yalta,
- Bahchysarai,
- Belogorsk,
- Stary Krym,
- Shchelkino,
- urban villages Krasnogvardeiskoye
- Lenin,
- Nizhnegorsky,
- Pervomaiskoye,
- Razdolnoye,
- Sovetskiy,
- Chernomorskoye.

It also suggests waste disposal plants in the cities of:

- Saki,
- Simferopol,
- Leninsky districts,
- Alouchta,
- Kerch.

The local governments are requested to define before July 1st 2006 places for implementation of the project.

There are two further requirements of the decision:

- That a tender be issued (or organized, or proposed) by the Ministry Construction, Architecture, Housing and Municipal Economy for the choice of technologies of waste disposal after preliminary sorting;
- That the Ministry of economy together with the Ministry above and the Republican Committee of land resources propose a location for two interregional landfills for residual waste.

The decision in itself does not define a program or objectives for the waste treatment such as those found in international legislation. It is more an intention of setting up a program. The issues of financing the program are not addressed. See English translation in Annexe 6.

3.4.7. Comments to the administrative or political decisions brought to our knowledge

The decisions above are difficult for the consultant to comment. There seems to be a logical succession of technical choices heading to the same direction but with decisions which sometimes contradict each other.

The decisions have been done according to the following trend:

- Design or construction of 15 regional landfills, 7 waste processing plants, waste sorting centres in towns and settlements in an undefined number were planned in the October 2003 decided program
- Decision on September 2005 calls for the implementation of waste sorting centres in Simferopol, Kerch, Evpatoria, Kerch and Yalta with, in parallel, development of separate collection of recyclables. These municipalities, except Evpatoria are requested to define a plot of land in order to host the future plant. The tender for proposal from private partners for treatment of the waste in these places is issued. The state company KrymEkoKomResurcy is suggested to be the agency to market the resource recovered.
- Analysis of bids is done in September 2005. It appears that the second envelops for the bids submitted have not been opened. The decision taken is to follow with negotiations with two promoters of mixed waste sorting plant out of which the company UkrEkologia (With an imported Swedish technology) and

the company UkrEkoKomResurcy with a local technology. The tender documents have not been submitted to the consultant, therefore the number or locations of projects concerned are not known.

- Strategy on waste treatment in Crimea published on January 10th 2006. This move appears to be in parallel with the sequence of decisions listed above although it is endorsed by Council of ministers. The proposal comprises in the short-term creation of waste sorting plants with baling the residues to a density of 1.5 in the major cities of Crimea, which are not listed, and land filling the residues in regional landfills with one to be created in the "Western area" between Saki and Simferopol. This scheme is complemented by a transfer of residual waste by sea or by road from the south sea cost of Crimea to the above mentioned landfill. Four waste to energy (Incineration) treatment plants are proposed in the longer term in the areas of Saki-Simferopol (Western landfill), Armiansk-Krasnoperekopsk (North), Dzhankoy-Nizhnegorsky (North east) and Kerch (East). Synergies with industrial waste treatment are proposed in some of these locations.
- The last decision on February 24th 2006 requests implementation of waste sorting centres in every city in Crimea (City under control of the republic of Crimea or under the control of Ukraine), of waste disposal plants in Saki, Simferopol, Leninskiy, Alouchta and Kerch, the method of disposal being not mentioned and of two inter regional landfills. A tender is envisaged to call for proposals of treatment techniques on residual waste once it has been sorted.

3.4.8. General comment on the project logic

The decision above generally favours a modern approach of the waste management including separate collection and sorting of recyclables.

But lot of questions are not answered to:

- Have the financial means necessitated by a comprehensive waste management been gathered?
- How is the financing of separate waste collection and sorting going to be organized?
- Has it been decided by governing bodies to continue collecting the fees or to give the waste collection and treatment as a concession to companies in which case payment is done via a fee paid by waste producers?
- Have the municipalities engaged expenses required by waste collection (Drop off stations, individual containers, trucks etc)?
- Are the sorting centres meant to be used for sorting waste separated at source or not, and if yes, what is the program the municipalities or the governing bodies intend to implement for separate collection?
- Who is going to invest and operate equipment?

It is not known whether the promoters of waste sorting stations propose to take the waste for free or require to be paid for it.

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 could be the main source of financing of construction of these

facilities. But for 2006 this fund is only 1 mln UAH that are allocated to the construction of the landfills of Krasnoperekopsk and Dzhankoy.

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. Global action programme or Regional Strategic SHW Management Plan

For the moment, there's nothing in Crimea that could be called an action programme or a strategic plan. The SHW are collected and disposed in some cities and settlements. The Government of Crimea dreams that miraculously private investors will solve the problem.

3.6. Long-term political objectives

3.6.1. To reduce the risks while controlling the costs

The household waste provoke in the whole ARC 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. Moreover, the main activity is the tourism and the beaches are regularly invaded of plastic bags and waste.

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 ARC.

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.

3.6.2. 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.

3.6.3. 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

3.6.4. 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.

3.7. Strategic objectives

3.7.1. Awareness of the importance of waste problems

In the first phase 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 2 million inhabitants that to throw waste anywhere constitutes an un-civic and reprehensible act, and that to burn household waste is a hard attempt to environment and makes run important in term sanitary risks. Specific campaigns must address the tourists during summer.

3.7.2. 100% waste collection services paid by inhabitants in 2011

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 ARC, 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 2011.**

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. The Universal Payment Centre has been successfully experienced in other regions. It's a way to simplify the payment by the users and a way to improve the recovery rate.

The question of a tax on tourism remains. The organisations as sanatoriums and hotels already pay for the waste management throughout the contracts they have passed with local utilities. For tourists housed in the family or renting private rooms, the inhabitants pay on the base of the official number of people living in the home (if they pay) as registered by the JEKs. The question is: should it be created a registration procedure for 1 million tourists or more in aim to collect fees for the public utilities?

3.7.3. 100% of household waste collected in 2011

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 2011. 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.

3.7.4. 100% of ultimate waste in sanitary landfills in 2016

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 ARC.

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 2016.

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 ARC.

3.7.5. Development of recycling capacities

The State Programme of Solid Household Waste Treatment envisages up to 2015 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 ARC as well as a heavy load on the atmosphere caused by human activities, the priority in solid household waste treatment in ARC 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 2015 it should be good to start in the ARC 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.

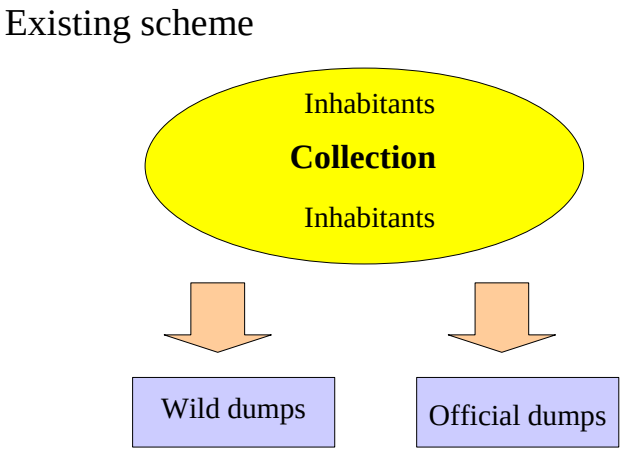
1. The regional scale cannot be considered as exclusive. Most of the facilities for recycling the secondary raw materials must be planned as a rule at the national level. A glass factory or paper mill for instance must be designed with a capacity, which exceeds the amount of glasses or paper able to 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 must not be used for competing with private entrepreneurs, and to risk money of taxpayers 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 ARC 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 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.

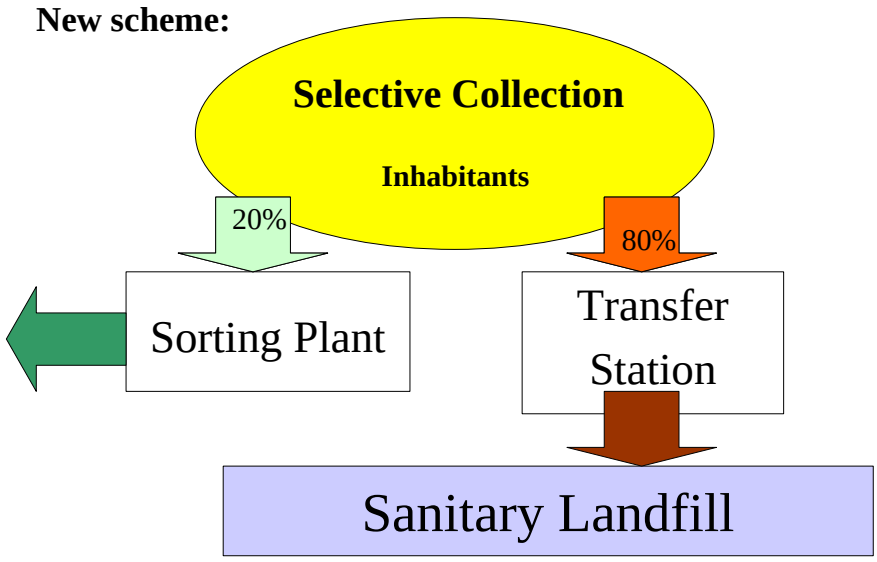
3.7.6. Experimentations of alternative management

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 2015. 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.

3.7.7. 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.

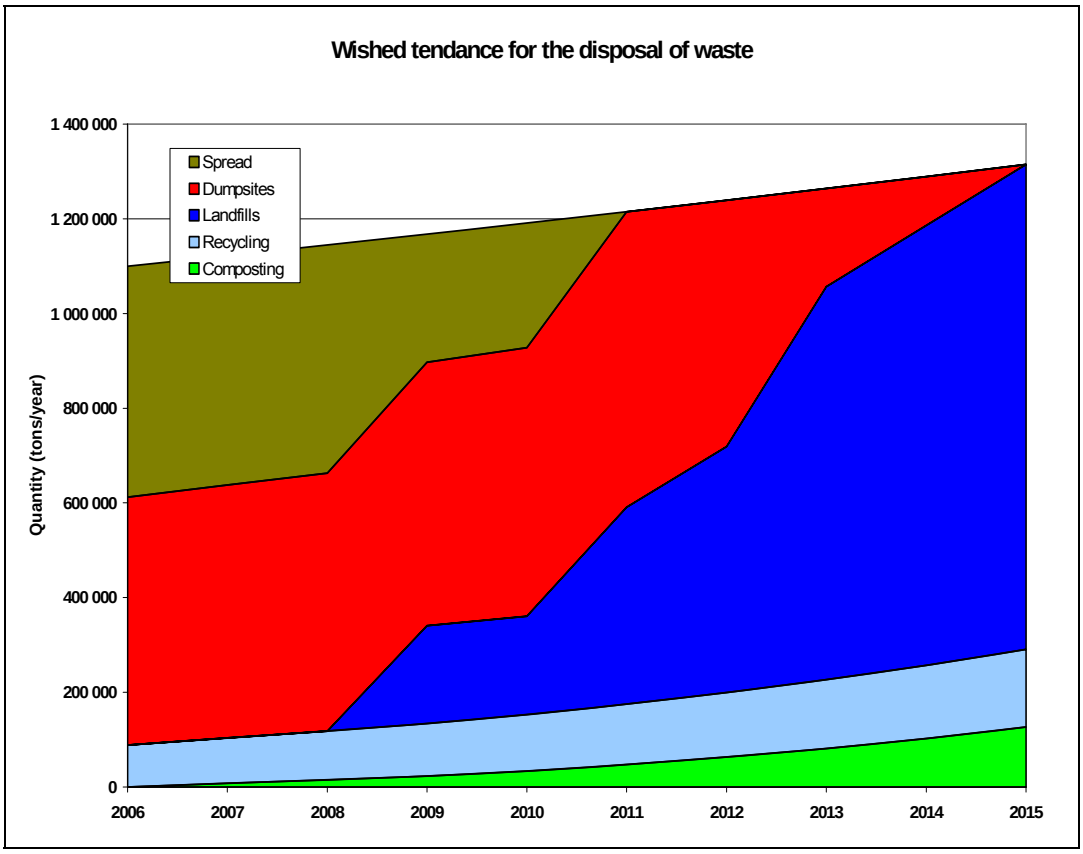




The following Graph 2 shows the tendencies of development of household waste treatment techniques:

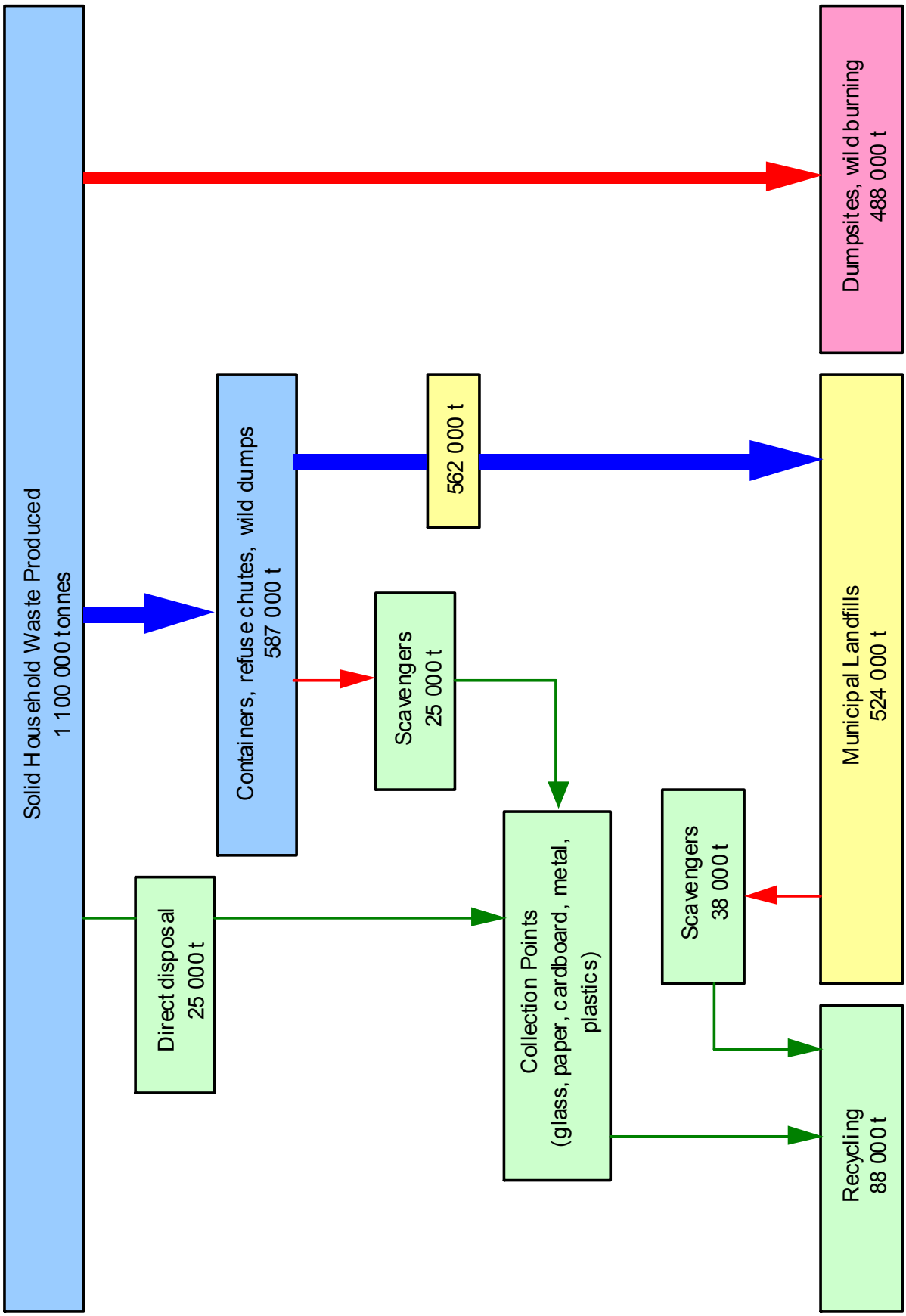
- at the base, a development of composting and recycling;

- 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).

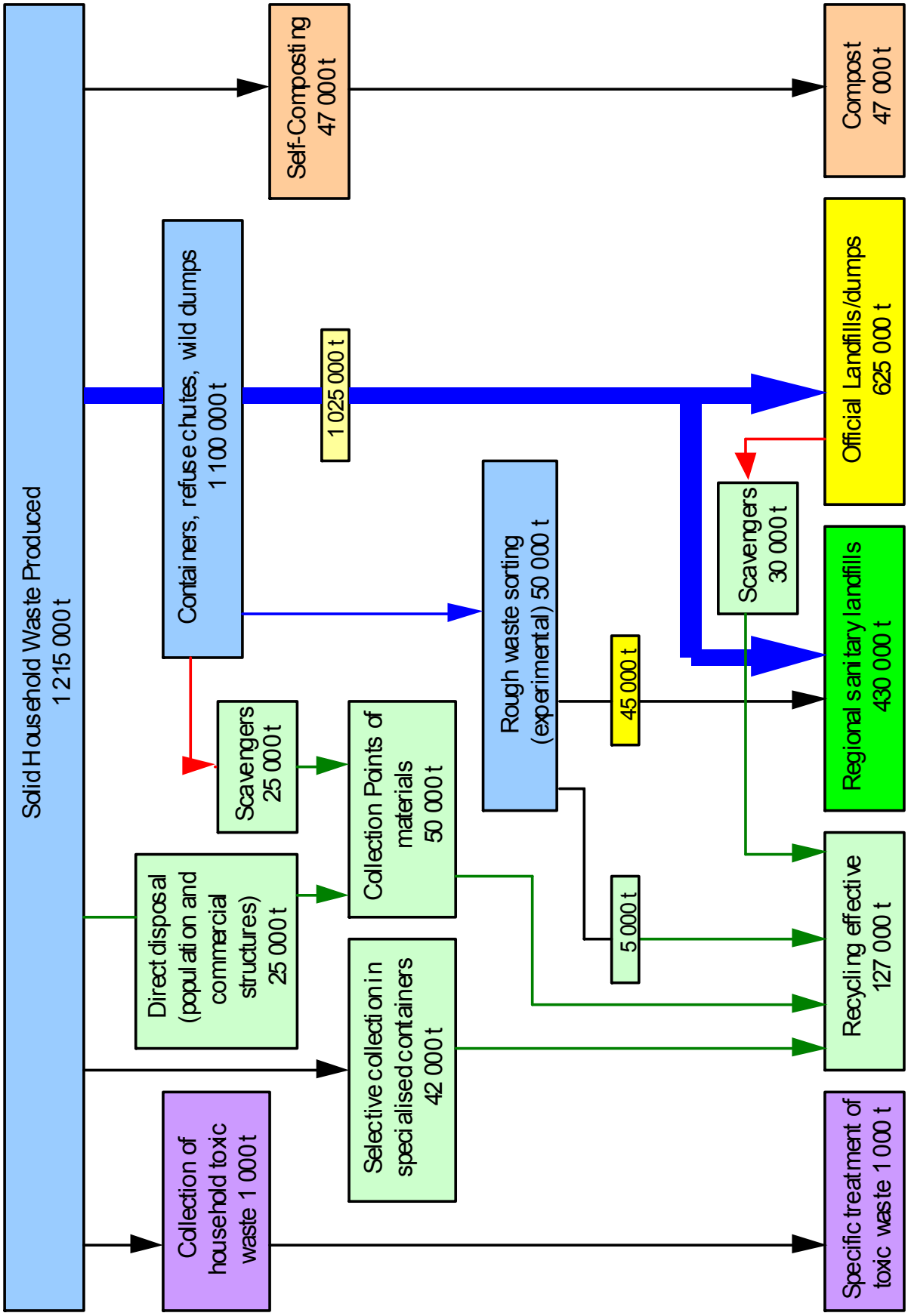


Graph 2 Evolution of the disposal to be scheduled, in size order, by type of disposal

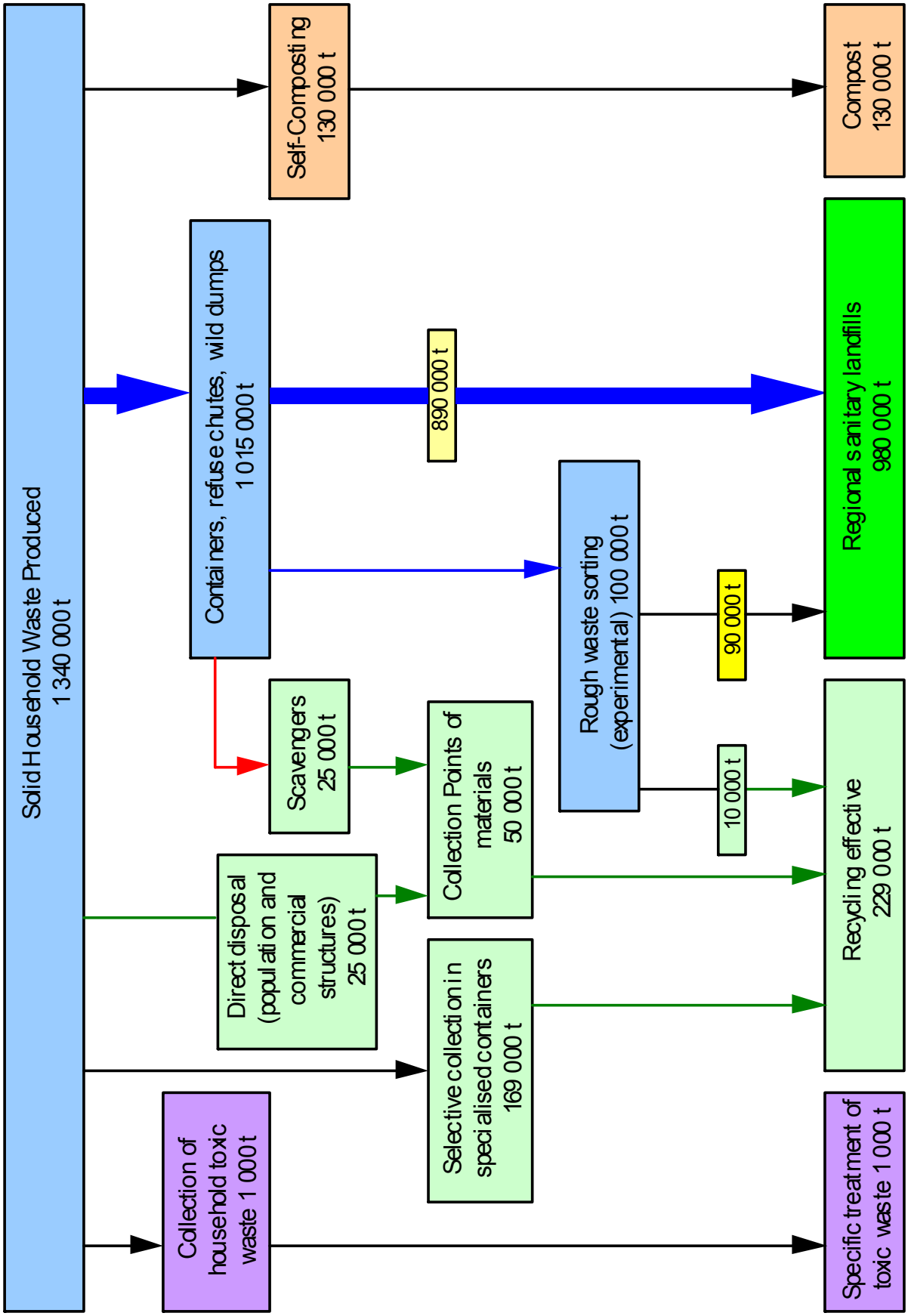
The quantities of SHW in 2006 and foreseen for 2011 and 2016 are resumed on the three following synoptics. The techniques of waste treatment are generally presented at the following three schemes.



Graph 3 Situation assessed in 2006



Graph 4 Objectives 2011



Graph 5 Objectives 2016

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

3.8.1. Action priorities

The priority actions by years must be defined in accordance with the objectives set for 2011 such as 100% collection of SHW and 100% collection of payments from the population at the whole territory of the ARC 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 ARC 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.

3.8.2. Programme 2007

3.8.2.1. To implement the toolboxes

- Computerization of the fees
- Research of funding
  - 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.

3.8.2.2. Waste collection

For the year 2007 the task for the **ARC 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.

3.8.2.3. 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	9.00	UAH/inh/y

3.8.2.4. Recycling

Development of the selective collection in Simferopol

3.8.3. Programme 2008

3.8.3.1. First sanitary landfill

Construction of the 1st sanitary landfill for the city of Simferopol, the rayons of Bahchysaraiskiy and Simferopolskiy, and eventually the city of Sevastopol.

Construction of 2 transfer stations

Purchase of the necessary waste transfer semi-trailers

3.8.3.2. 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

3.8.3.3. 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	10.00	UAH/inh/y

3.8.3.4. Recycling

Implementation of the selective collection and a sorting facility in Yalta

3.8.4. Programme 2009

3.8.4.1. Second sanitary landfill

Construction of the 2nd sanitary landfill for the cities of Yalta and Alouchta

Construction of 3 transfer stations

Purchase of the necessary waste transfer semi-trailers

3.8.4.2. 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

3.8.4.3. 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	11.00	UAH/inh/y

3.8.4.4. Recycling

Implementation of the selective collection and a sorting facility in Kerch

3.8.5. Programme 2010

3.8.5.1. Third sanitary landfill

Construction of the 3rd sanitary landfill for the cities of Evpatoria and Saki, and the rayons of Sakskiy and Chornomorskiy

Construction of 2 transfer stations

Purchase of the necessary waste transfer semi-trailers

3.8.5.2. 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.

3.8.5.3. 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	12.00	UAH/inh/y

3.8.5.4. Recycling

Implementation of the selective collection and a sorting facility in Evpatoria

3.8.6. Programme 2011

3.8.6.1. Fourth sanitary landfill

Construction of the 4th sanitary landfill for the city of Sudak and the rayons of Bilohisrkiy, Kirovskiy and Sovetskiy.

Purchase of the necessary waste transfer semi-trailers

3.8.6.2. 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

3.8.6.3. 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

3.8.6.4. 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 ARC, so around 2.1 mln people.

Based on 2005 figures, only 35% were regularly collected and no landfill meets the international standards.

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 ‰

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.

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 2006 and 2007. The first pedagogical equipment has been designed and taken in charge by Tacis for the pilot-project in Slaviansk and it can be used in Crimea. 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 should 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

If the Government of Crimea decides to launch a Regional Solid Household Waste Management Strategic Plan, it should be 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 should be informed of the draft plan and invited to take knowledge of it. The Government of Crimea, the Parliament of Crimea, 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 should 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 should be synthesized in a report. This report should be sent to the ad hoc working group who will answer point by point.

4.2.5. Elected, administrative executives and local officials

The Plan should be transmitted to a maximum of elected people, of administrations executives, of economics leaders, of journalists, of intellectuals, etc. It should be necessary to publish a periodic bulletin which should 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 SHW Management Plan. As an option, such a bulletin can be published in a local newspaper.

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. The same job should be done in Crimea.

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. Inhabitants

The cities of the Autonomous Republic of Crimea have been subject to a systematic visit by the consultant. A detailed questionnaire is submitted at the time of the visit the result of which is given below (Table 11, Map 4 and Map 5):

Cities, Rayons	Popula-tion	Household waste		Commer-cial Waste	Municipal waste	Total	Density	Production
	1000	m^3	tonnes	m^3	m^3	m^3	t/m^3	m^3/inh/y
AR Crimea	**1,994.3**	**1,203,993**	**386,590**	**310,320**	**323,621**	**2,054,334**	**0.321**	**1.882**
Cities	**1,091.7**	**1,170,800**	**356,508**	**274,090**	**313,392**	**1,853,282**	**0.304**	**1.698**
Alouchta	52.6	76,000	23,560	6,000	60,000	142,000	0.310	2.700
Armiansk	25.2							
Dzhankoy	40.5	21,100	6,800	5,700	43,000	69,800	0.322	1.723
Evpatoria	121.7	142,700	46,400	20,800	46,500	210,000	0.325	1.726
Kerch	152.6	121,200		63,200	40,600	225,000	0.000	1.474
Krasnoperekopsk	30.8	20,200	6,060	13,325	779	34,304	0.300	1.114
Saki	27.1					65,000		
Simferopol	363.3	557,800	200,808	3,542	65,246	626,588	0.360	1.725
Sudak	28.6					30,000		
Feodossia	106.6	88,000	26,000	12,000	8,700	108,700	0.295	1.020
Yalta	142.7	143,800	46,880	149,523	48,567	341,890	0.326	2.396
Rayons	**902.6**	**33,193**	**30,082**	**36,230**	**10,229**	**201,052**	**0.906**	**0.223**
Bahchysaraiskiy	90.7							
Bilohisrkiy	64.8	5,000	1,650	3,500	2,075	10,575	0.330	0.163
Dzhankoiskiy	78.8							
Kirovskiy	55.8	8,100	2,700	10,000	2,300	20,400	0.333	0.366

Krasnohvardiyskiy	91.7					16,000		0.174
Krasnoperekopskiy	30.9	8,450	18,435	830	2,544	11,824	2.182	0.383
Leninskiy	66.3							
Nyzhniohirskiy	53.5					12,000		0.224
Pervomayskiy	38.2	1,200	2,520	4,200	310	5,710	2.100	0.149
Rozdolnenskiy	35.7					15,000		0.420
Sakskiy	78.5					78,400		0.999
Simferopolskiy	149.8							
Sovetskiy	35.3							
Chornomorskiy	32.6	10,443	4,777	17,700	3,000	31,143	0.457	0.955

Table 11 Collected SHW according to the Questionnaire

Although not all of the cities had been visited at the time of doing this report, the data on population, waste tonnage and waste volumes for 2005 were available from the central government.

The data above give a ratio of 3.9 litres per person and per day.

The waste presented here may also include waste outside of the categories of household waste:

- Bulky waste
- Park waste
- Industrial and commercial waste

The accuracy of data is of importance as it commands the size of landfill sites and of transfer stations.

The transfer to be implemented cannot take into account waste which basically are not part of the household waste or can be treated in the vicinity of their place of production.

We don't know how the tonnages of waste are obtained as waste is generally not weighed in Ukraine. It may be that waste tonnage is estimated from the number of waste trucks arriving to the plant or from waste volumes which are also estimated.

A calculation has been done by the consultant with the volumes of waste per year indicated above (in m^3) and an average density of 0.35.

Results show an average value of waste produced per person and per day of 0.65 kg/person and per day although there is a variation from 0.2 to 9.6.

Therefore a conservative ratio of 1kg per person and per day may be taken in order to define the size of the landfills and the transfer to the treatment point.

5.1.3. Commercial waste

The tariffs for the enterprises and institutions are established for the whole administrative-territorial unit by the local administrations, depending on the type of activity.

Waste Source	Unit	Average daily rate, m^3	Average annual rate, m^3
Hotel	bed	0.00159	0.582
Hostel	bed	0.00143	0.524
Hospital	bed	0.00250	0.915
Polyclinic	patient	0.00063	0.019
Sanatorium, holiday hotel	bed	0.00274	1.000
Preschool institutions	bed	0.00117	0.292
Higher and vocational educational institutions	student	0.00047	0.116
School	pupil	0.00038	0.095
Boarding school	pupil	0.00208	0.520
Professional school	student	0.00190	0.476
Manufactured goods shop	m^2	0.00083	0.251
Grocery	m^2	0.0058	0.475
Outdoor retail outlets (holiday season)	m^2	0.0070	

Market	m²	0.00030	0.109
Restaurant	dish/day	0.00033	0.120
Café, canteen	dish/day	0.00018	0.077
Outdoor café (holiday season)	seat	0.01	
Warehouse	m²	0.00022	0.055
Administrative and public institutions/organisations	workplace	0.00124	0.310
Entertainment sites	seat	0.00046	0.166
Consumer services enterprises	workplace	0.0028	0.924
Railway station, airport, bus/coach station	m² of passenger area	0.00168	0.614
Camping, parking lots	parking cell	0.0066	2.408
Beach (holiday season)	m²	0.00019	

Table 12: SHW accumulation rates for the public, administrative, and cultural institutions

Notes:

The standard rates do not include yard waste (sweepings, leaves, branches), which make additional annual waste load on each square meter:

- for improved territories - 0.012 m^3
- for unimproved territories - 0.02 m^3
- lanes and open areas in parks an squares - 0.008 m^3.

The standard rates for the sites, not listed in the table, are deduced from similar sites. If there is no similar site - the actually measured accumulation rate is used.

In case of container system the billing is based on the container capacity.

5.1.4. Tourists

Tourism is a seasonal business, typically being active only during 4 to 5 months. Compared to its 150,000 residents, Yalta alone claims to have more than 2 million visitors in summer, with population temporarily increasing to 850,000, a more than 6.5-fold increase. For the waste management, it's a big problem: 1) for collection: to size the equipments for 8 months (permanent inhabitants) or for 4 months (the season) when the volume is multiplied by 5; 2) for disposal: what are the real yearly volumes to dispose.

So we'll try to determine a size order of the incidence of tourism on waste management. The tourists are generating waste in public areas (beach, café, restaurant) and in the place they live (sanatorium, hotel, camping, secondary residence, inhabitants).

Hereafter (Table 13) are the official[6] statistics about tourism in Crimea.

Region	Number of sana-toriums	Capacity of beds	Number of tourists in sanatoriums		Number of tourists in private homes		Number of tourists in camping & other	
			2004	2005	2004	2005	2004	2005
Yalta	144	37,594	483,163	515,168	403,610	399,808	79,553	115,360
Alouchta	84	23,747	193,956	201,635	178,772	180,055	15,184	21,580
Evpatoria	71	30,540	233,000	249,300	209,400	231,900	23,600	17,400
Sudak	24	6,706	66,610	68,615	52,010	57,000	14,600	11,615
Feodossia	64	13,064	144,356	152,602	79,707	80,162	64,649	72,440
Saki	14	5,103	56,565	56,811	39,500	39,747	17,065	17,064
Kerch	36	4,559	33,545	35,070	19,879	21,560	13,666	13,510
Bahchysaraiskiy	21	6,849	39,760	41,023	39,462	40,500	298	523
Leninskiy	49	5,697	33,205	33,627	13,622	13,915	19,583	19,712
Rozdolnenskiy	16	2,726	13,996	15,428	11,578	12,357	2,418	3,071
Chornomorskiy	40	5,131	37,667	37,235	22,667	22,135	15,000	15,100
Simferopolskiy	45	5,624	35,933	37,490	33,185	33,522	2,748	3,968
Sakskiy	25	4,136	28,250	18,211	11,000	10,906	17,250	7,305

[6] These statistics are based on forms that the people housing tourists (hotels, sanatoriums, but also individuals) must fill in aim to pay taxes (see in appendix), so they are under the reality.

Total	633	151,476	1,400,006	1,462,215	1,114,392	1,143,567	285,614	318,648

Table 13 Crimean statistics on Tourism

The State Administration of Tourism of Ukraine provides another Table 14 giving other figures for 9 months 2005:

Administrative Unit	Number of enterprises providing services		Number of tourists				Excursions	Amount of provided services	Payments to the Budget	Average number of employees
			Total	Foreign	Crimean going outside	Local				
	Number	% Ukraine	People	People	People	People	People	th UAH	th UAH	People
AR Crimea	324	*12.7*	317,903	104,223	2,881	210,799	361,663	413,481	16,263	3,919
Sevastopol	113	*4.4*	130,986	57,536	9,621	63,829	196,135	108,719	2,049	806

Table 14 State statistics on Tourism

For the SHWM, the objective is to determine the number of "nights" (according to the usual terminology of tourism industry).

- Sanatoriums and hotels

From 15 June to 15 September, the high season, it's quite impossible to find a room without to reserve several months ago. So for 90 days, the beds capacity is full. From 1st May to 15 June and from 15 September to 30 October, the low season, the week-ends are rather full and we can take an occupation rate of 1/3.

Saki is a particular case. This place is famous for the treatment of handicapped people and the sanatoriums of Saki and Sakskiy Rayon are full all year long, so 9239 beds.

- Private homes

It's an old tradition from former USSR. Within the resort area (the coast from Evpatoria to Feodossia), people house cousins and relatives coming from all CIS. As size order, we can consider that half the families are housing another family for two months each summer, so 325,000 tourists for 60 days.

- Camping and other

It's difficult to appreciate this type of tourism. According the official Crimean statistics, it should be 1/3 of the figures of the sanatoriums during the high season.

- Holiday homes

For the last years there's a boom of the construction of holiday apartments. This phenomenon adds to the existing holiday homes of the former "nomenklatura". Unfortunately, if we know that they are occupied around 60 days per year, there are no figures about the relevant number of tourists. We can only estimate it's ~100,000.

- Rough estimation

With all these figures, we can estimate the number of "beds" to ~700,000 per year, generating ~80,000 t SHW. It means also that during the high season, it's necessary to collect, in addition to the usual, ~950 t/d or ~3,800 m^3/d.

Housing	Season	Tourists	Days	"Nights"	Additional SHW collection				SHW production	
					High season		Low season			
					t/d	m^3/d	t/d	m^3/d	t/y	m^3/y
Sanatoriums	High	151,476	90	13,632,840	227	908			20,449	81,796
	Low	50,492	90	4,544,280			76	304	6,816	27,264
Saki	Year	9,239	365	3,372,235	-	-	-	-	5,058	20,232
Home	High	325,000	60	19,500,000	488	1,952			29,250	117,000
Holiday home	High	100,000	60	6,000,000	150	600			9,000	36,000
Camping	High	50,492	90	4,544,280	76	304			6,816	27,264
TOTAL		686,699		51,593,635	941	3,764	76	304	77,389	309,556

Table 15 Estimation of tourism SHW

Another approach is to use the figures of the Table 13. A calculation can be done on the base of an average duration of holidays as Table 16:

	Total		Number of tourists in sanatoriums		Number of tourists in private homes		Number of tourists in camping & other	
	2004	2005	2004	2005	2004	2005	2004	2005
Duration of holidays			14	14	21	21	21	21
tonnes/year	58,800	61,413	23,520	24,565	28,083	28,818	7,197	8,030

Table 16 Estimation of tourism SHW

These figures cannot include the holiday homes and so they are of the same size order than with the previous method (~80,000 t).

5.1.5. Tonnage

As nowadays in Ukraine even if there is a state primary registration of data, the single form of state statistic reporting concerning the volumes of household waste generated, disposed and accumulated, has been modified without instruction leaflet and local administrations put the figures they can, 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 in ARC 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 in Crimea are the following:

Groups of residences	***Localities with the population of >10,000 people***	***Localities with the population of <10,000 people***
Buildings with all modern conveniences (gas supply, centralized heating system, water supply, sewerage)		
- with refuse chutes	1.20	1.23
- without refuse chutes	1.09	1.12
Buildings with modern conveniences (without water supply and sewerage)		
- with gas heating	1.19	1.19
- with coal heating	1.20	1.20
Buildings with no modern conveniences (without water supply and sewerage)		
- with gas heating	1.28	1.28
- with coal heating	1.30	1.30
Private sector houses with homestead land of approved area		
- with gas heating	1.45	1.45
- with coal heating	1.50	1.50

Table 17 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.

Thus, the only one actual way to estimate the quantities of produced waste should consist 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 ARC should comprise about **732,000 tons per year** (335,000 tons for individual housing and 397,000 tons for collective housing).

Housing	Rate	Population	Norm	Tonnage
	%	inh	kg/inh/y	t
Private sector	29	578,300	580	335,414
Collective buildings	71	1,416,000	280	396,480
TOTAL	100	1,994,300		731,894

Table 18 Calculation of the estimated production of SHW

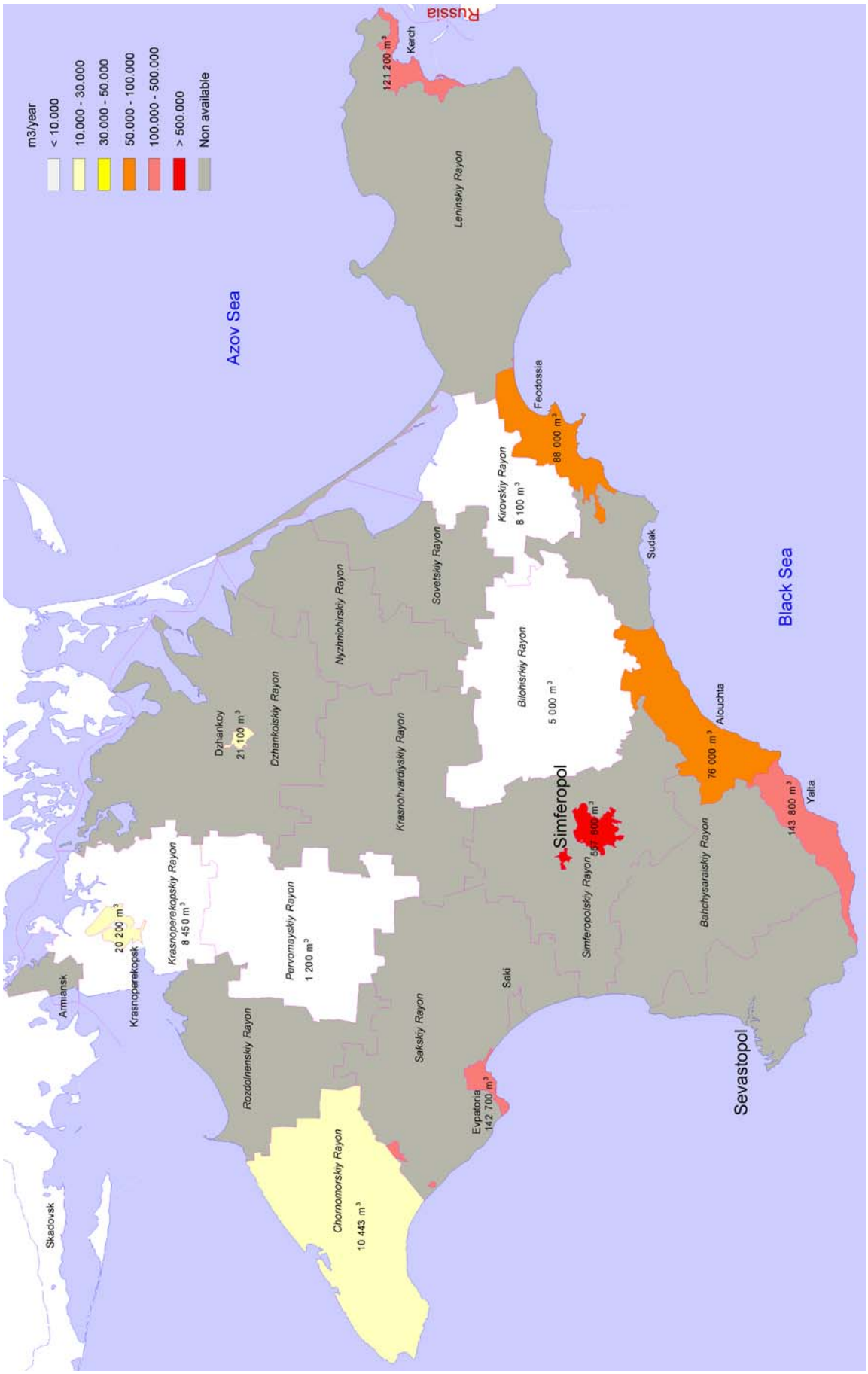
A more detailed calculation has been made with the figures of the population given in the questionnaire. This estimation is: **710,000 tons per year** (Table 19 and Map 6).

Region	Population	SHW Production	
	1000	1000 m^3	1000 t
AR Crimea	**1,994.3**	**2,840.7**	**710.2**
Cities	**1,091.7**	**1,535.9**	**384.0**
Alouchta	52.6	76.7	19.2
Armiansk	25.2	33.8	8.5
Dzhankoy	40.5	53.5	13.4
Evpatoria	121.7	171.4	42.9
Kerch	152.6	214.9	53.7
Krasnoperekopsk	30.8	40.7	10.2
Saki	27.1	38.2	9.6
Simferopol	363.3	511.5	127.9
Sudak	28.6	42.3	10.6
Feodossia	106.6	151.8	38.0
Yalta	142.7	201.1	50.3
Rayons	**902.6**	**1,304.8**	**326.2**
Bahchysaraiskiy	90.7	17.0	34.3
Bilohisrkiy	64.8	91.5	22.9
Dzhankoiskiy	78.8	15.0	28.8
Kirovskiy	55.8	79.5	19.9
Krasnohvardiyskiy	91.7	131.5	32.9
Krasnoperekopskiy	30.9	45.4	11.4
Leninskiy	66.3	93.9	23.5
Nyzhniohirskiy	53.5	77.2	19.3
Pervomayskiy	38.2	54.8	13.7
Rozdolnenskiy	35.7	50.9	12.7
Sakskiy	78.5	114.5	28.6
Simferopolskiy	149.8	216.9	54.2
Sovetskiy	35.3	50.4	12.6
Chornomorskiy	32.6	46.3	11.6

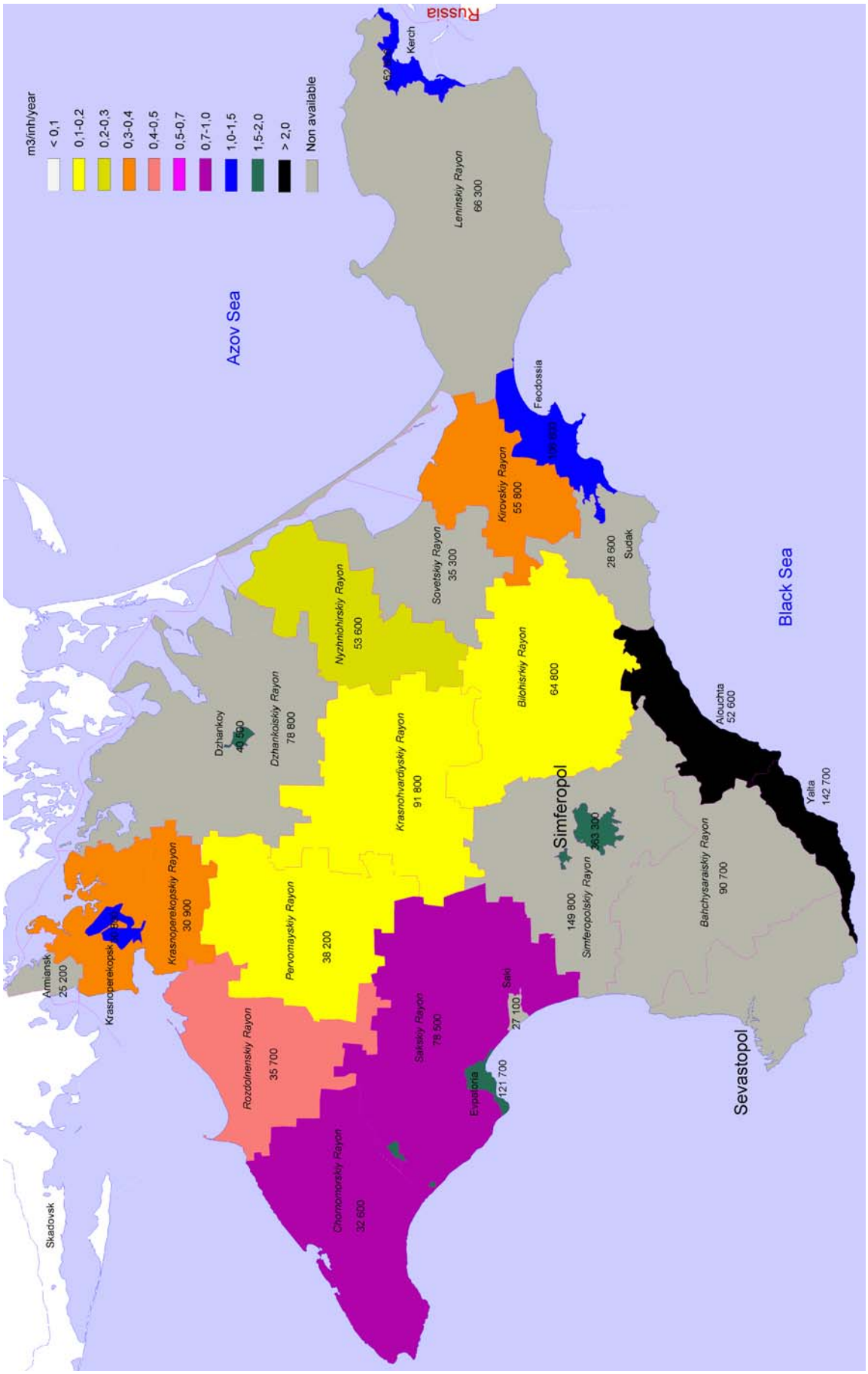
Table 19 Calculation of the production of SHW

But the data obtained by asking all administrative units of the ARC involved in the field of waste treatment are very far of this theoretic production. We have asked in 2006 the collected quantities in m^3 and in tons for the year 2005. In this Table 11 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 not 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. The results[7] are 1,203,993 m^3 as Household waste, 310,320 m^3 as Commercial waste, and 323,621 m^3 as Municipal waste, for a total of 2,054,334 m^3. For Household waste, it's declared as 310,320 tonnes.

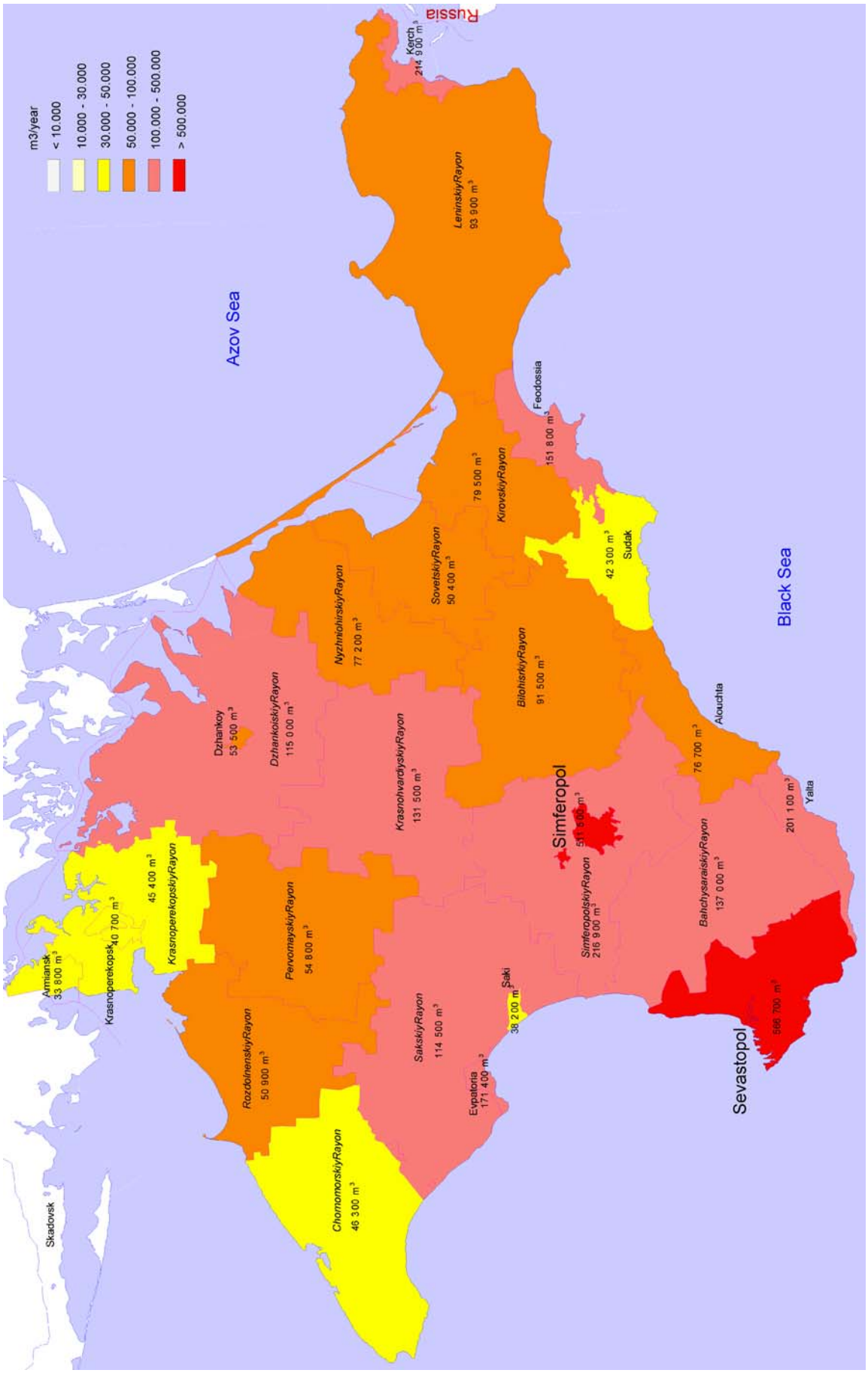
[7] Very often the obtained figures are based upon the capacity of the collection containers and the number of truck rounds.



Map 4. SHW Production and Disposal by Administrative Units (m^3/year)



Map 5. Collection of SHW per inhabitant (in m^3/y)



Map 6 Theoretical productions of the administrative units

5.1.5.1. Quality of the information

The data provided in Table 11 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 ARC. 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.

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 at special weighting equipment which transfers the data in a computer format. Such a system allows to receive true data.

5.1.5.2. True figures?

Aggregating all the figures, we get the Table 21:

	Population (2005 in 1000s)	Households	Tourists[1]	Commercial waste[2]	Municipal waste[2]	TOTAL 2006	2011[3]	2016[3]
Total	***1,994.3***	***727,920***	***75,172***	***174,998***	***135,614***	***1,113,704***	***1,229,617***	***1,357,597***
Cities	***1,091.7***	***398,471***	***66,440***	***128,922***	***113,204***	***707,037***	***780,624***	***861,872***
Simferopol	363.3	132,605		*20,000*	20,000	172,605	190,569	210,404
Alouchta	52.6	19,199	9,810	*2,000*	*2,000*	33,009	36,445	40,238
Armiansk	25.2	9,198		1,900	14,333	25,431	28,078	31,000
Dzhankoy	40.5	14,783		6,933	15,500	37,216	41,089	45,366
Evpatoria	121.7	44,421	12,173	21,067	13,533	91,194	100,685	111,164
Kerch	152.6	55,699	1,640	*20,000*	*5,000*	82,339	90,909	100,371
Krasnoperekopsk	30.8	11,242		*1,000*	*1,000*	13,242	14,620	16,142
Saki	27.1	9,892	7,701	1,181	21,749	40,522	44,739	49,395
Sudak	28.6	10,439	3,313	*1,000*	*1,000*	15,752	17,391	19,201
Feodossia	106.6	38,909	7,093	4,000	2,900	52,902	58,408	64,487
Yalta	142.7	52,086	24,710	49,841	16,189	142,826	157,691	174,104
Rayons	***902.6***	***329,449***	***8,732***	***46,077***	***22,410***	***406,667***	***448,993***	***495,725***
Bahchysaraiskiy	90.7	33,106	2,016	*1,000*	*1,000*	37,122	40,985	45,251
Bilohisrkiy	64.8	23,652		1,167	692	25,510	28,165	31,096
Dzhankoiskiy	78.8	28,762		*3,000*	*3,000*	34,762	38,380	42,375
Kirovskiy	55.8	20,367		3,333	767	24,467	27,014	29,826
Krasnohvardiyskiy	91.7	33,471		*1,000*	*1,000*	35,471	39,162	43,238
Krasnoperekopskiy	30.9	11,279		277	848	12,403	13,694	15,119
Leninskiy	66.3	24,200	1,542	*2,000*	*2,000*	29,742	32,837	36,255
Nyzhniohirskiy	53.5	19,528		*2,000*	*2,000*	23,528	25,976	28,680
Pervomayskiy	38.2	13,943		1,400	103	15,446	17,054	18,829
Rozdolnenskiy	35.7	13,031	740	*1,000*	*1,000*	15,771	17,412	19,224
Sakskiy	78.5	28,653	855	*3,000*	*3,000*	35,508	39,203	43,283
Simferopolskiy	149.8	54,677	1,832	*20,000*	*5,000*	81,509	89,993	99,360
Sovetskiy	35.3	12,885		*1,000*	*1,000*	14,885	16,434	18,144

Chornomorskiy	32.6	11,899	1,747	5,900	1,000	20,546	22,684	25,045

1 Based on 5.1.4
2 Based on Questionnaire and estimations (in italic)
3 Progression of 2% per year

Table 21 Aggregation of the figures

5.1.5.3. 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 situating a little better the problems.

- Tourism factor

  The tourism generates around 75,000 t/y. But more important, during the high season it adds 3,800 m^3/d to the 4,300 m^3/d produced by the inhabitants in the involved areas.

  So the means of the SHW collection in tourist areas should be doubled during summer or used twice.

- Rate of collection of domestic waste in cities and rayons of the ARC

  The tonnage collected in normal conditions by the administrative units should be as order of 310,000 t/y.

  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 730,000 t/y. Adding the production of tourism, it should be for SHW 810,000 t/y.

  The rate of normally collected waste should be 38% all over the territory of the ARC.

- Rural factor

  If the cities show very diverse performances (from 1.0 to 2.7 m^3/inh/y), all the rayons (excepted Sakskiy) are under 0.4 m^3/inh/y.

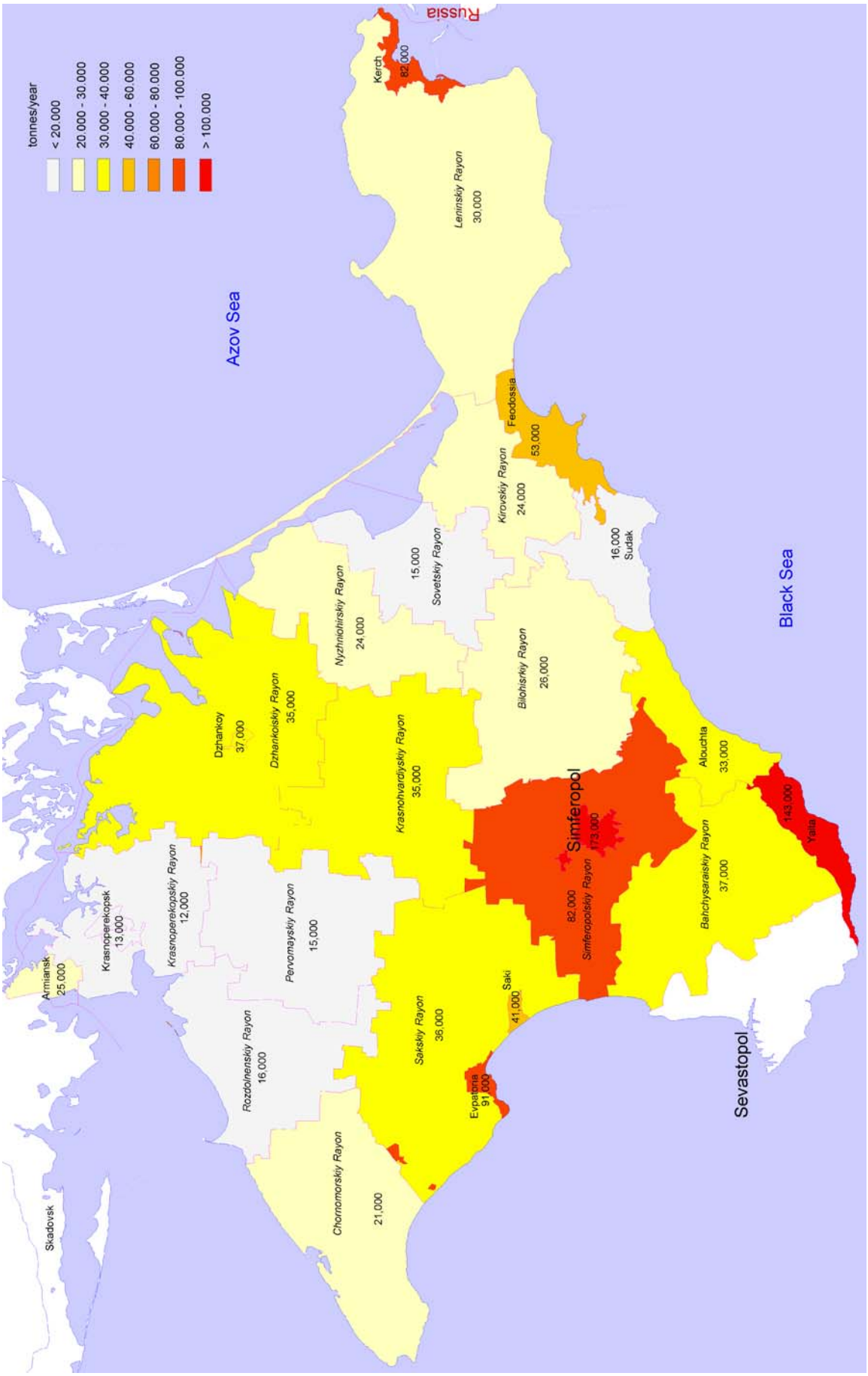
  Some rayons have no equipment for the waste collection!

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

- Other waste

  We can easily add to these figures 175,000 t/y commercial waste and 135,000 t/y municipal waste.

The real total production of SHW and assimilated waste of ARC is around 1,100,000 t/year.



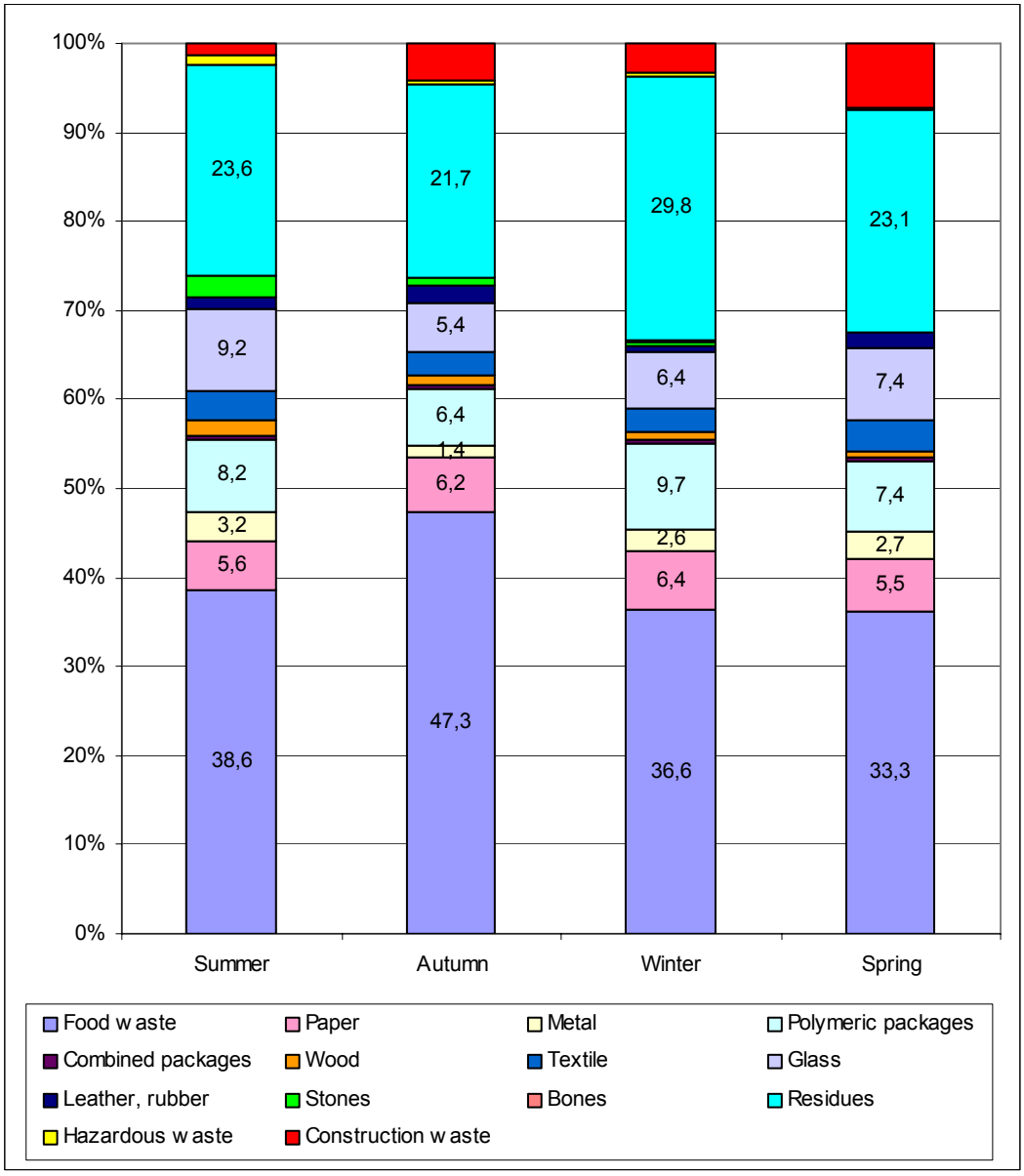
Map 7 Real SHW production in tonnes

5.1.6. 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 in Donetsk Oblast 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 22 Average composition of SHW

The same study is missing for ARC. Two key-factors can change the figures of the composition of the waste: the tourism and the port activity.

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

According to an opinion poll in Donetsk Oblast in 2003, 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.

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 1,000,000 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 ARC 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 47,000 tons nowadays and 129,000 tons in term.

The recycling is already 88,000 tons per year for glass, plastics and 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 88,000 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 1,100,000 tons per year which should increase by 2% per year, the needs of landfilling capacity in 2016 should be then around 1,043,000 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 not so far the amount paid by the inhabitants to the JEK for those who are living in collective buildings. In the private sector, it's a little bit more but less than 30% of the concerned inhabitants are really paying that. For the active population, it was in 2005 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 ARC 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 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 13 towns with such companies in the ARC. 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 same inquiry should be done in ARC.

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 ARC 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 Yalta, the company ALFATER has been devoted to cleansing the city. The company operates the city landfill.

In Saki the company UKRMOREKOSERVICE has built a sorting plant for SHW collected in the city 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 ARC (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 some cities of the ARC, as Yalta, 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 Table 23 and Table 24 below.

Cities, Rayons	Population	Number of containers by capacity			Total capacity		N rounds /collected	N rounds /produced
	x1000	*0.36 m^3*	*0.75 m^3*	*1.1 m^3*	*m^3*	*l/inh*		
AR Crimea	**1,994.3**	**362**	**6,260**	**953**	**5,873**	**2.94**	**205**	**484**
Cities	***1,091.7***	***362***	***5,765***	***953***	**5,502**	**5.04**	**213**	**279**
Alouchta	52.6		330		248	4.71	306	309
Armiansk	25.2				0			
Dzhankoy	40.5		359		269	6.64	78	199
Evpatoria	121.7		600	350	835	6.86	171	205
Kerch	152.6		958		719	4.71	169	299
Krasnoperekopsk	30.8		310	7	240	7.79	84	170
Saki	27.1							
Simferopol	363.3		2,768		2,076	5.71	269	246
Sudak	28.6							
Feodossia	106.6		440		330	3.10	267	460
Yalta	142.7	362	0	596	786	5.51	183	256
Rayons	***902.6***	***0***	***495***	***0***	**371**	**0.41**	**89**	**3,517**
Bahchysaraiskiy	90.7							
Bilohisrkiy	64.8		128		96	1.48	52	953
Dzhankoiskiy	78.8							
Kirovskiy	55.8		50		38	0.68	213	2,092
Krasnohvardiyskiy	91.7							
Krasnoperekopskiy	30.9		46		35	1.13	241	1,297
Leninskiy	66.3							
Nyzhniohirskiy	53.5							
Pervomayskiy	38.2		140		105	2.75	11	522
Rozdolnenskiy	35.7							
Sakskiy	78.5							
Simferopolskiy	149.8							
Sovetskiy	35.3							
Chornomorskiy	32.6		131		98	3.01	107	472

Table 23 Park of containers

As it can be seen from the table, among **7,575** containers used in the ARC, the total capacity of which is 5,873 m^3, 93% 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 Simferopol, Yalta, Evpatoria, Dzhankoy, and Krasnoperekopsk, and the worst it is in districts. But for Evpatoria and Yalta, it must be reminded that the needs are of another size during summer and this capacity is insufficient. The park of containers for the cities correspond to a daily collection, excepted for Dzhankoy and Krasnoperekopsk 2 weekly collections.

Household waste is collected by trucks (mainly in urban areas) and tractors with trailers (mainly in rural areas). In the ARC as a whole (by 2005) at the disposal of companies there are 164 waste collection trucks, 26 tractors + trailers of the total capacity of 3.5 thous. m^3.

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

	N inh (x1000)	Truck				Tractors + Trailers				Total m^3	Vol/inh l/inh	SDW from residential sector m^3	N rounds
		Park	In good state	In Repair	Total Vol m^3	Park	In good state	In Repair	Total Vol m^3				
AR Crimea	**1,994.3**	**164**	**124**	**20**	**3,371**	**26**	**25**	**1**	**121**	**3,492**		**1,837,934**	**526**
Cities (total)	**1,091.7**	**147**	**106**	**18**	**3,216**	**15**	**15**	**0**	**56**	**3,272**		**1,758,282**	**537**
Alouchta	52.6	17	13	4	221	1	1	0	4	225	43	142,000	631
Armiansk	25.2												
Dzhankoy	40.5	4	7	0	284	2	2	0	8	292	72	69,800	239
Evpatoria	121.7	20	18	2	487	2	2	0	6	493	41	210,000	426
Kerch	152.6	26	0	0	633	8	8	0	32	665	44	225,000	338
Krasnoperekopsk	30.8	5	5	0	66	2	2	0	6	72	23	34,034	476
Saki	27.1												
Simferopol	363.3	51	39	12	459	0				459	13	626,588	1,365
Sudak	28.6												
Feodossia	106.6	8	8		346					346	32	108,700	314
Yalta	142.7	16	16		720					720	50	341,890	475
Rayons	**902.7**	**17**	**18**	**2**	**155**	**11**	**10**	**1**	**65**	**220**		**79,652**	**363**
Bahchysaraiskiy	90.7												
Bilohirskiy	64.8	4	4	2	50	2	1	1	20	70	11	10,575	151
Dzhankoiskiy	78.8												
Kirovskiy	55.8	2	2		24	2	2	0	16	40	7	20,400	510
Krasnohvardiyskiy	91.7												
Krasnoperekopskiy	30.9	4	4	0	16	4	4	0	16	32	10	11,824	370
Leninskiy	66.3												
Nyzhniohirskiy	53.5												156
Pervomayskiy	38.2	2	2	0	29	2	2	0	8	36,5	10	5,710	
Rozdolnenskiy	35.7												
Sakskiy	78.5												
Simferopolskiy	149.8												
Sovetskiy	35.3												
Chornomorskiy	32.6	5	5	0	36	1	1	0	5	41	13	31,143	760

Table 24 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 **(300,000 tons** regularly collected but **500,000 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 **(1,100,000 tons)** that **600,000 tons** to **800,000 tons** per year are not regularly collected or disposed.

In aim to be clear, the local utilities declare they collect in normal conditions 386,590 tons per year. From his side, the Committee of Environment and Natural Resources of the ARC (ResKomPrirod Crimea) has figures amounting household waste, municipal waste and commercial waste.

	Residential sector	Commercial waste (except for residential sector)	Municipal waste	Total	Data of Committee of Environment and Natural Resources
m^3	**1,203,993**	**310,320**	**323,621**	**1,837,934**	**2,095,397**
tons	**386,590**				

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 300,000 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 450,00 and 500,000 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, the plastic bottles and the cardboard, whose the sorting is made by the individuals, the caretakers and mainly the scavengers.

About the ¾ glass, so 58,000 t/year, and ½ paper-cardboard, so 33,000 t/year, are so recovered, transiting through intermediary purchasing points. 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 a Regional Plan. The city of Simferopol took a decree in 2005 imposing to bring the construction waste to the landfill where they are used for covering the household waste.

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 ARC.

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 SHW collection in Ukraine.

Advantages	Drawbacks
Low Investment cost of trucks	Low efficiency of containers downloading in trucks, and often a large part of the waste falls on the ground
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
For Ukraine, not fitted to the circulation in the yards: too heavy for the pavement, too big turning circle, too big for the carriage entrances	
For Ukraine: specific concrete platforms without kerb to be implemented	
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.*[8]*".*

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 25 trucks.

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 3,500 m^3. Bearing in mind that some of the companies didn't provide any data this figure might increase up to 4,000 m^3.

The hypothesis taken into account are: a truck can do 4 collection rounds a day in the collective housing sector (collection and trip to the landfill), and 2 collection rounds a day in the private sector; 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 1.2 Mt *(according to the data of General assessments and forecasts)* in 2011, 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 / 4 rounds / 11 m^3/truck = 425 trucks
- 800,000 m^3 / 300 days / 2 round / 2.75 t/truck = 250 trucks

According to the existing park, the increasing of collection capacity is (as size order) 550 trucks. 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.

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.

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

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 realize 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.

It must be noticed that this collection is the most economically efficient possible: no investment and a rather good rate of recovery. Socially, it provides incomes to a lot of people. Ethically, it belongs to the grey economy. Technically, this system will progressively loose its interest with the growth of the incomes and the economical recovery.

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.

6.6. Programme for waste collection

Anyway, a lot of things can be done but they must be considered as optimisation of the waste collection. It pre-supposes to be able to collect 100% household waste. The best way for the moment is the usual existing system with containers and local truck. It's the best way as: i) it's the cheapest in today's technico-economical conditions; ii) this technique is perfectly well-known by the municipal companies.

6.6.1. Containers

The Table 25 reports the park of containers as declared during our inquiry. We have added the real tonnage as we have calculated it. We have considered that in the collective housing, the collection should be done everyday (300 days/year). It represents something like 70% inhabitants of the cities and 30% inhabitants of the rayons. We have considered that in the private sector, the collection should be done twice a week (104 days/year). It represents something like 30% inhabitants of the cities and 30% inhabitants of the rayons. So the necessary containers are calculated on the base of 150 kg/container.

Cities, Rayons	Population	Number of containers by capacity			Total capacity		Yearly tonnage	Needs 1/d	Needs 2/w
	x1000	*0.36 m^3*	*0,75.m^3*	*1.1 m^3*	*m^3*	*l/inh*	t		
AR Crimea	**1,994.3**	***362***	***6,260***	***953***	***5,875***	**2.94**	**1,113,708**	**13,709**	**31,847**
Cities	***1,091.7***	***362***	***5,765***	***953***	***5,503***	**5.04**	**707,038**	**10,999**	**13,597**
Alouchta	52.6		330		248	4.71	33,009	513	635
Armiansk	25.2				0		25,431	396	489
Dzhankoy	40.5		359		269	6.64	37,216	579	716
Evpatoria	121.7		600	350	835	6.86	91,194	1419	1754
Kerch	152.6		958		719	4.71	82,339	1281	1583
Krasnoperekopsk	30.8		310	7	240	7.79	13,242	206	255
Saki	27.1						40,522	630	779
Simferopol	363.3		2768		2076	5.71	172,605	2685	3319
Sudak	28.6						15,752	245	303
Feodossia	106.6		440		330	3.10	52,902	823	1017
Yalta	142.7	362	0	596	786	5.51	142,826	2222	2747
Rayons	***902.6***	***0***	***495***	***0***	***372***	***0***	**406,670**	**2,710**	**18,250**
Bahchysaraiskiy	90.7						37,122	247	1666
Bilohisrkiy	64.8		128		96	1.48	25,510	170	1145
Dzhankoiskiy	78.8						34,762	232	1560
Kirovskiy	55.8		50		38	0.68	24,467	163	1098
Krasnohvardiyskiy	91.7						35,471	236	1592
Krasnoperekopskiy	30.9		46		35	1.13	12,403	83	557
Leninskiy	66.3						29,742	198	1335
Nyzhniohirskiy	53.5						23,528	157	1056

Pervomayskiy	38.2		140		105	2.75	15,446	103	693
Rozdolnenskiy	35.7						15,771	105	708
Sakskiy	78.5						35,508	237	1593
Simferopolskiy	149.8						81,509	543	3657
Sovetskiy	35.3						14,885	99	668
Chornomorskiy	32.6		131		98	3.01	20,546	137	922

Table 25 Needs of containers

It means that 5,000 containers should be replaced and 40,000 new containers are required for a 100% collection.

6.6.2. Trucks

The Table 26 reports the park of trucks as declared during our inquiry. We have added the real tonnage as we have calculated it. We have considered that in the collective housing, the collection should be done everyday (300 days/year). It represents something like 70% inhabitants of the cities and 30% inhabitants of the rayons. In this sector a truck can do 4 rounds/day. We have considered that in the private sector, the collection should be done twice a week (104 days/year). It represents something like 30% inhabitants of the cities and 30% inhabitants of the rayons. In this sector a truck can do 4 rounds/day.

Cities, Rayons	Population	Trucks			Total capacity		Yearly tonnage	Needs 1/d	Needs 2/w
	x1000	Quantity	Satisfactory state	Under repair	m^3	l/inh	t	4 R/d	2 R/d
AR Crimea	**1,994.3**	**164**	**124**	**20**	3,371		**1,113,708**	**258**	**414**
Cities	***1,091.7***	**147**	**106**	**18**	3,216		**707,038**	**207**	**176**
Alouchta	52.6	17	13	4	221	43	33,009	10	8
Armiansk	25.2						25,431	7	6
Dzhankoy	40.5	4	7	0	284	72	37,216	11	9
Evpatoria	121.7	20	18	2	487	41	91,194	27	23
Kerch	152.6	26	0	0	633	44	82,339	24	21
Krasnoperekopsk	30.8	5	5	0	66	23	13,242	4	3
Saki	27.1						40,522	12	10
Simferopol	363.3	51	39	12	459	13	172,605	50	43
Sudak	28.6						15,752	5	4
Feodossia	106.6	8	8		346	32	52,902	15	13
Yalta	142.7	16	16		720	50	142,826	42	36
Rayons	***902.6***	**17**	**18**	**2**	155		**406,670**	**51**	**238**
Bahchysaraiskiy	90.7						37,122	5	22
Bilohisrkiy	64.8	4	4	2	50	11	25,510	3	15
Dzhankoiskiy	78.8						34,762	4	20
Kirovskiy	55.8	2	2		24	7	24,467	3	14
Krasnohvardiyskiy	91.7						35,471	4	21
Krasnoperekopskiy	30.9	4	4	0	16	10	12,403	2	7
Leninskiy	66.3						29,742	4	17
Nyzhniohirskiy	53.5						23,528	3	14
Pervomayskiy	38.2	2	2	0	29	10	15,446	2	9
Rozdolnenskiy	35.7						15,771	2	9
Sakskiy	78.5						35,508	4	21
Simferopolskiy	149.8						81,509	10	48
Sovetskiy	35.3						14,885	2	9
Chornomorskiy	32.6	5	5	0	36	13	20,546	3	12

Table 26 Needs of trucks

It means that 124 trucks should be replaced and 550 new trucks are required for a 100% collection.

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 ARC today envisaging collection of separate fractions into individual containers and requiring preliminary sorting of waste generated by the inhabitants (that is in houses/apartments) (an experiment dealing with selective collection of waste is implemented by the Tacis project in Slaviansk and in Kramatorsk, some experimentations have been done in Kiev). 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 ARC 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.

Development and construction of facilities for recycling of stored raw materials in the ARC should be necessary.

7.2. Development of sorting-recycling

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 17% of effective recycling in 2016.

The great fashion is the creation of rough waste sorting plants. The household waste are downloaded at the plant. Sorting is done mechanically (sieve, magnetic overband) and manually. It has been tried 15-20 years ago in Western Europe and systematically abandoned because the very low quality of the recyclable (spoiled by the organic waste) and the cost of the operation for <10% waste recyclable and >90% waste to landfill at the end. The today's equation is based on very low wages and high prices of recyclable plastics (due to a high demand from China). These factors can quickly evolve and ruin the profitability of this activity.

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 10% of the waste produced in individual housing in 2016.

7.3.2. Promotion of household composting

The promotion of the individual composting all over the ARC could be realized. Composting is a technique that the inhabitants must learn. The common culture in the rural areas should be favourable to this technique.

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 six main landfills have been visited. Only the one of Feodossia can be used for number of years. The ones of Yalta and Simferopol are rather good but their capacity is limited to a few years. The ones of Kerch, Evpatoria and Alouchta should be quickly closed.

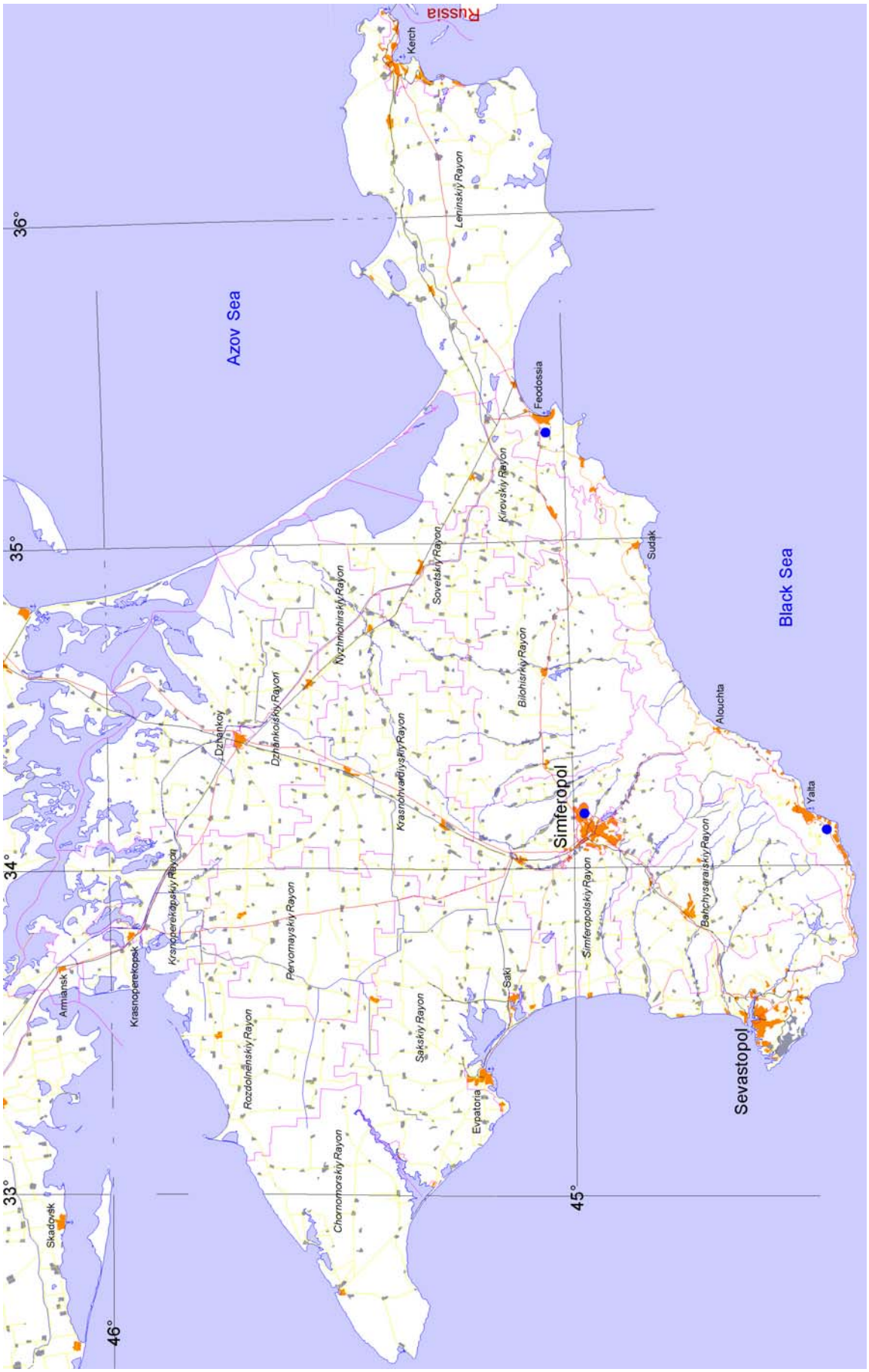
8.3. Interesting landfills

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
Feodossia	150,000	1,500,000
Yalta	300,000	500,000
Simferopol	600,000	1,000,000
TOTAL Capacity		3,000,000

Table 27 Interesting landfills

These landfills are reported on the following Map 8.



Map 8 Proposition of transition landfills

8.4. Transfer network

The decision to progressively pass from the existing situation 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 ARC, transfer stations should be implemented in:

	SHW tonnes	N transfer stations
Simferopol	172,605	2
Alouchta	33,009	1
Dzhankoy	37,216	1
Evpatoria	91,194	1
Kerch	82,339	1
Saki	40,522	1
Feodossia	52,902	1
Yalta	142,826	2
TOTAL	652,611	10

Table 28 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 30 semi-trailers.

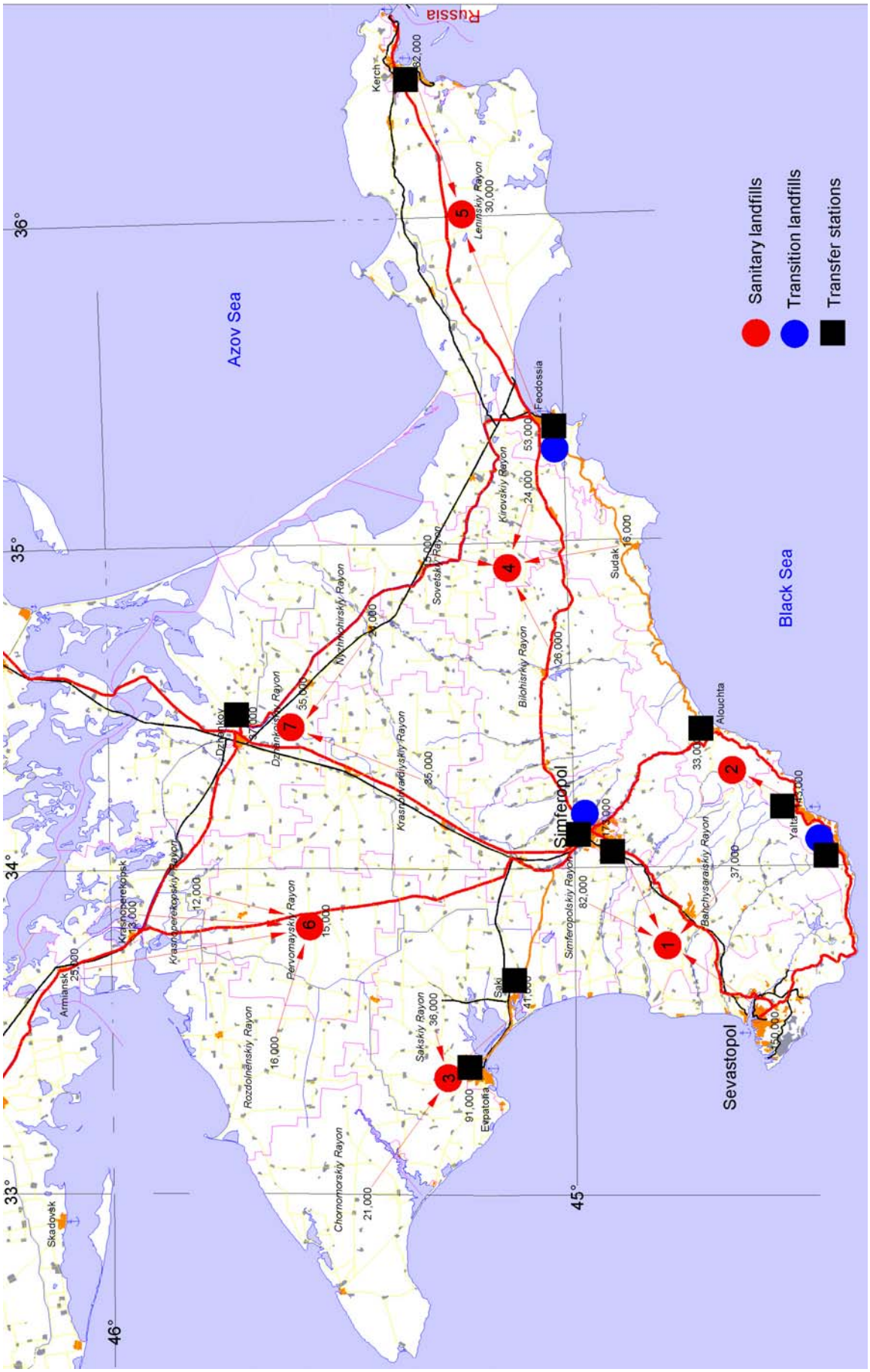
8.4.2. Small cities

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 two 30-m^3 tippings.

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

The mobile means are 200 30-m^3 tippings and 25 road carriages (truck + trailer).

All that is summarized on the following Map 9.



Map 9 Summary of the transition programme

8.5. Transfer facilities

8.5.1. Simulation of different ways of transfer

One project submitted to the Government of ARC includes the transfer of waste by sea (Annexe 5). So we studied several ways of transfer of the SHW. The second part is classically based on road transfer.

8.5.1.1. Preliminary choice of alternatives

The distances between each city or region in ARC and the two landfill sites proposed in the Strategy of Crimea have been calculated in order to determine different alternatives of transferring schemes:

Table 29 Tonnages to carry

The calculation of the tonnage per day is done on the basis of 312 worked days per year (52 weeks of 6 days). A table is constructed with different alternative	Waste transfer 1 kg/c/day 6 days/week (t/d)	Road distance		Scheme 1 (Road transfer)		Scheme 2		Scheme 3 (Road transfer)			
		to Saki (km)	to Kerch (km)	to Saki (t/d)	to Kerch (t/d)	Road transfer to Saki (t/d)	ailway+ sea :ransfer o Kerch (t/d)	to Saki (t/d)	to Kerch (t/d)	to North landfill (t/d)	to South central landfill (t/d)
Alouchta	62	130	200	62			62				62
Armiansk	29	166	291	29			29			29	
Dzhankoy	47	112	217	47			47			47	
Dzhankoiskiy Rayon	92	112	217	92			92			92	
Evpatoria	142	24	266	142		142		142			
Kerch	179		0		179		179		179		
Krasnoperekopsk	36	146	271	36			36			36	
Krasnoperekopskiy Rayon	36	146	271	36			36			36	
Saki	32	0		32		32		32			
Sakskiy Rayon	92	0		92		92		92			
Simferopol	425	48	198	425		425		425			
Simferopolskiy Rayon	175	48	198	175		175		175			
Sudak	33	137	145	33			33				33
Feodossia	125	149	109		125		125		125		
Yalta	167	120	223	167			167				167
Bahchysaraiskiy Rayon	106	78	228	106		106		106			
Bilohisrkiy Rayon	76	85	158	76		76		76			
Kirovskiy Rayon	65	165	104		65		65		65		
Kranohvardiysiy Rayon	107	90	207	107		107		107			
Leninskiy Rayon	78	195	55		78		78		78		
Nyzhniohirskiy Rayon	63	120	149	63			63				63
Pervomayskiy Rayon	45	146	271	45		45				45	
Rozdolnenskiy Rayon	42	90	290	42		42					
Sovetskiy Rayon	41	140	129		41		41				
Chornomorskiy Rayon	38	97	339	38		38					
Total	**2333**			**1846**	**487**	**1280**	**1053**	**1155**	**446**	**286**	**325**

Road transport corresponds to scheme 1:

- The cities and regions which are likely to transfer their domestic waste to Saki with a distance of transfer lesser than 100 km are: Evpatoria, Saki and Saki region, Simferopol and Simferopol region, Bahchysarai region, Bilohisrkiy region, Kranohvardiysiy region, Rozdolnenskiy region and Chornomorskiy region.
- The cities and regions which are likely to transfer their domestic waste to Saki although they are more than 100 km distant from Saki are: Alouchta, Armiansk, Dzhankoy, Dzhankoiskiy region, Krasnoperekopsk and Krasnoperekopskiy region, Sudak, Yalta, Nyzhniohirskiy region and Pervomayskiy region. For these cities the economy of transfer will be worsened by the long distance to the land fill site.
- The cities and regions which are likely to transfer their domestic waste to Kerch with a distance of transfer lesser than 100km are: Feodossia, Kirovskiy region and Leninskiy region.
- The city or region which is likely to transfer its waste to the landfill in Kerch with a distance greater than 100 km is the Sovetskiy region.

Alternative ways of transporting the waste on long distances may be considered for some cities by using existing railway and waterways infrastructures which have generally proven to be more economical (Scheme N° 2):

- Railway or waterway transfer of waste by using the North East canal of Crimea from the cities of Armiansk, Dzhankoy, Dzhankoiskiy region, Krasnoperekopsk, Krasnoperekopskiy region and Nyzhniohirskiy region to the landfill of Kerch.
- Sea transfer of waste from the cities of Yalta, Feodossia, Sudak and Alouchta. As there are no existing sea port in the cities of Alouchta and Sudak those cities would primarily transfer by road to respectively to Yalta and to Feodossia.

Else if alternative transport are not feasible, and considering the long distance of transfer for some cities or regions mentioned above (Distance greater than 100 km), it is recommended two other landfill sites are implemented (Scheme N° 3):

- In the North of Crimea to serve the North Crimea cities of Armiansk, Dzhankoy, Dzhankoiskiy region, Krasnoperekopsk, Krasnoperekopskiy region and Pervomayskiy region.
- In the mountain range of south central Crimea to serve the cities of Alouchta, Sudak, Yalta and Nyzhniohirskiy region.

Constraints of Scheme N°1 reside in the long road distance between some waste producing place and the landfills of either Kerch or Saki.

As the research of additional landfill site under scheme N°3 has not yet been started by the authority, Scheme N°2 is seen as the only applicable strategy in order to optimise scheme N°1 and is therefore taken as a basis for calculation of the investment cost for Crimea.

Validity of Scheme N°2 is subject to the implementation of the sea transfer from Yalta (+ Alouchta) and Feodossia (+ Sudak) to Kerch. If this option would not be confirmed, a road transfer would have to be implemented:

- From Alouchta and Yalta to Saki landfill;
- From Sudak and Feodossia to Kerch landfill.

Alternatively, and if there are capacities for landfilling in Alouchta, waste produced in Alouchta and Sudak could be land filled in Alouchta. In this case two transfers of waste would remain only in the south region:

- From Yalta to Saki landfill (167 tons per day in yearly average);
- From Feodossia to Kerch landfill (125 tons per day in yearly average).

The basis for calculation of the investment cost will be scheme 2 as follows:

Table 30 Needs of transport equipments

City/Rayon	qty transferred (tons per day)	Direction	distance (km)	technology of transfer	20' ISO cont. filled per day	Need 20' ISO cont.	20 t semi-trailer filled per day	type of transfer	cont. moved / truck/ day	Need for truck and trailer	Need for semi trailer truck	type of station
Alouchta	62	Yalta	35	road/road	7	41		type 1	7	1		1 Trns 5 pos
Armiansk	29	Kerch	291	road/rail	3	20		type 2				1 pos comp
Dzhankoy	47	Kerch	217	road/rail	5	32		type 2				2 Trns 5 pos
Dzhankoiskiy Rayon	92	Kerch	217	road/rail	10	61		type 2				coupled with above
Evpatoria	142	Saki	24	road/road			7	type 4	5		2	mov floor trail
Kerch	179	Kerch	0					no transfer				
Krasnoperekopsk	36	Kerch	271	road/rail	4	24		type 2				1 Trns 5 pos
Krasnoperekopskiy Rayon	36	Kerch	271	road/rail	4	24		type 2				coupled with above
Saki	32	Saki	0					no transfer				
Sakskiy Rayon	92	Saki	0					no transfer				
Simferopol	425	Saki	48	road/road			30	type 4	3		11	mov floor trail
Simferopolskiy Rayon	175	Saki	48	road/road				type 4				coupled with above
Sudak	33	Feodossia	45	road/road	4	22		type 1	6	1		1 pos comp
Feodossia	125	Kerch	109	road/sea	14	83		type 3				2 Trns 5 pos
Yalta	167	Kerch	223	road/sea	19	111		type 3				2 Trns 5 pos
Bahchysaraiskiy Rayon	106	Saki	78	road/road			5	type 4	2		3	mov floor trail
Bilohisrkiy Rayon	76	Saki	85	road/road	8	17		type 1	4	3		1 Trns 5 pos
Kirovskiy Rayon	65	Kerch	104	road/rail	7	44		type 2				1 Trns 5 pos
Kranohvardiysiy Rayon	107	Saki	90	road/road			5	type 4	2		3	mov floor trail
Leninskiy Rayon	78	Kerch	55	road/road	9	17		type 1	5	2		1 Trns 5 pos
Nyzhniohirskiy Rayon	63	Kerch	120	road/rail	7	42		type 2				1 Trns 5 pos
Pervomayskiy Rayon	45	Krasnoperekopsk	40	road/road	5	10		type 1	7	1		1 pos comp
Rozdolnenskiy Rayon	42	Saki	90	road/road	5	9		type 1	4	2		1 pos comp
Sovetskiy Rayon	41	Kerch	129	road/rail	5	28		type 2				1 pos comp
Chornomorskiy Rayon	38	Saki	97	road/road	4	8		type 1	3	2		1 pos comp
Total					**119**	**593**	**48**			**12**	**19**	

- Type 1 of transferring concept corresponds to a transfer by compactor trough into 20' ISO containers to be transported on trucks;
- Type 2 of transferring concept corresponds to a transfer type 1 combined with loading onto railway;
- Type 3 of transfer corresponds to a type 1 combined with loading onto vessel;
- Type 4: transfer to 20 tons moving floor semi trailer trucks.

Calculations above are done with the following parameters:

- The Mean Load of 20' ISO container is 9 tons;
- Mean load of moving floor waste semi trailer is 20 tons;
- There are 7.5 working hours per day;
- The mean speed of a train is 25km/hour;
- The mean speed of a truck on a motorway is 50km/hour.

The type of transfer station referred to last column is developed section 8.5.1.4.

8.5.1.2. Choice of container

8.5.1.2.1. Transfer of small quantities by road or railway, sea or waterway transfer

The type of containers to be used is subject to discussion. The 20’ and 40’ containers are a standard in the ISO organization. The 20’ container is a standard widely used in maritime/river waste transport, and fits easily onto a standard twist locker truck. It is also adapted to trucks equipped with a hook lifter and therefore can be easily unloaded at the landfill by dumping.

The 40’ ISO container is utilized for road transfer from land transfer stations. It can be loaded by horizontal compactors, although the average density which may be reached with a compactor won’t be equivalent to the density reached with a 20’ container. The 20’ container loading efficiency is a reason to choose this type of container for the loading of waste.

Another criterion is the cost of unloading the residues at the landfill site. While the 20’ container can be easily fitted on a twist locker truck equipped with a dumping device, a standard heavy trailer truck cannot be directly used for dumping the waste at the landfill. Waste must then be transferred on arrival to a pit where it is loaded again on special waste dumpers, or the container has to be loaded on a special truck for unloading into the landfill site.

These two solutions bear an increased cost of either an additional stage in the transfer procedure (Pit + dumper) or an increased cost of non-standard equipment (Special twist locker all wheel drive equipment) compared to using a 20’ standard truck carrier.

40’ ISO containers are not necessarily adapted to the transfer by waterway or if intended to be transferred by railway or sea, the cost of handling infrastructure is high.

Therefore the 20’ container equipment will be preferred. The loading capacity is limited to 9 tons when a road transport is intended (Road regulations), but loading compactors allow a higher capacity to be reached when using other types of transport (railways or water), if technically possible.

8.5.1.2.2. Transfer of large quantities by road

Transfer is done by moving floor 40’ long semi trailer trucks which have become a standard of transfer. Higher investment cost of infrastructure and equipment is compensated by a higher productivity at loading and unloading the waste compared to a system of two 20’ ISO containers.

8.5.1.3. Handling of 20’ ISO containers

All these ISO compatible containers can be handled using either standard ISO container lifting gear such as the gantry cranes found in Freightliner yards or by various types of wheeled carriers. In crowded Freightliner and dock container yards a straddle carrier is often used. These have long legs with hydraulic motors driving wheels at the base and a set of lifting gear suspended from the rectangular top section.

In use they are driven over the top of the container and a lifting frame is lowered to engage with the twist lock attachments on the top of the box.

Early straddle carriers could stack the boxes two high, a few were built that could only lift the box high enough to load it onto the road trailer or railway wagon but these were rare. Since the mid 1980's four-high units seem to have become more common and six-high or higher are available.

As a conclusion to the project, the handling of the containers could be done:

- On the road from inland district transfer quays, (or the treatment plants) to the railway, river or sea transfer stations and from Kerch terminal to the landfill on trucks with twist lockers and/or hook lifter (standard will be a 6X6 truck with front wheels, and two sets of back wheels which will carry a container and a trailer at the back which will carry another container).
- On the quay, a handling device will be used for moving the containers from the compacting place to the boat loading place. It is advisable to use forklift for transportation, and preparation of the loads in front of the port or railway station crane, and for stacking the containers in piles. A reach stacker could be an alternative.

Picture 1 Forklift and reach stacker equipped with a swap body

8.5.1.4. Transferring infrastructure

8.5.1.4.1. Transfer with 20’ ISO waste containers

This kind of transfer station will be implemented:

- For road transfer for distances of transport lesser than 100 km: 7 stations of the type N°1;
- Upstream of railway transfer: 6 stations of the type N°2;
- Upstream of Sea transfer: 2 stations of the type N°3.

Depending on the daily flow of waste, two sizes of transfer stations with 20’ISO containers are proposed:

- An ordinary transfer station with an upper platform, a compactor and removable container on one position only. When the container is full, it is removed with the trailer and replaced by another container from the yard. This kind of station is proposed for the places with a daily flow of waste lesser than 50 tons. The code referred to in the table above is (1 pos comp).
- Transfer station with an upper platform, a compactor and a translation system with five positions for three containers. This type of station is appropriate for daily flow of waste comprised between 50 and 100 tons of waste. The code referred to in the table above is (Trns 5 pos). The transfer station may comprise 2 or three units of this type depending on the daily flow.

8.5.1.4.2. Transfer in 40' moving floor semi trailers

This kind of transfer is done when the quantity transferred is greater than 100 tons per day. This is the case in 4 locations of the type N° 4.

These transfer stations are proposed in Evpatoria, Bahchysaraiskiy region, Kranohvardiysiy region and in Simferopol.

The building comprises an upper platform where the collection vehicle unloads waste in a through for loading a semi-trailer underneath. The semi trailer is equipped with a hydraulic driven moving floor. Electricity is supplied from the transfer station building.

According to the daily capacity, Evpatoria, Kranohvardiysiy and Bahchysaraiskiy transfer stations are equipped with three unloading troughs buildings, while Simferopol and region transfer station is equipped with an eight unloading troughs.

8.5.1.5. Logistical implementation of waste transfer

8.5.1.5.1. Road transfer of waste

Road transfer is done:

- Between the city of Alouchta and the port terminal of Yalta (20' ISO container, truck and trailer)
- Between the city of Sudak and the port terminal of Feodossia (20' ISO container, truck and trailer)
- Between Simferopol and Saki landfill in 40' length semi trailers
- Between Evpatoria and Saki landfill in 40' length semi trailers
- Between Kranohvardiysiy region and Saki landfill in 40' length semi trailers
- Between Bahchysarai region and Saki landfill in 40' length semi trailers
- Between Pervomayskiy region and Krasnoperekopsk loading terminal in 20' ISO container, truck and trailer
- Between Leninskiy region and Kerch landfill in 20' ISO container, truck and trailer
- Between Rozdolnenskiy region and Saki landfill in 20' ISO container, truck and trailer
- Between Chornomorskiy region and Saki landfill in 20' ISO container, truck and trailer

The infrastructures needed for transfer are detailed in section transferring infrastructure above.

The equipments needed for the transfer of waste are:

- 60 ISO 20' containers;
- 12 20'ISO transfer trucks with trailers;
- 19 40' semi trailer transfer trucks.

The infrastructure needed for transferring waste to the equipment above is:

- 3 transfer stations with a compactor and a 5 positions 20' ISO containers translation system;
- 4 transfer stations with a compactor for loading a one position 20' ISO container;
- 4 transfer stations with transfer to 40 ' waste semi trailers (One station with

8.5.1.5.2. Maritime transfer of waste

The maritime transfer of waste is considered for the south coast of Crimea. The objective of the sub project is:

- To establish a road to sea transfer in the city of Yalta;
- To organize a road transfer of waste from the city of Alouchta to the transfer of Yalta;
- Similarly to organize a road to sea transfer in the city of Feodossia;
- To organize a road transfer of waste from the city of Sudak to the city of Feodossia;

- To organize the reception of waste at Kerch for a disposal in the landfill of Kerch.

The picture below shows the principle of a waste transfer station by sea. The transfer station is Hong Kong island west transfer station. It is bigger than the one proposed in Yalta (940 tons per day against 229 tons).

Picture 2 Waste transfer station by sea

The Sea transfer could make sense for the southern cities of Crimea on the Sea cost because of the difficulties of road transfer in the region due to the geography and congestion of traffic during summer season.

The conditions to be met for the implementation of such transfer are:

- There is a free area next to the quay (Up to five thousand m²) which the port authority is willing to concede to the activity of waste compacting and waste sea transfer;
- That the activity above is compatible with the tourist maritime traffic in the ports of Yalta and Feodossia;
- That the structure of the wharf is compatible with construction of a crane for loading the transfer vessels;
- That storage of waste for two to three days in these places or next to these places is acceptable as daily volume of waste is not enough to guarantee the full capacity of the boats.

Answers to the questions above need a detailed study of public infrastructures and possible logistical arrangements in the ports of Yalta and Feodossia to be done.

The daily quantity of waste to be transferred to Kerch amounts to 229 tons from Yalta and Alouchta, to be loaded in Yalta, and to 158 tons from Feodossia and Sudak, to be loaded in Feodossia.

The daily flow of waste is 387 tons to be loaded on a boat to Kerch seaport.

This is equivalent to 40 to 45 containers per day, on yearly average with transport 6 days per week.

In comparison, the typical capacity of a boat is 5,000 m^3. 120 to 132 20' ISO containers (8 to 9 tons of waste loaded + 1.5 ton container's weight and a gross volume of 40 m^3 including spacing), can be loaded onto the boat in 4 rows of 10 to 11 containers, on a maximum of three layers.

Ensuring a transport at 2/3 capacity means that waste needs to be stored during two days at the place of departure 800 m² in Yalta, 600 m² in Feodossia and 1400 m² in Kerch with storage over three layers.

As the one way distance Yalta to Feodossia to Kerch is equivalent to 125 nautical miles, and depending on the performance of containers handling in the three ports, a round waste transfer trip may take between 36 and 48 hours.

90 to 100 containers are on board (Two layers of waste) while 90 containers are under refilling by waste compactors in Yalta, Feodossia and the remote transfer stations of Sudak and Alouchta, and an equal number of empty containers are waiting to be reloaded in Kerch.

The material needed for the transfer of waste are:

- 260 ISO 20' containers;
- 4 port handling reach stackers (One in each sea port location and one spare);
- 5 Trucks and trolley for transporting containers from the sea port in Kerch to the landfill (Number depends on the distance between sea port and landfill which has been assumed to be 20 km).

The boat can be equipped with a traveller crane for loading the containers, while the reach stackers are used for management of the containers stacks on the quay.

The infrastructure needed for transferring waste to the equipment above is 4 transfer stations with a compactor and a 5 positions 20' ISO containers translation system two of them to be implemented in Yalta and two of them to be implemented in Feodossia.

8.5.1.5.3. Railway transfer of waste

Railway transfer makes sense as it allows transfer on long distances. Railway lines could help making the transfer of waste produced in the North and North east of Crimea to Kerch landfill at a reasonable cost, provided transfer stations could be constructed at the location of the railway stations.

In the absence of a landfill in the North central region of Crimea, cost of road transport of waste to the landfills of Kerch or Saki at more than 200 km distance would be unbearable.

Each wagon can carry two 20' ISO waste containers. The railway line is used between Armiansk in the North and Kerch in the South east of Crimea.

The train stops for loading waste in the stations of:

- Krasnoperekopsk
- Dzhankoy city and region
- Nyzhniohirskiy region
- Kirovskiy
- Sovetskiy

Once loaded by the compactor, 20' ISO containers are carried by front carrying trolleys in order to be loaded on the train. The standardized wagon floor rotates laterally to an angle of 45° in order to receive the trolley's carried container. After being twist locked, the wagon floor is rotated to its transport position.

Alternatively transfer of container to wagon may be done with a traveller crane.

The railway line from Armiansk to Kerch is approximately 250 km long. It is assumed the round trip from Transport of waste from Armiansk to Kerch would take 48 hours including the necessary time for the containers to be loaded on and unloaded from the train.

The total quantity of waste transferred by train is 409 tons daily (312 days per year), corresponding to 45 to 50 containers per day. The system transfer system requires two days storage of waste at each place and a total of 300 containers for transport with 100 containers on the train and in each of the origin or destination place.

The equipments needed for the transfer of waste are:

- 275 ISO 20' containers;
- 8 front carrying trolleys (One in each railway station and one spare);

- 5 Trucks and trolley for transporting containers from the railway station in Kerch to the landfill (Number depends on the distance between sea port and landfill which has been assumed to be 20 km). The whole can be optimised if anyway the railway line has a branch into the sea port of Kerch.

The infrastructure needed for transferring waste to the equipment above is:

- 5 transfer stations with a compactor and a 5 positions 20' ISO containers translation system, two of those being constructed in Dzhankoy;
- 2 transfer stations with a compactor for loading a one position 20' ISO container.

8.5.1.5.4. River transfer

River transfer is an environmentally friendly way of transporting waste. It could be an alternative to the railway transfer mentioned above as the North east canal of Crimea links exactly the same cities as those linked with the railway line. The capacity of the canal to be used as a waterway needs to be assessed by the consultant:

- Is the waterway used at present for barge transport and is it maintained?
- What is the width of the waterway? Typically the transport with barges of the 225 standard below would require a 20 m wide waterway at least.
- Are there river transport infrastructures already existing on the waterway in the cities concerned with the waste transport? Else the cost of works could be quite significant for the project.

The capacity of the river boats could be limited by the size of the waterway.

Picture 3 Waste transport in Lille (In open air containers)

Typical capacities of barge for transporting waste could be as follows:

Barge type (ton)	Total length (m)	Width (m)	Depth (m)	Draft full load (m)	Cabin volume (m^3) *	Actual loading weight (ton)
87	25.30	5.2	1.6	1.15	110	44
120	27.85	6.3	1.7	1.33	140	56
150	30.80	6.0	1.8	1.25	250	100
200	35.00	7.6	2.4	1.75	300	120
225	35.30	8.0	2.4	1.80	360	144
360					500	200

* The cabin volume is the net volume available for the loading of waste. This is corresponding to the volume set by the internal dimensions of the boat. For instance the internal measurements of the 225 Ton type referred to above are estimated to be 18.5 m (L) X 6.5 m (l) X 3m (h) which is equivalent to the 360 m3.

Table 31 River boats specifications

There are much bigger barges as those travelling on North Europe waterways to the North Europe canal standard size which allows mass transport of goods in 2000 to 3000 tons capacity barges.

The loading weight is calculated in bulk at a density of 0.4 Ton/m^3.

We assume that the dimensions of 360 Tons type container are in proportion to those of a 225 tons container i.e. 21.8 m (L) X 7.8 m (l) X 3m (h).

The boat which could envisaged to use for the river transfer is the 360. The typical loading structure of the boat could be 18 containers of 11 tons, which is 9 tons payload and 2 tons weight of empty container, in three rows of three containers with three layers (Stacks).

Then a full load boat to landfill would be 198 tons of waste. The material needed in that option would be:

- 5 barges type 360 for waste transfer;
- Total number of containers required equivalent to the one calculated for railway transfer although it could be probably optimised;
- 8 reach stackers or traveller crane if existing (One in each river port location);
- 5 Trucks and trolley for transporting containers from the river terminal in Kerch to the landfill (Number depends on the distance to the landfill which has been assumed to be 20 km).

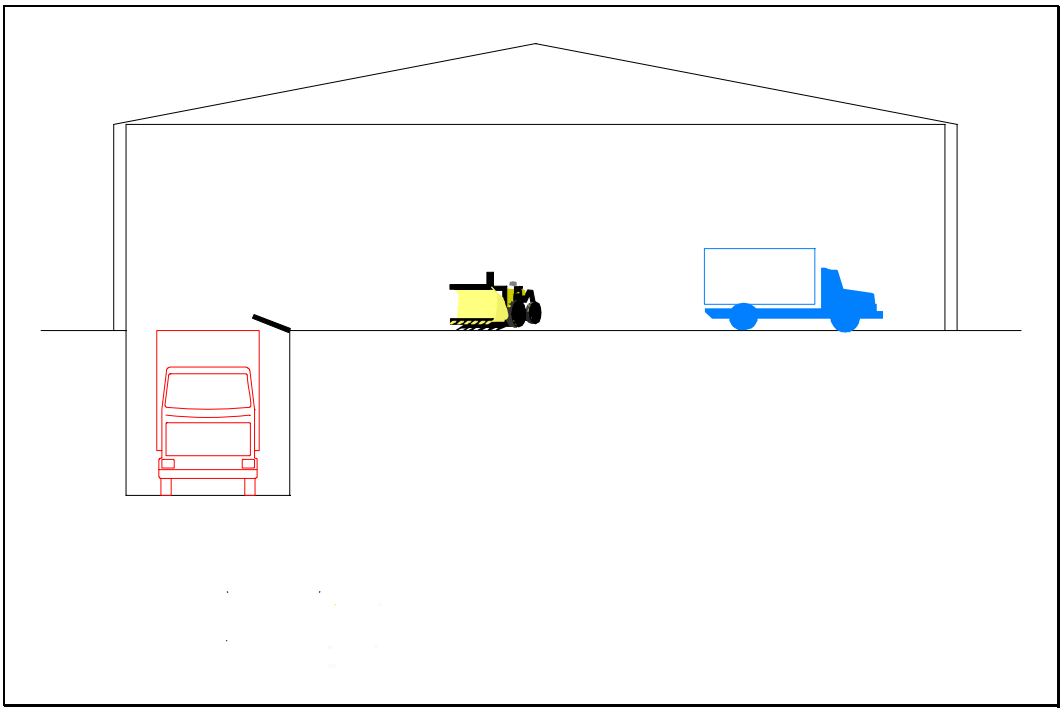
The infrastructure needed is similar to that needed in case of a railway transfer.

This option is not studied further as the railway transport infrastructure is ready for transport of waste while the condition of the waterway is not known.

8.5.2. Road transfer

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).



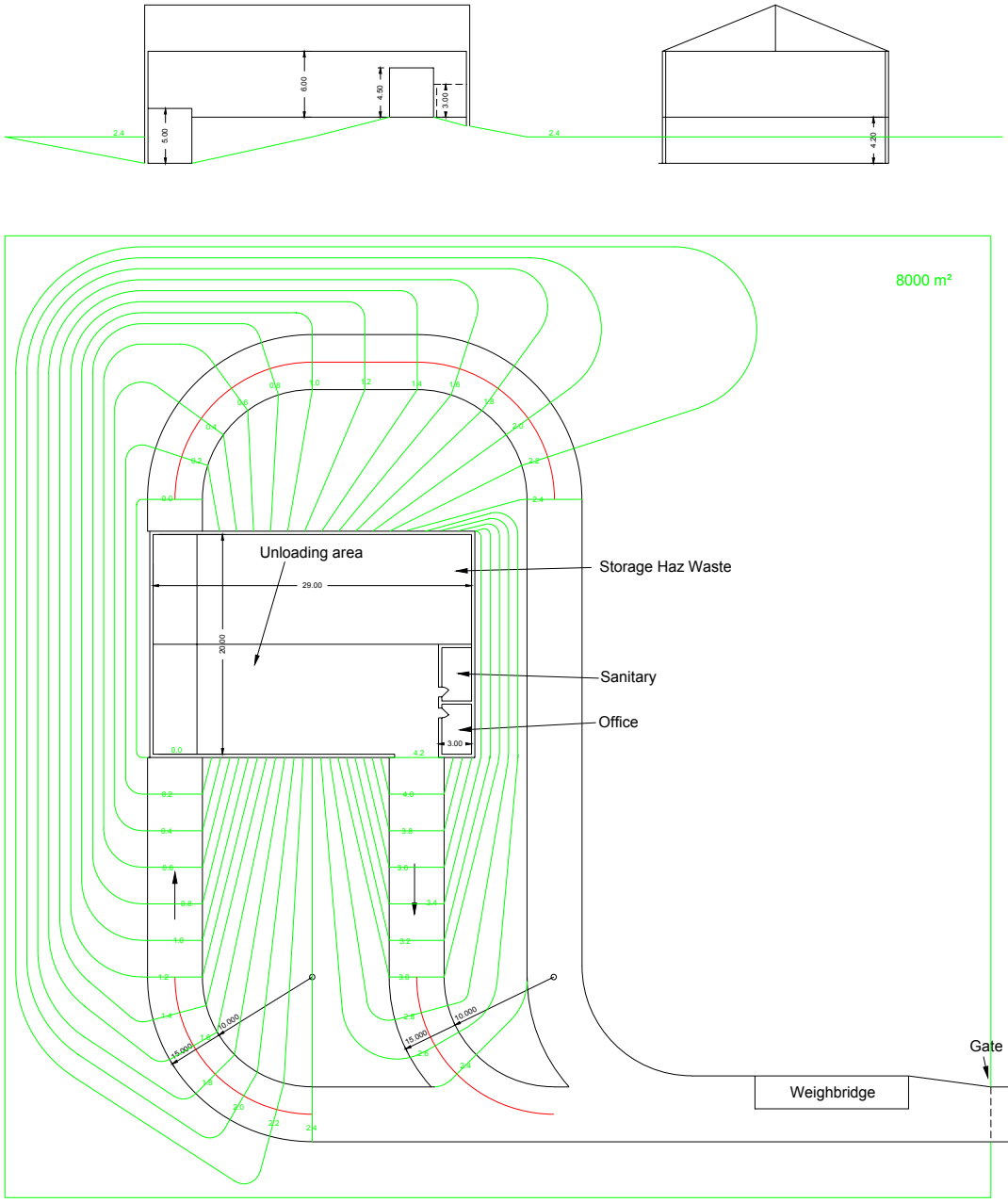
Drawing 1 Scheme of a transfer station

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. Main existing landfills

BSIF expert visited 6 landfills in July 2005.

9.1.1. ALOUCHTA

Visited on July 19th 2005

9.1.1.1. Communal and Housing Services Report

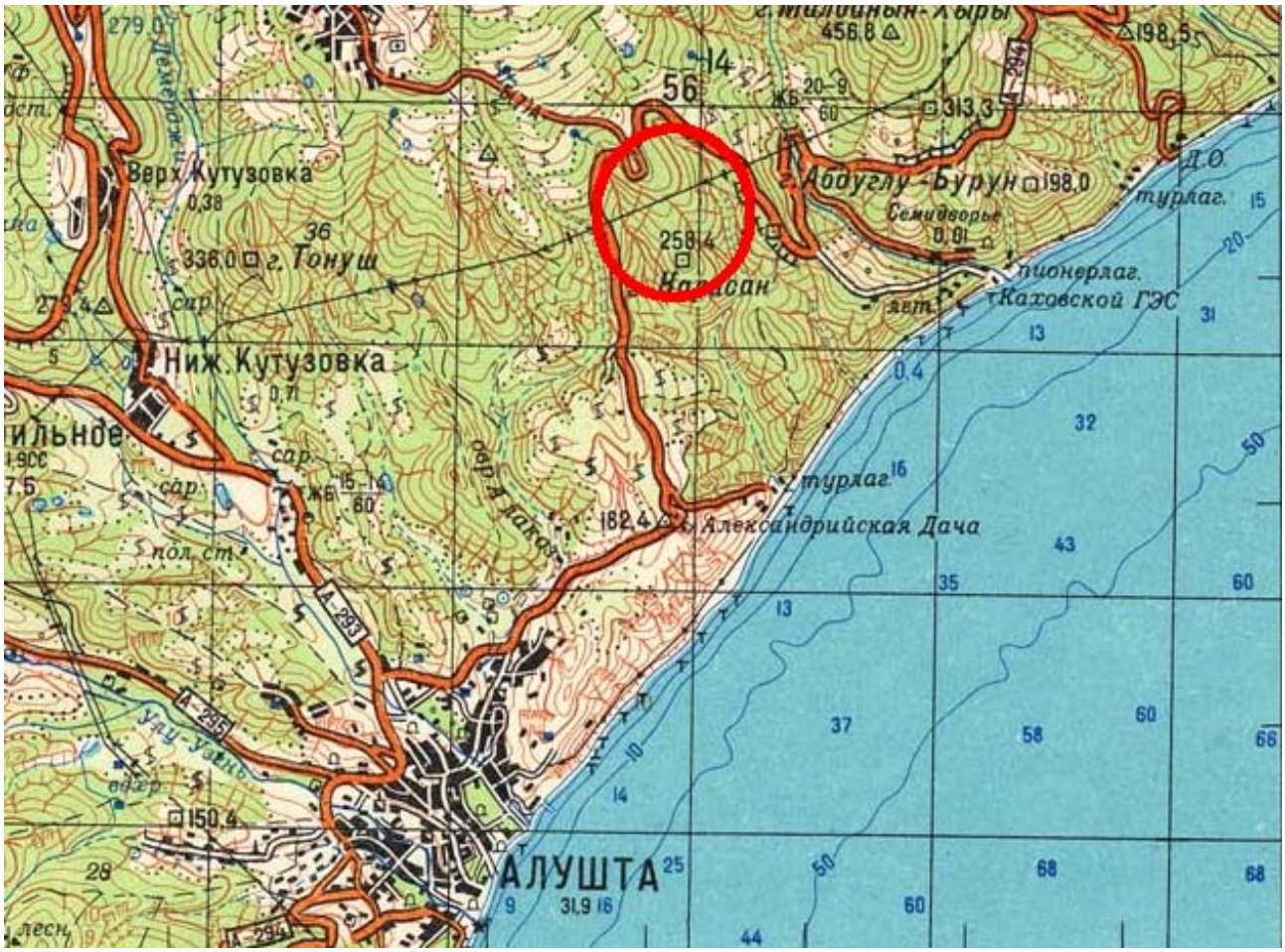
Annual load is 120,000 m^3 (40,000 tons) of waste

The 6.87 ha big landfill is situated on the territory of the collective farm "Aloushta" and Aloushta state forestry (State Act N° 103 dated 03.02.99). The landfill has been operating since 1960 and is located at 9 km of the Sudak motor road at the watershed between the cradles of the Ayan-Dere ravine, approximately 2.5 km off its mouth; visible embankment is as high as 40-50 m.

The SW landfill has been examined, assessments of the negative impact on the environment were made, a bore hole was drilled to control the quality of the underground waters; measures were taken to prevent the landfill from fires by installation of a spare tank 50 m^3 in volume; a flusher on duty is appointed, a bulldozer was bought to compact and cover the waste with earth, one layer above another; fire safety lawns were built. A disinfection barrier was erected to treat the exiting transport, a truck-washing facility was installed. The landfill needs reconstruction (required sum is 6,1 mln UAH.)

To increase the landfill capacity it is possible to move the existing buildings and constructions up the dumpsite and the freed area may be used for solid waste disposal.

9.1.1.2. Location



Map 10 Location of the landfill of Alouchta

9.1.1.3. Risks for Environment and health

9.1.1.3.1. Underground waters

Nothing has been done to check the presence of underground water.

9.1.1.3.2. Surface waters

It seems that the leachates of the landfill are appearing in the brook at the South of the landfill. It was told us that samplings of mud have been done in the bed of the brook, revealing a contamination by the leachates. This brook flows directly in the Black Sea, which is 2.5 km far from the landfill.

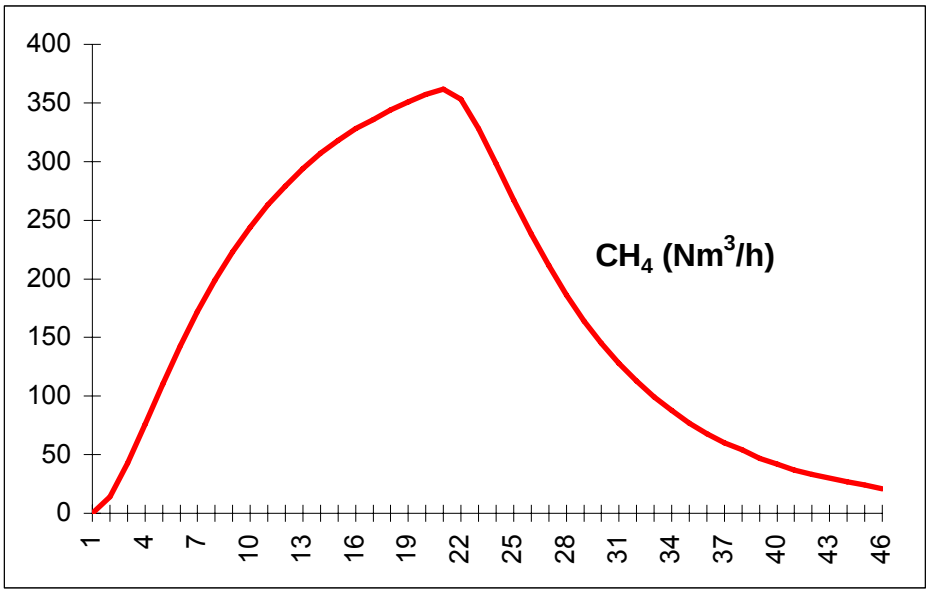
Picture 4 Alouchta Landfill: Sight on Black Sea

9.1.1.3.3. Fires

Nowadays, there are no fires on the landfill. In the past the landfill was regularly burning as it can be seen on the old parts as on Picture 5.

Picture 5 Alouchta Landfill: Burnt waste under the fresh waste

Burnt waste cannot produce biogas. The organics compounds have been oxidized by the combustion. So today, only the fresh waste will produce biogas if the fires are efficiently fought. It means that the flow which can be impounded will be weak during the first years as illustrated by the Graph 7. To reach 200 m^3/h will require 8 years on the base of 40,000 t/y as nowadays! These 200 m^3/h correspond to the usual size of electricity power generator of 600 kVA.



Graph 7: Potential of biogas production

So the investigations of biogas made as on the Picture 5 are not significant.

Picture 6 Alouchta Landfill: Boring for biogas detection

After several months, fresh waste produce biogas which can be detected. We must add that nobody can measure the production of biogas of a landfill in m^3/h. As far the landfill is not airtight and put under

depression with an aspiration system, it's impossible to measure the flow. We can only make estimations on the base of models. The methane appears after several weeks of biodegradation and to detect it is not a scoop.

9.1.1.3.4. Other risks

The slopes around the part which is today on operation are very important (Picture 7 and Picture 8). There's always a risk of collapse when the compactor approaches the edge of the disposal area.

Picture 7 Alouchta Landfill: Slopes at the South of the landfill

Picture 8 Alouchta Landfill: Slopes at the South of the landfill

9.1.1.3.5. Neighbourhood

There's no neighbours close the landfill.

9.1.1.4. Expert's comments

The soil under the landfill is a sponge. The leachate reappears in the brook downstream and has been detected by analyses. This brook goes directly to the sea which is 2.5 km far from the landfill.

The landfill is well operated for some time and the fires are controlled.

The company Gavsa-Schid of Poltava has convinced the municipality to implement their system of biogas collection. The figures and the methods that were communicated indicate that this company has no real skill in biogas collection.

The place where the trucks download the waste has been covered with earth. It's well done and improves the conditions of operation (Picture 9).

Picture 9 Alouchta Landfill: Downloading area

The western part of the landfill has begun to be covered with construction waste. It's good. But there's a comment we'll renew for all landfills visited. Sooner or later, the landfill will be surrounded and covered with earth and/or construction waste. It should be better to build as early as possible a dyke around the row where the waste will be disposed. It should ensure the stability of the mass of waste and the lateral airtightness of the landfill.

On the Eastern part of the landfill there's a ravine which could be interesting for an extension of the landfill (Picture 10). It seems that there's a question of border of protected area. The protection of the environment is a technical question and when there's an administrative limit, it must be based on technical considerations. So any project, new or extension, must be based on technical considerations (geology, hydrogeology, topography, endangered species of fauna and flora), and if necessary, the administrative limits must be revised on the base of these studies which had not be done when these borders have been decided.

Picture 10 Alouchta Landfill: Ravine

9.1.2. EVPATORIA

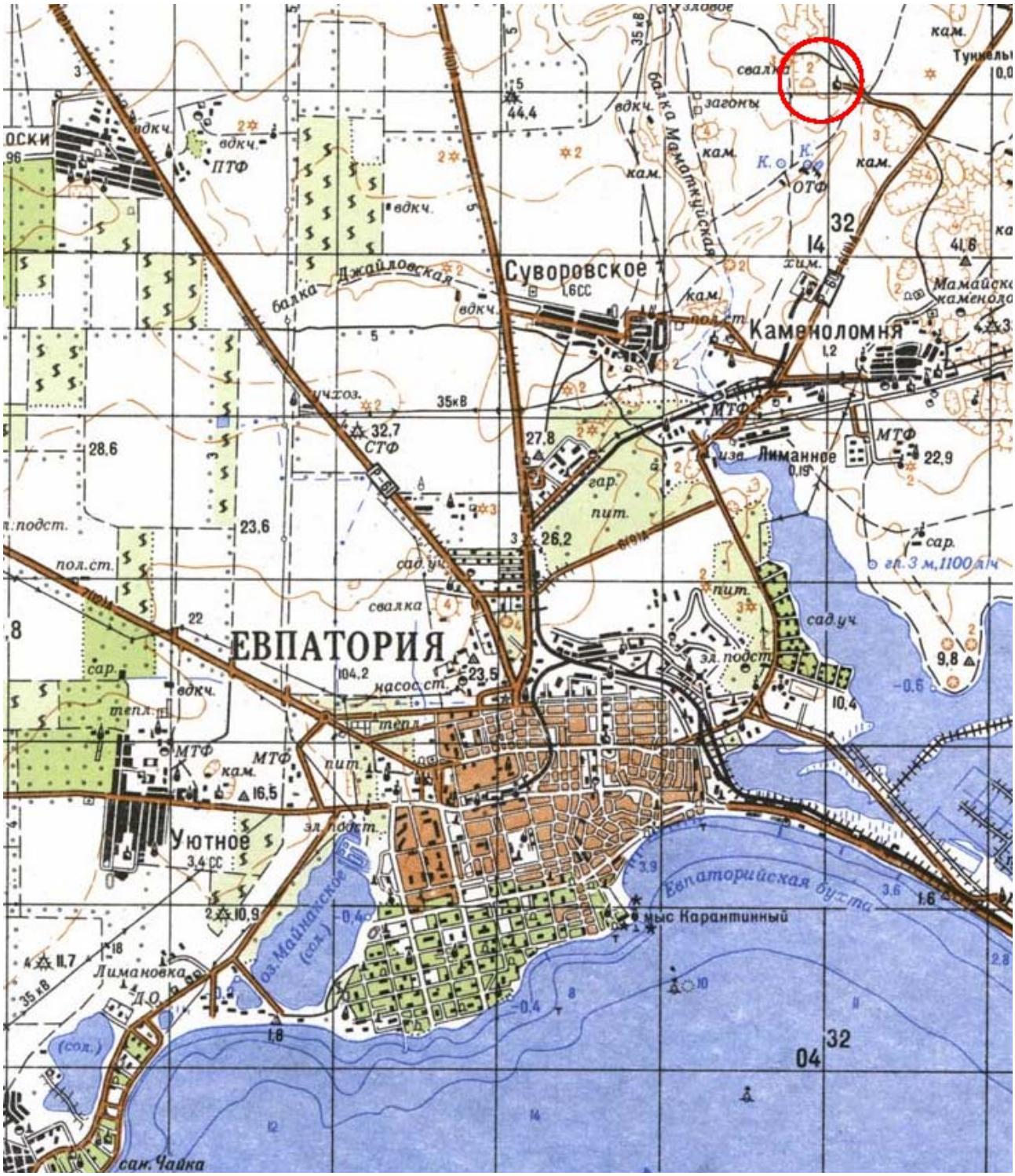
Visited on July 18th 2005

9.1.2.1. Communal and Housing Services Report

Annual load is 210,000 m^3 (70,000 tons) of waste.

The 28.0 ha big landfill is situated on the lands of the Suvorov battery farm in the Saki district. It has been operating since 1974 and is located at 9 km of the Razdolnyanskoye motor road. It is constructed in accordance with the project. There are: office buildings, KKP, a boiler-house, a building of the automated and open truck-washing facility, a water tower "Rozhnova", a bore hole, pump stations, a disinfecting barrier, outdoor lighting, telephones. The landfill is banked in perimeter. In order to provide systematic control of the impact the dumpsite causes on the environment it is planned to drill several observation holes in 2005.

9.1.2.2. Location



Map 11 Location of the landfill of Evpatoria

9.1.2.3. Risks for Environment and health

9.1.2.3.1. Underground waters

It has been told us that the landfill was operated by digging trenches which were filled with the waste and then covered. It's false. The landfill is using a former quarry of limestone (Picture 11 and Picture 12).

Picture 11 Evpatoria Landfill: Bed of limestone

Picture 12 Evpatoria Landfill: Former quarry row

Between the beds of limestone are layers of sand. This geological formation is particularly permeable. At the entrance of the landfill there's a borehole providing the water for the needs of the landfill (Picture 13). It has been told us that, naturally, the results of the analyses of this water were good! We have not seen the results of the analyses but as general comments we can say that: a) only what is searched can be found and it depends a lot of the parameters which are analysed; b) what are the limits and what are the laboratory

equipments able to measure around these limits? In this case, it should be of the highest importance to check the heavy metals but the EU limits require an ICP equipment which is not usual in Ukraine.

Picture 13 Evpatoria Landfill: Place of the water supply borehole

9.1.2.3.2. Surface waters

In such a permeable ground, there are no surface waters around the landfill. Some time before our visit it had rained and some traces could be seen on the landfill itself as on Picture 14 in parts where the soil is covered with ashes. But in the ditches and so, there was no trace of water.

Picture 14 Evpatoria Landfill: Trace of the former rain on the landfill

9.1.2.3.3. Fires

The landfill is continuously burning (Picture 15, Picture 16, Picture 17, Picture 18, Picture 19 and Picture 20). It's not due to a lack of means to fight against the fires (there's a water supply on the landfill) but due to a lack of efficiency of the operation. Different parts of the landfill are simultaneously used for the disposal. A lot of scavengers are working on the landfill (between 20 and 30). There are 2 bulldozers whose 1 is supposed to be in order and the second waiting for repair.

Picture 15 Evpatoria Landfill: Smoke covering a part of the landfill

Picture 16 Evpatoria Landfill: Fire on the landfill

Picture 17 Evpatoria Landfill: Burning waste

Picture 18 Evpatoria Landfill: Burnt waste

Picture 19 Evpatoria Landfill: Burning waste

Picture 20 Evpatoria Landfill: Burning waste

9.1.2.3.4. Other risks

There's a fence only on the side of the entrance of the landfill. For the rest, there's no fence and anybody can enter in the landfill.

9.1.2.3.5. Neighbourhood

Fortunately, there are no neighbours close to the landfill (Picture 21).

Picture 21 Evpatoria Landfill: The closest neighbours are very far

9.1.2.4. Expert's comments

The soil under the landfill is a sponge: sand and limestone.

The landfill is contaminating the watertable. A well exists on the landfill and samples of water should be fully analysed (all heavy metals, HC, HAP, phenols, bacteriology).

The landfill is badly operated and is continuously burning.

This landfill must be quickly closed and remedied.

9.1.3. FEODOSSIA

Visited on July 20th 2005

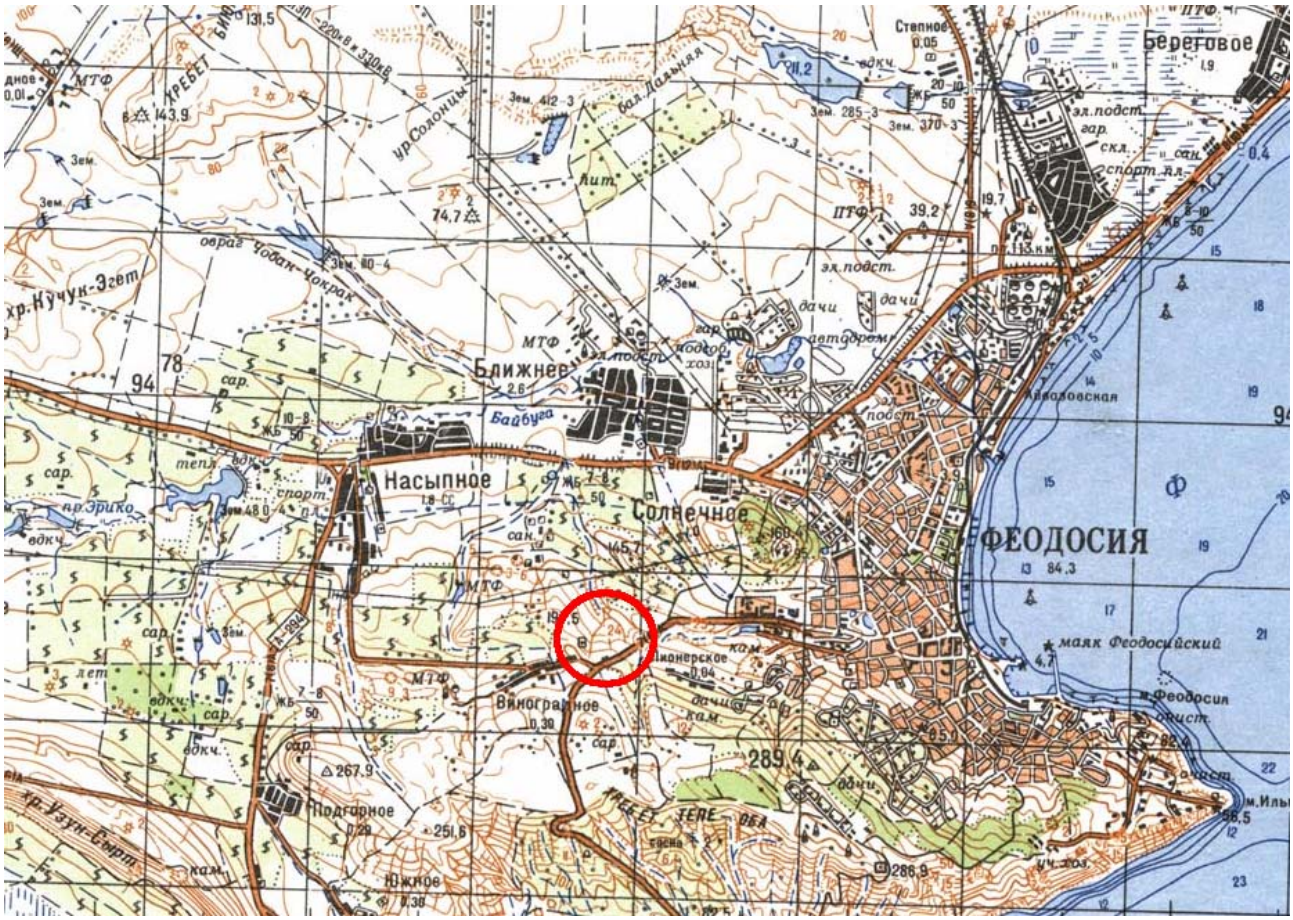
9.1.3.1. Communal and Housing Services Report

Annual load is 150,000 m^3 (50,000 tons) of waste

The dumpsite 10.4 ha big is situated on the land of the collective farm "Feodosiysky". It has been operating since 1974 and is situated at the distance of 0.6 km off the city. The perimeter of the dumpsite is fenced (285 m long).

The design for reconstruction of the existing dumpsite is being elaborated. It provides the construction of the catch water drains and waste treatment plants, of the disinfection barrier, KPP, settling pits and sludge drying beds, fixing of the fence. The waste sterilization is performed by surfacing followed by the earth covering (layer on the layer). The legalization of the rights for the land ownership will be soon completed.

9.1.3.2. Location



Map 12 Location of the landfill of Feodossia

9.1.3.3. Risks for Environment and health

9.1.3.3.1. Underground waters

On the site it had been planned to operate a plant of bricks, which indicates that the soil contains clay. Missing any other information, we can suppose that eventual groundwater should be protected by the clay.

9.1.3.3.2. Surface waters

The landfill is bordered by a brook (Picture 22) and it is known that this brook is contaminated by the leachates.

Picture 22 Feodossia Landfill: On the right, the bed of the brook

As it's known that the leachates of the landfill are running out to the brook, and with the topography of the site, it should be easy to manage 2 dykes of clay constituting 2 ponds for the treatment of the leachate before reject in the brook. As it can be seen on Picture 23, there's vegetation in the bed of the brook providing a phyto-purification of matters as carbon compounds, nitrates, phosphates, and some others. But it cannot help for heavy metals and others. A pre-treatment with 2 ponds should provide a decantation of the leachate in the first one and oxygenation in the second one.

Picture 23 Feodossia Landfill: Position of a dyke for leachates

9.1.3.3.3. Fires

The landfill is continuously burning, even if the operator says they are fighting against the fires. The former deposits show burnt waste (Picture 24) and during our visit, there were several fires.

Picture 24 Feodossia Landfill: Deposit of burnt waste

9.1.3.3.4. Other risks

On the other side of the road bordering the landfill, it's a natural protected area. In the past, a lot of flying waste were polluting this area. So, the operator installed a net which catches a lot of these flying waste (Picture 25 and Picture 26).

Picture 25 Feodossia Landfill: Net

Picture 26 Feodossia Landfill: Entrance of the landfill

As the soil is mainly made of clay, during winter and long periods of rain, the trucks cannot access to the disposal area. So a platform of concrete (Picture 27) provides a good access to the trucks which download there. Further, the waste are pushed with bulldozer to the disposal zones.

Picture 27 Feodossia Landfill: Concrete platform

9.1.3.3.5. Neighbourhood

There are not close neighbours. But as we have said, the landfill is contiguous to a natural protected area. We don't know what is exactly the administrative statute of this protected area and for which reasons it has been classified so.

9.1.3.4. Expert's comments

The landfill is bordered with a fence all along the road. On the others sides, there's no fence.

The disposal zones are several and dispersed. It's not the best way of operation and it doesn't allow to control the waste and to dispose them properly. As usual, the waste are pushed from the existing lanes and the landfill is not managed with rows delimited by earth dykes.

Picture 28 Feodossia Landfill: Dispersion of the waste

Picture 29 Feodossia Landfill: Disposal zones

Unfortunately, the soil is relatively watertight and the leachates are running to a brook. The landfill is often (if not continuously) burning.

The operation is not really bad but not so good.

The site is interesting. It could be studied for a sanitary landfill if there's nothing better in this area.

9.1.4. KERCH

Visited on July 20th 2005

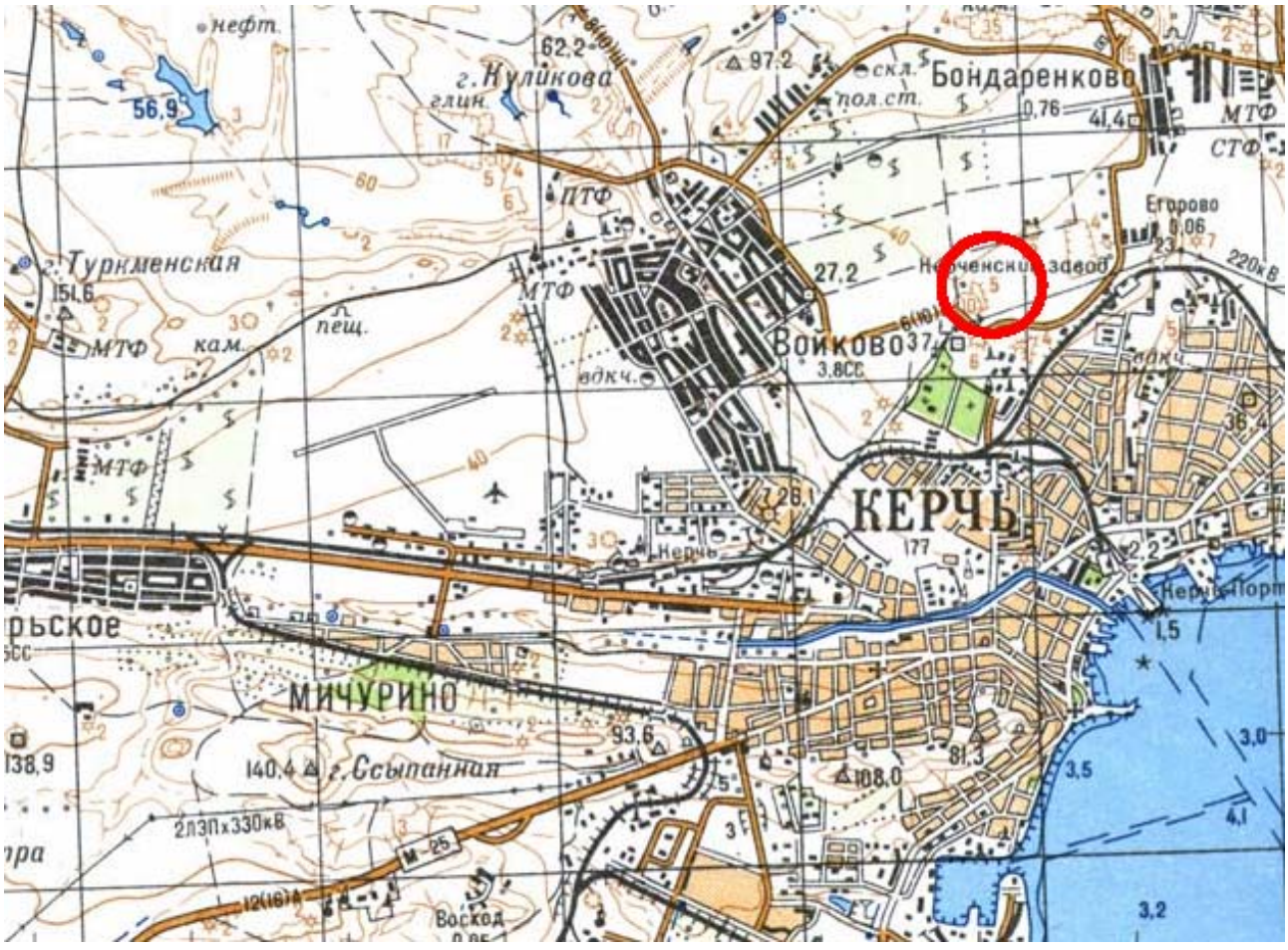
9.1.4.1. Communal and Housing Services Report

Annual load 250,000 m^3 (80,000 tons) of waste

The 19.3 ha big dumpsite is situated in the northern part of the city within the boundaries of the former open-cast quarry of the Kerch plant of the construction materials. It has been operating since 1970. Since 1994 the dumpsite is overfilled and presently extra loading takes place above the relief level. Engineering survey is carried on to reconstruct the dumpsite, land measuring on the territory of 20 ha as well as banking of the object perimeter are already over.

A site was found to construct a new landfill on the land of the Lenin district; the Lease contract is being prepared.

9.1.4.2. Location



Map 13 Location of the landfill of Kerch

9.1.4.3. Risks for Environment and health

9.1.4.3.1. Underground waters

The landfill occupies a former quarry of clay of the manufacture of bricks which is close (Picture 30).

Picture 30 Kerch Landfill: the bricks manufacture

It means that the subsoil of the landfill is clay and the underground water is protected. At a first glance, this clay offers a very good permeability, around $10^{-8}/10^{-9}$ m/s. These figures should be confirmed by laboratory analyses.

9.1.4.3.2. Surface waters

There's no surface water close to the landfill.

9.1.4.3.3. Fires

The landfill is continuously burning (Picture 31 and Picture 32) and nothing seems to be seriously done to fight against these fires.

Picture 31 Kerch Landfill: Fires on the landfill

Picture 32 Kerch Landfill: Fires on the landfill

9.1.4.3.4. Other risks

There's no fence around the landfill.

The waste can be seen all over the landfill. It is not covered with earth. As the landfill is near to be full and closed, it should be surrounded by a dyke of earth and covered with earth.

9.1.4.3.5. Neighbourhood

The landfill is located at the limit of the territories of the City of Kerch and the Rayon of Lenin. A road is bordering the landfill and as people as collection trucks use to download the waste on the road when the landfill is closed after 17:00 (Picture 33).

Picture 33 Kerch Landfill: Road bordering the landfill

9.1.4.4. Expert's comments

This landfill is close to be full. The soil is made of excellent clay. The best conditions could be found in this area for a sanitary landfill.

The landfill is very badly operated. It's continuously burning. A lot of works are necessary to close properly this landfill: peripheral dyke and cover of clay.

9.1.5. SIMFEROPOL

Visited on July 22nd 2005

9.1.5.1. Communal and Housing Services Report

Annual load is 600,000 m^3 (200,000 tons) of waste

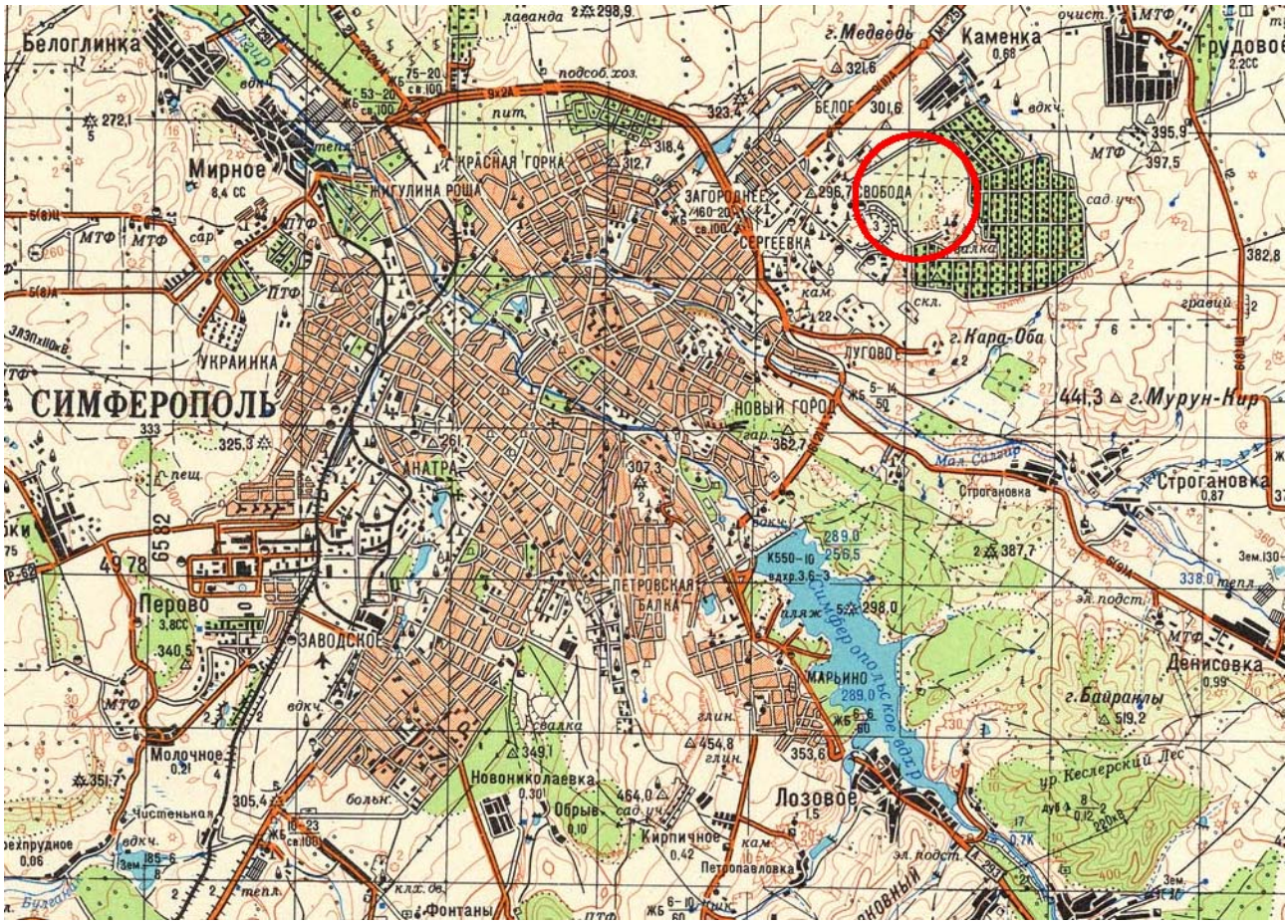
The landfill has been operating since 1981; its area is 24 ha (urban village Kamianka). Its operation life is exceeded and presently this landfill is inside the inhabited area which results in violation of the sanitary regulations.

For the time being it is not possible to close the landfill up as there is no available land in the 30 km zone off the city to construct a new solid waste landfill.

In 2000 a working project "Closing up of Simferopol solid waste landfill and provision of its maintenance for the period of performing works on recultivation and preservation" was elaborated. Its budget made 9.42 mln. UAH. The project provides measures which would assist in prolongation of the operation of the existing SW landfill for another 6.5 years, taking into consideration additional site (2.57 ha big) as well as enlargement of the sanitary protection zone up to 500 m. The State Act confirming the right of ownership of the site for the future landfill (plus extra 2.57 ha) is produced.

Another site 4.55 ha big was found and official permit was given to its allotment for the construction of the waste treatment plant.

9.1.5.2. Location



Map 14 Location of the landfill of Simferopol

9.1.5.3. Risks for Environment and health

9.1.5.3.1. Underground waters

There's no indication about the permeability of the soil and the subsoil, and about the underground waters. But it has been impossible to see leachates around the landfill. Usually, it indicates that all the leachates are penetrating in the soil.

9.1.5.3.2. Surface waters

There's no indication about surface waters.

9.1.5.3.3. Fires

The Company is operating alternatively 2 parts of the landfill, depending the weather conditions. The landfill is equipped with a water tank regularly filled. There's a wheels washing place but it's not used by the trucks.

Picture 34 Simferopol Landfill: Water supply

There are few traces of fires. In fact, even if the waste is lightly covered, there's a continuous self combustion of the waste, emitting from place to place some smoke (Picture 35).

Picture 35 Simferopol Landfill: Self combustion of the waste

9.1.5.3.4. Other risks

As often, the peripheral slopes of the waste are too strong (Picture 36 and Picture 37).

Picture 36 Simferopol Landfill: Slopes

Picture 37 Simferopol Landfill: Slopes

9.1.5.3.5. Neighbourhood

The landfill is inside the urban area. It seems that initially the closest neighbours were >500 m from the landfill but since, the land has been given to people who built houses despite the fact they were close the landfill. Now these people are complaining they are living close the landfill and ask for compensation. We

cannot know the truth of all that but the houses we have seen have been built after the creation of the landfill in 1981.

Picture 38 Simferopol Landfill: Closest neighbours

9.1.5.4. Expert's comments

A part of the landfill is on going of closure. The waste are covered with construction waste and earth (Picture 39, Picture 40, Picture 41 and Picture 42). A dyke with a light slope is created (Picture 43 and Picture 44).

Picture 39 Simferopol Landfill: Cover with construction waste

Picture 40 Simferopol Landfill: Cover with construction waste

Picture 41 Simferopol Landfill: Cover with construction waste

Picture 42 Simferopol Landfill: Cover with construction waste

Picture 43 Simferopol Landfill: Light slopes around the row

Picture 44 Simferopol Landfill: Light slopes around the row

All that is very good but why not to build these dykes before to operate a row of the landfill? Why to wait for after? The advantage to do it before is that it's easier to control the flying waste and the migration of leachates. It gives also a better sight of the landfill for the neighbours.

The landfill is seriously operated as we could see. Even if there's a lot of scavengers (>80), it's well managed.

Picture 45 Simferopol Landfill: Entrance of the landfill

Picture 46 Simferopol Landfill: 2 bulldozers at work on the landfill

Picture 47 Simferopol Landfill: Scavengers at work

9.1.6. YALTA

Visited on July 19th 2005

9.1.6.1. Communal and Housing Services Report

Annual load is 300,000 m^3 (100,000 tons) of waste

The landfill 5.76 ha big is situated outside the inhabited area of the Gasprinsky village council. 5.15 ha of the land belong to the Yalta mountain and forest reserve, 0.61 ha is the land of the collective farm "Livadia". The Black Sea is as far as 3.2 km. The dumpsite began its operation in 1973 on the site of former Issarsky open-cast quarry. No legal permits were issued and the dumpsite does not meet the nature protection requirements. The State Act of the land ownership was not issued because the dumpsite is situated on the lands of a natural reserve while such permit may be issued only by the decision of the Government of Ukraine.

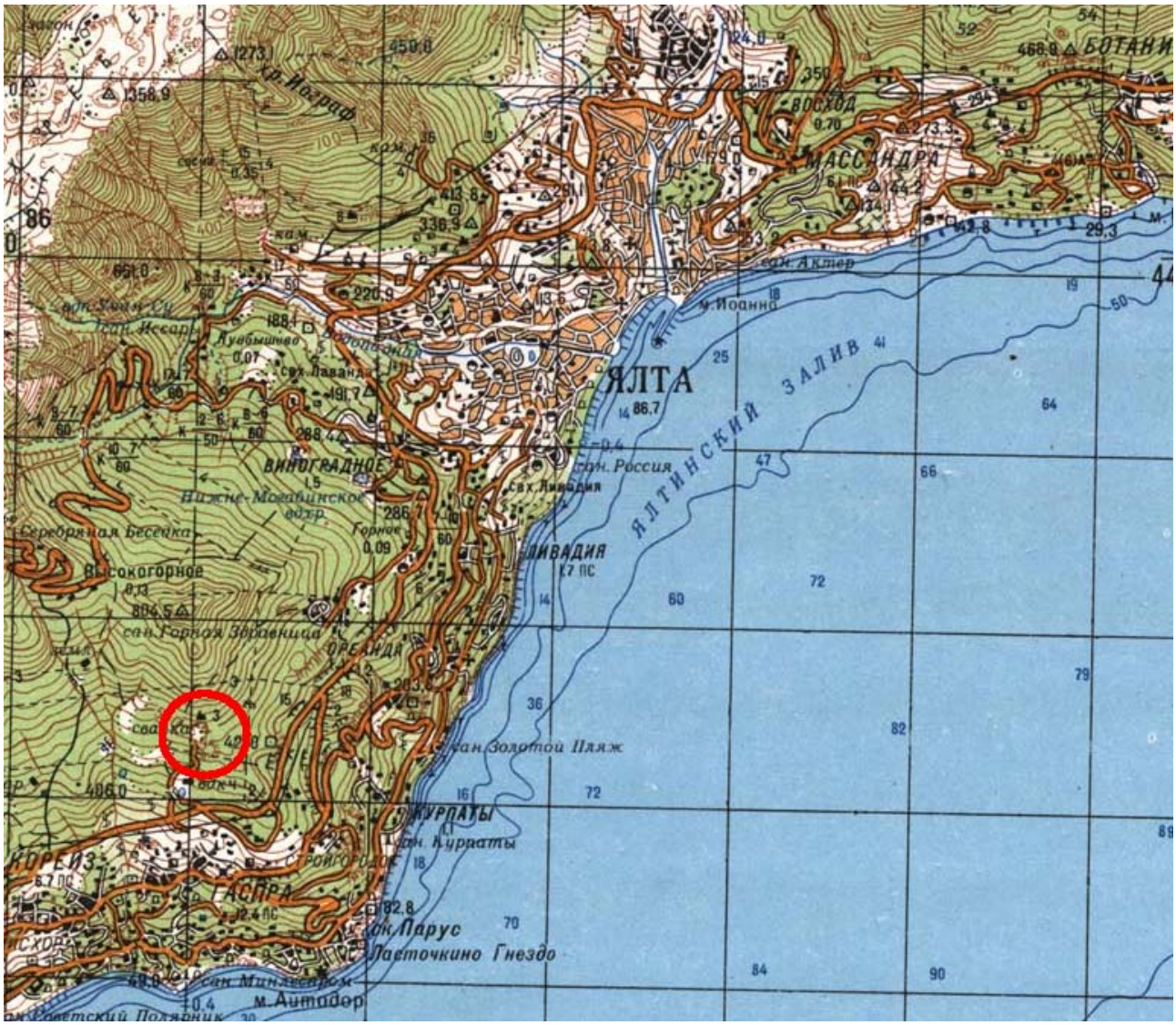
Gasprinsky dumpsite was constructed in accordance with the design and is the only place for the waste disposal on the territory of Big Yalta. So its closure without offering alternative dumpsite will result in spontaneous contamination of the Southern Crimean coast by unapproved dumpsites which will cause even more considerable danger to the national resort.

Engineering investigation (Chapter "Assessment of impact on the environment") were made to get a permit for a site for the existing SW landfill in urban village Gaspra, a draft long-term Lease contract has been prepared, a working project "Reconstruction of the SW landfill in urban village Gaspra" has been implemented which provides the prolongation of its operation. The scope of work performed during the reconstruction of the SW landfill in 2004 made 3.1 mln UAH.

Necessary documents for the approval of the SW landfill allotment in the urban village Gaspra on the lands of the Yalta mountain and forest natural reserve 5.15 ha in size were sent to the Cabinet of Ministers of Ukraine and corresponding decision on the matter was made.

After the site in question is excluded from the lands of the reserve it will be used for the landfill on the basis of a long-term Lease contract.

9.1.6.2. Location



Map 15 Location of the landfill of Yalta

9.1.6.3. Risks for Environment and health

9.1.6.3.1. Underground waters

There's no indication about the geology and the hydrogeology of the site. As the leachate appears, it may be supposed that the ground is relatively not very permeable.

9.1.6.3.2. Surface waters

The landfill includes 2 parts: the old landfill (Picture 48) and the new row recently built. For the older part, a peripheral ditch has been made collecting the running waters and leachates. These waters are driven to a tank and will be used to re-asperse the landfill.

Picture 48 Yalta Landfill: the old part of the landfill

It's interesting to see the first built row (Picture 49). It has really been built: a good access road, a concrete wall, a geomembrane (HDPE, thickness 1.2 mm), a layer of gravel for the draining, a collector driving the leachate to a tank. Other interest: it's the first time we see a waste compactor (Picture 50).

Picture 49 Yalta Landfill: New Row

Picture 50 Yalta Landfill: Waste compactor

The location of the landfill is by itself a risk. It's very close the Black Sea (Picture 51).

Picture 51 Yalta Landfill: Black Sea seen from the landfill

9.1.6.3.3. Fires

With the today's operation, there's no fire on the landfill.

9.1.6.3.4. Other risks

The slopes of the old part are too strong (Picture 48). With the operation of the new part, this slope can be smoothened in this axle. It should be good also to cover the old part with earth.

9.1.6.3.5. Neighbourhood

There are no close neighbours.

9.1.6.4. Expert's comments

The new zone of the landfill is very well done and the landfill is well operated. Some details could be improved but as a whole, it's good. Unfortunately, this extension has a very limited capacity.

From the period when the waste were transferred to the incineration plant of Sevastopol, hoppers are remaining (Picture 52). They were used to download the collection trucks and to reload transportation trucks. They could be reused for a waste transfer to a regional landfill.

Picture 52 Yalta Landfill: Hoppers for waste transfer

9.2. Other existing landfills

9.2.1. Functioning of the landfills

In accordance with the table of the Committee of Environment and Natural Resources of the ARC (ResKomPrirod Crimea), the local authorities of cities and rayons of the ARC manage 28 SHW dumps/landfills (including the dumps of village councils) that are used for disposal of SHW collected in a mechanised way by public utilities. Many of them have already exhausted their capacities, other will be full in the short-term perspective as there are more than 21 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 10 dumps, i.e. 36%.

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 some SHW dumps/landfills.

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 ARC have started to be designed and constructed in accordance with current sanitary and ecological requirements.

The Committee of Environment and Natural Resources of the ARC (ResKomPrirod Crimea) is equipped with a laboratory. It disposes of a spectrophotometer and a Gas Chromatograph (some local inspectorates are said to have a laboratory). The regional laboratory controls the landfills of Alouchta, Krasnoperekopsk, Saki, Simferopol, Sudak and Yalta and 2 villages of the Sakskiy and Simferopolskiy rayons. If the Gas Chromatograph is very useful for the detection of pollution by organic compounds, the National Standardisation Committee of Ukraine is always still blocking the norms for analyses with this equipment, which means that the analyses cannot be legally used.

9.2.2. Dumpsites

500 to 1000 sites of wild dumping exist within the ARC. 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 ARC on the annual basis, especially in spring. 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.

9.2.3. Existing landfills

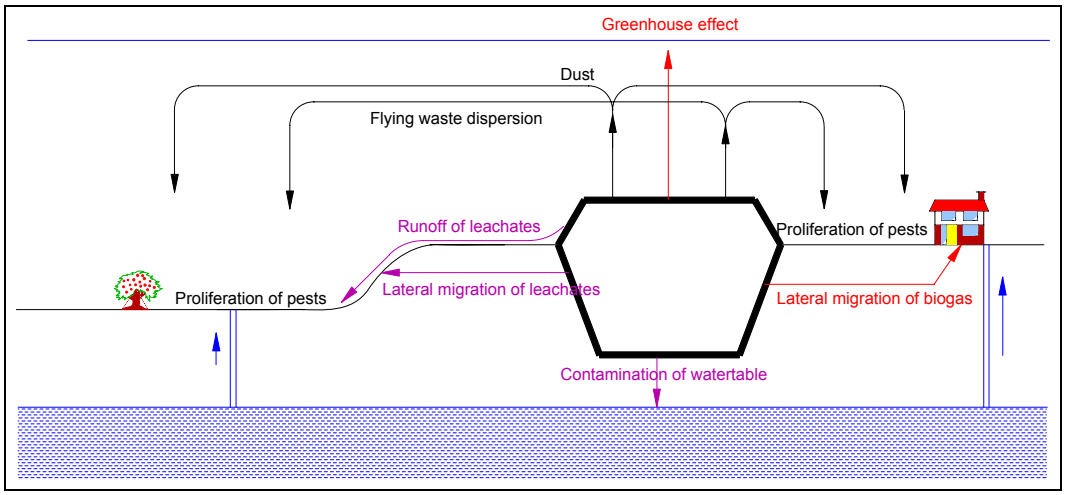
The answers that could be extracted from the Questionnaire sent to the administrative units are incomplete. Nevertheless they have the merit to exist. The less that can be said is that there's an atomisation of the landfills. It's typically the situation of past practices. Each one is putting the waste in the closest hole. Unfortunately such an approach is still in use.

9.2.3.1. 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.

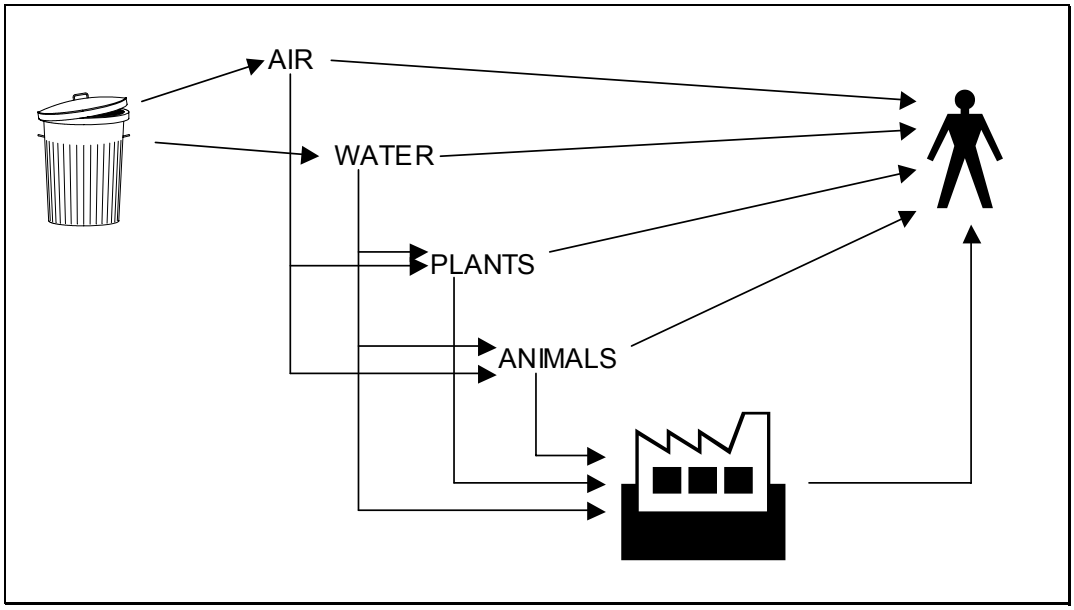


Drawing 3 Emissions of pollution from Dumpsite and Exposure Pathways

9.2.3.2. 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[9] (breeding)	Human Feeding
Leachates	Groundwater		Food Industry	Human Feeding
Waste dispersion		Animals		Human Feeding
Fire propagation				Disaster

Table 32 Possible contamination chains

9.3. Programme of actions concerning the disposal of ultimate waste

9.3.1. Principles

9.3.1.1. Objectives and transition

The objectives are:

- To pass from 400,000 t/y (collected) to 1,100,000 t/y (really produced) disposed in landfills;
- To pass from several hundreds landfills and dumpsites to 7 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.

9.3.1.2. Resorption of the dumpsites

9.3.1.2.1. 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, and 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] Breeding of animals uses network water for animal drinking

9.3.1.2.2. 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.

9.3.1.2.3. 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 SHW 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

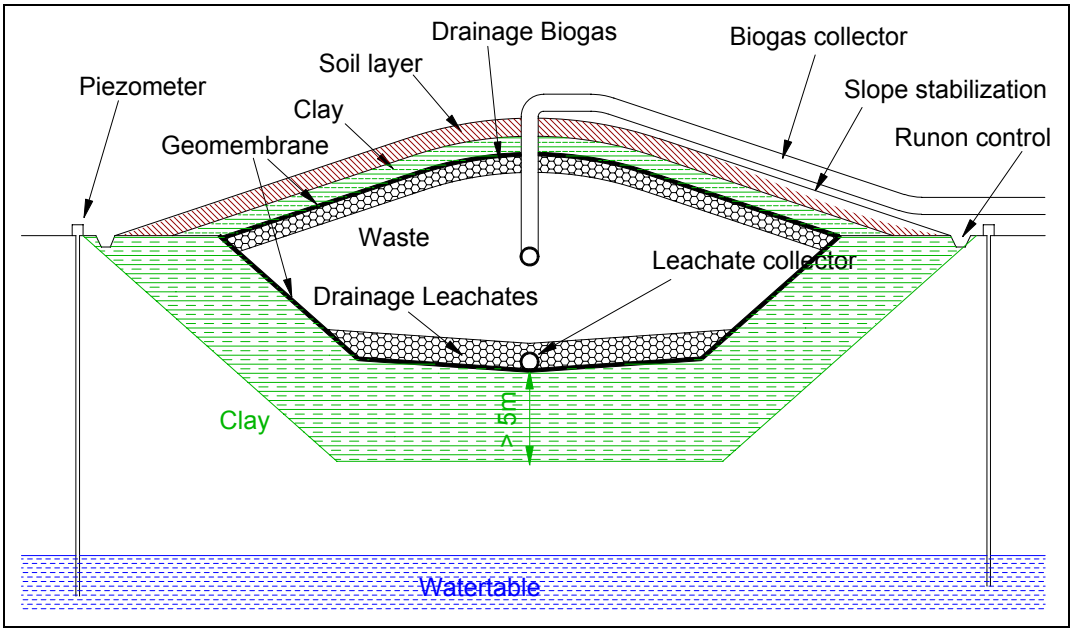
9.4.1. Principles of sanitary landfills

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 which 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.

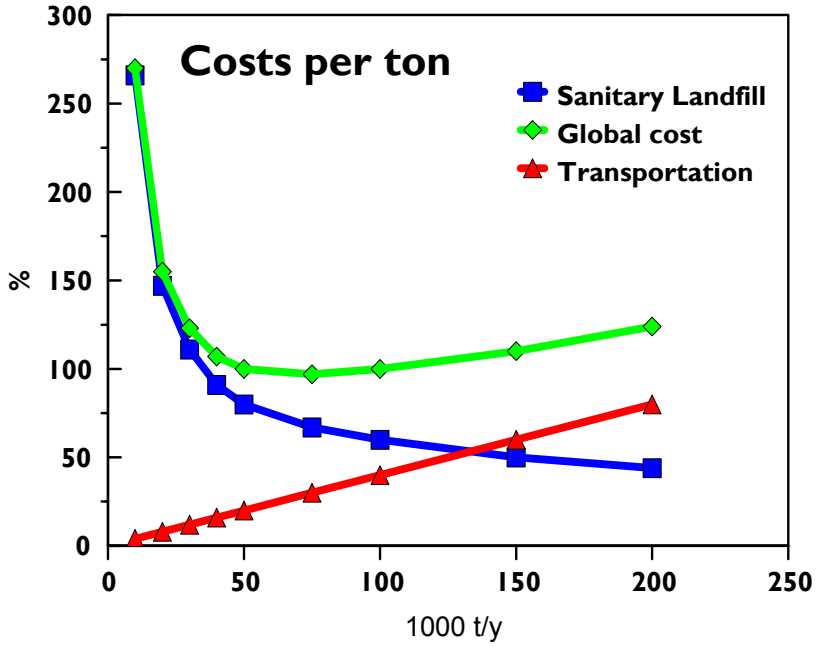
9.4.2. Global cost

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 8.



Graph 8 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 axle Simferopol - Sevastopol could absorb the production of the big cities, then be progressively relayed with the construction of other sanitary landfills.

9.4.4. Organisation of the landfilling at the maturity of 2016

A full transfer to SHW disposal at regional landfills is planned to be implemented by 2016. Seven potential sites proposed at the map for construction of regional landfills selected with consideration of geological and hydrogeological peculiarities of the ARC 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 Simferopol, Bahchysarai and Simferopolskiy Rayon (and even Sevastopol) for a total of around 1 mln. inhabitants. The site must be enough large (100 ha). It's possible that this site receives during a period tonnage up to 450,000 t/y as some sanitary landfills in Europe.

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

9.4.4.2. Inert waste landfill

The Crimea 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 ARC foresee the construction of facilities for incineration of SHW. 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

The siting must be based on geological and hydrogeological considerations. In July 2005, the experts asked KrimGeologia to establish the map of the favourable areas. The authorities asked from Tacis BSIF a lot of official letters and documents and in May 2006, the question was not solved.

During the study, on 24th May 2006, we discovered in the office of Mrs Tomtchichina the map. She found this map in the archives and put it on the wall. This map has been established by IOUJEKOGEOCENTR in 2000 but since this company disappeared. The map has been done with a CAD software, maybe Autocad. It indicates in green the areas of clay, and 4 scales of raster indicate 4 scales of depth of the clay. It is exactly what was asked. But Mrs Tomtchichina is not allowed to give any copy of the map, even any copy of the legend of the map! **This map is secret.**

We have seen that there's clay only on the South of Crimea, from Kerch to Evpatoria.

From the Ministry in Kiev, we got a hydrogeological map of Crimea. It's not the required map.

We can only consider that our demand troubles some people. Officially nobody wants to know where to implement regional sanitary landfills. This behaviour is surely motivated.

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.

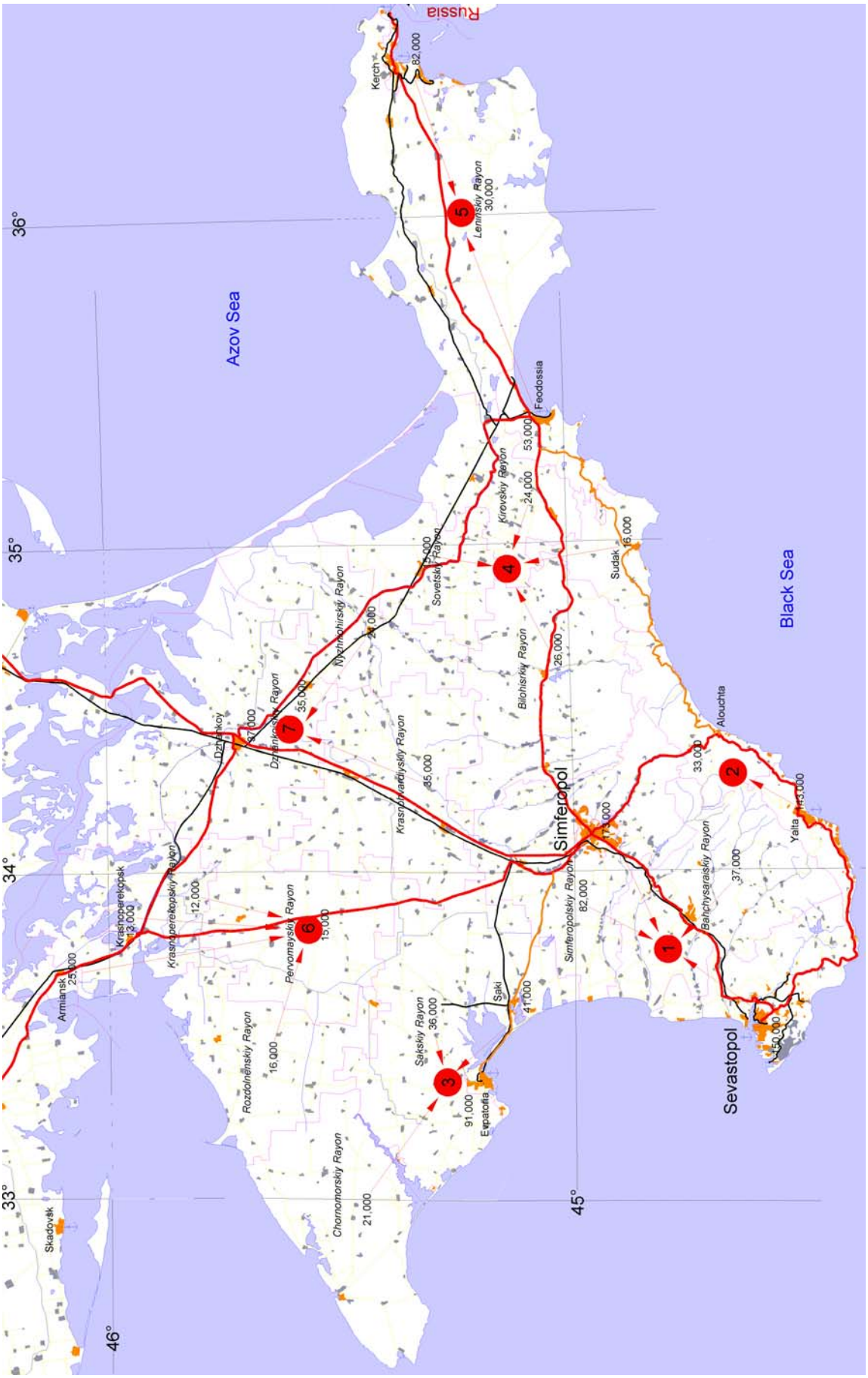
The produced waste must be found within a radius of reasonable transportation distance. With 80-m^3 semi trailer, 70 km are a good distance. There are also solutions of transportation by rail or by sea. But the ARC is characterized by its relief and we have privileged the main axis roads for the delimitation of the catchments.

The following Table 33 and Map 16 show an example of sizing. It gives a good potential for each landfill with reasonable transportation distances.

	Population (2005 in 1000s)	Households	Tourists	Commercial waste	Municipal waste	TOTAL 2006
Landfill 1	***603.8***	***220,387***	***3,848***	***41,000***	***26,000***	***441,235***
Simferopol	363.3	132,605		*20,000*	20,000	172,605

Bahchysarai	90.7	33,106	2,016	*1,000*	*1,000*	37,122
Simferopolskiy	149.8	54,677	1,832	*20,000*	*5,000*	81,509
Sevastopol						150,000
Landfill 2	***195.3***	***71,285***	***34,520***	***51,841***	***18,189***	***175,835***
Yalta	142.7	52,086	24,710	49,841	16,189	142,826
Alouchta	52.6	19,199	9,810	*2,000*	*2,000*	33,009
Landfill 3	***259.9***	***94,864***	***22,476***	***31,147***	***39,282***	***187,769***
Evpatoria	121.7	44,421	12,173	21,067	13,533	91,194
Saki	27.1	9,892	7,701	1,181	21,749	40,522
Sakskiy	78.5	28,653	855	*3,000*	*3,000*	35,508
Chornomorskiy	32.6	11,899	1,747	5,900	1,000	20,546
Landfill 4	***184.5***	***67,343***	***3,313***	***6,500***	***3,458***	***80,614***
Sudak	28.6	10,439	3,313	*1,000*	*1,000*	15,752
Bilohisrkiy	64.8	23,652		1,167	692	25,510
Kirovskiy	55.8	20,367		3,333	767	24,467
Sovetskiy	35.3	12,885		*1,000*	*1,000*	14,885
Landfill 5	***325.5***	***118,808***	***10,275***	***26,000***	***9,900***	***164,983***
Kerch	152.6	55,699	1,640	*20,000*	*5,000*	82,339
Feodossia	106.6	38,909	7,093	4,000	2,900	52,902
Leninskiy	66.3	24,200	1,542	*2,000*	*2,000*	29,742
Landfill 6	***160.8***	***58,692***	***740***	***5,577***	***17,285***	***82,293***
Armiansk	25.2	9,198		1,900	14,333	25,431
Krasnoperekopsk	30.8	11,242		*1,000*	*1,000*	13,242
Krasnoperekopskiy	30.9	11,279		277	848	12,403
Pervomayskiy	38.2	13,943		1,400	103	15,446
Rozdolnenskiy	35.7	13,031	740	*1,000*	*1,000*	15,771
Landfill 7	***264.5***	***96,543***	***0***	***12,933***	***21,500***	***130,976***
Dzhankoy	40.5	14,783		6,933	15,500	37,216
Dzhankoiskiy	78.8	28,762		*3,000*	*3,000*	34,762
Krasnohvardiyskiy	91.7	33,471		*1,000*	*1,000*	35,471
Nyzhniohirskiy	53.5	19,528		*2,000*	*2,000*	23,528

Table 33 Proposition of zones for new sanitary landfills



Map 16 Proposition of zones for new sanitary landfills

9.6. 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 ARC 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 one city dump (Kerch) has developed project 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 programme of investments of a Regional Strategic Plan for Crimea can be summarized as Table 34:

mln UAH	TOTAL	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Weighbridges	2,000		1,000	1,000							
Computerization	1,000		1,000								
Put at level of collection											
Trucks	9,000		1,800	1,800	1,800	1,800	1,800				
Tractor + trailer	0										
Containers	1,500		0.300	0.300	0.300	0.300	0.300				
Development of collection											
Trucks	38.000		7.600	7.600	7.600	7.600	7.600				
Tractor + trailer	0										
Containers	12.000		2.400	2.400	2.400	2.400	2.400				
Selective collection											
Containers	12.600				1.800	1.800	1.800	1.800	1.800	1.800	1.800
Trucks	14.000				2.000	2.000	2.000	2.000	2.000	2.000	2.000
Sorting plants	60.000				15.000		15.000		15.000		15.000
Transfer											
Road carriages	17.500			4.900		2.100	2.800	1.400	3.500	2.800	
Semi-trailers	30.000			6.000	9.000	6.000	3.000	3.000		3.000	
Transfer station	20.000			4.000	6.000	4.000	2.000	2.000		2.000	
Landfills	210.000			30.000	30.000	30.000	30.000	30.000	30.000	30.000	
Diverse	24.000			3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000
TOTAL	451.600	0	14.100	61.000	78.900	61.000	71.700	43.200	55.300	44.600	21.800

Table 34 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	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Operation costs											
Collection	20.725	26.553	35.125	44.188	51.203	58.599	60.357	62.168	64.033	65.954	67.933
Selective collection	0.000	0.040	0.080	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											
Trucks			1.933	3.903	5.378	5.378	6.892	6.892	7.309	7.309	7.309
Transfer station			0.173	0.348	0.480	0.480	0.615	0.615	0.653	0.653	0.653
Landfills			7.369	10.456	13.573	15.082	17.857	19.541	21.956	21.956	21.956
TOTAL	20.725	26.593	46.680	63.095	75.034	86.139	92.522	98.217	103.151	107.272	109.450
Amortization											
Weighbridges			0.100	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200
Computerization				0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200
Put at level of collection											
Trucks			0.257	0.514	0.771	1.029	1.286	1.286	1.286	1.286	1.286
Tractor + trailer				0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Containers			0.060	0.120	0.180	0.240	0.300	0.300	0.300	0.300	0.300
Development of collection											
Trucks			1.086	2.171	3.257	4.343	5.429	5.429	5.429	5.429	5.429
Tractor + trailer			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Containers			0.480	0.960	1.440	1.920	2.400	2.400	2.400	2.400	2.400
Selective collection											
Containers				0.000	0.360	0.720	1.080	1.440	1.800	2.160	2.520
Trucks				0.000	0.286	0.571	0.857	1.143	1.429	1.714	2.000
Sorting plants				0.000	1.500	1.500	3.000	3.000	4.500	4.500	6.000
Transfer											
Road carriages				0.700	0.700	1.000	1.400	1.600	2.100	2.500	2.500
Semi-trailers				0.857	2.143	3.000	3.429	3.857	3.857	4.286	4.286
Transfer station				0.267	0.667	0.933	1.067	1.200	1.200	1.333	1.333
Landfills			14.737	20.912	27.145	30.164	35.713	39.082	43.911	43.911	43.911
Diverse				0.600	1.200	1.800	2.400	3.000	3.600	4.200	4.800
TOTAL	0.000	0.000	16.720	27.502	40.049	47.620	58.760	64.136	72.211	74.419	77.165

Table 35 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:

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Private sector Amount M UAH	1.022	4.470	6.890	10.735	11.269	11.834	12.425	13.046	13.699	14.388	15.110
Collective H. Amount M UAH	3.914	9.691	12.100	13.201	13.863	14.557	15.287	16.051	16.854	17.698	18.581
TOTAL M UAH	4.936	14.161	18.990	23.936	25.132	26.391	27.712	29.097	30.553	32.086	33.691

Table 36 Evolution of the fees

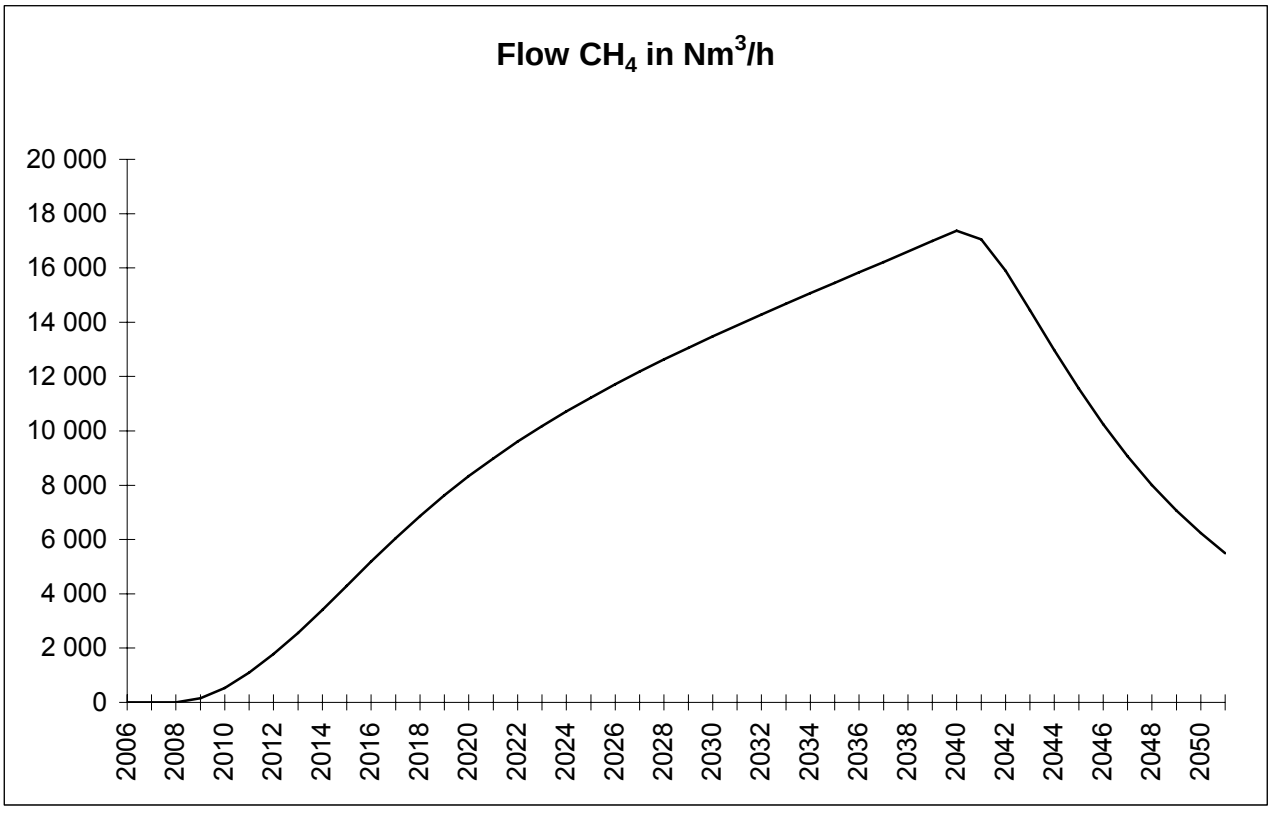
In parallel, the enterprises should be progressively obliged to dispose their waste in the new sanitary landfills with a payment of 60 UAH/tonne. The corresponding incomes can be estimated as:

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Tonnage 1000 t	0	0	50	80	100	120	140	170	200	200	200
Amount mln UAH	0.000	0.000	3.000	4.800	6.000	7.200	8.400	10.200	12.000	12.000	12.000

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 20 in proportion to carbon dioxide.

Supposing all the SHW of ARC 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 37).



Graph 9 Potential collecting of biogas

Year	Production CH_4 m^3/y	Collection CH_4 m^3/h	Equivalent CO_2 kg/y	Thermal Power kW	Potential Production of Electricity kW	Projected Production of Electricity kWh/y
2006	0	0	0	0	0	
2007	0	0	0	0	0	
2008	0	0	0	0	0	0
2009	1,310,471	150	25,583,255	1,496	499	4,371,240
2010	4,637,197	529	90,528,212	5,276	1,759	15,408,840
2011	9,587,335	1,094	187,165,714	10,910	3,637	31,860,120
2012	15,612,921	1,782	304,798,324	17,772	5,924	51,894,240
2013	22,428,028	2,560	437,844,089	25,531	8,510	74,547,600
2014	29,811,309	3,403	581,981,869	33,938	11,313	99,101,880
2015	37,586,111	4,291	733,762,994	42,794	14,265	124,961,400
2016	45,447,422	5,188	887,232,942	51,740	17,247	151,083,720
2017	53,015,657	6,052	1,034,981,418	60,357	20,119	176,242,440
2018	60,145,982	6,866	1,174,180,950	68,475	22,825	199,947,000
2019	66,802,602	7,626	1,304,132,714	76,054	25,351	222,074,760
2020	72,997,409	8,333	1,425,068,871	83,105	27,702	242,669,520
2021	78,764,007	8,991	1,537,645,470	89,667	29,889	261,827,640
2022	84,143,875	9,605	1,642,672,241	95,791	31,930	279,706,800
2023	89,181,103	10,180	1,741,009,924	101,525	33,842	296,455,920
2024	93,918,346	10,721	1,833,491,268	106,921	35,640	312,206,400
2025	98,395,745	11,232	1,920,899,859	112,017	37,339	327,089,640
2026	102,650,208	11,718	2,003,956,287	116,864	38,955	341,245,800
2027	106,714,691	12,182	2,083,303,870	121,491	40,497	354,753,720
2028	110,619,283	12,628	2,159,530,024	125,939	41,980	367,744,800
2029	114,390,451	13,058	2,233,151,470	130,227	43,409	380,262,840
2030	118,051,917	13,476	2,304,631,288	134,396	44,799	392,439,240
2031	121,624,099	13,884	2,374,368,073	138,465	46,155	404,317,800
2032	125,125,933	14,284	2,442,731,524	142,454	47,485	415,968,600
2033	128,573,124	14,677	2,510,028,214	146,374	48,791	427,409,160
2034	131,980,620	15,066	2,576,549,991	150,253	50,084	438,735,840
2035	135,360,374	15,452	2,642,530,168	154,103	51,368	449,983,680
2036	138,724,307	15,836	2,708,201,479	157,932	52,644	461,161,440
2037	142,082,037	16,219	2,773,751,708	161,752	53,917	472,312,920
2038	145,442,429	16,603	2,839,353,901	165,582	55,194	483,499,440
2039	148,812,999	16,988	2,905,154,786	169,421	56,474	494,712,240
2040	152,201,201	17,375	2,971,299,901	173,281	57,760	505,977,600
2041	149,332,688	17,047	2,915,300,261	170,010	56,670	496,429,200
2042	139,207,434	15,891	2,717,633,188	158,481	52,827	462,764,520
2043	126,591,252	14,451	2,471,337,758	144,120	48,040	420,830,400
2044	113,631,024	12,972	2,218,325,784	129,370	43,123	377,757,480
2045	101,241,578	11,557	1,976,456,741	115,258	38,419	336,550,440
2046	89,802,808	10,251	1,753,146,974	102,233	34,078	298,523,280
2047	79,440,199	9,069	1,550,846,209	90,445	30,148	264,096,480
2048	70,160,698	8,009	1,369,690,072	79,874	26,625	233,235,000
2049	61,911,584	7,068	1,208,649,347	70,489	23,496	205,824,960
2050	54,614,310	6,235	1,066,190,623	62,182	20,727	181,568,520
2051	48,179,259	5,500	940,564,373	54,852	18,284	160,167,840
TOTAL	3,820,252,026		74,579,664,127			12,699,722,400
Average	84,894,489	9,691	1,657,325,869		32,216	282,216,053

Table 37 Potential collecting of biogas

The landfilling should spare on average 1.66 mln tons CO_2 per year.

The landfilling should produce on average 280 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:

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Carbon rights Amount M UAH		0.000	0.000	0.767	2.716	5.615	9.144	13.135	17.459	22.013	26.617
Electricity Amount M UAH		0.000	0.000	1.180	4.160	8.602	14.011	20.128	26.758	33.740	40.793
TOTAL M UAH	0.000	0.000	0.000	1.947	6.876	14.217	23.155	33.263	44.217	55.753	67.410

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. For 4 sorting plants created for 2009, 2011, 2013 and 2015, and able to sort 50,000 t/y each, the sales of secondary raw materials should be:

mln UAH	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
New sorting plants				1		1		1		1	
Glass				1.000	1.000	2.000	2.000	3.000	3.000	4.000	4.000
PET				3.750	3.750	7.500	7.500	11.250	11.250	15.000	15.000
Paper				0.340	0.340	0.680	0.680	1.020	1.020	1.360	1.360
Textile				0.170	0.170	0.340	0.340	0.510	0.510	0.680	0.680
Metal				0.375	0.375	0.750	0.750	1.125	1.125	1.500	1.500
TOTAL	0.000	0.000	0.000	5.635	5.635	11.270	11.270	16.905	16.905	22.540	22.540

Table 38 Potential sales of secondary raw materials

10.2.4. Total potential incomes

mln UAH	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Fees	4.936	14.161	18.990	23.936	25.132	26.391	27.712	29.097	30.553	32.086	33.691
Common Industrial Waste	0.000	0.000	3.000	4.800	6.000	7.200	8.400	10.200	12.000	12.000	12.000
Carbon rights	0.000	0.000	0.000	0.767	2.716	5.615	9.144	13.135	17.459	22.013	26.617
Electricity	0.000	0.000	0.000	1.180	4.160	8.602	14.011	20.128	26.758	33.740	40.793
Secondary raw materials	0.000	0.000	0.000	5.635	5.635	11.270	11.270	16.905	16.905	22.540	22.540
TOTAL	4.936	14.161	21.990	36.318	43.643	59.078	70.537	89.465	103.675	122.379	135.641

Table 39 Total potential incomes

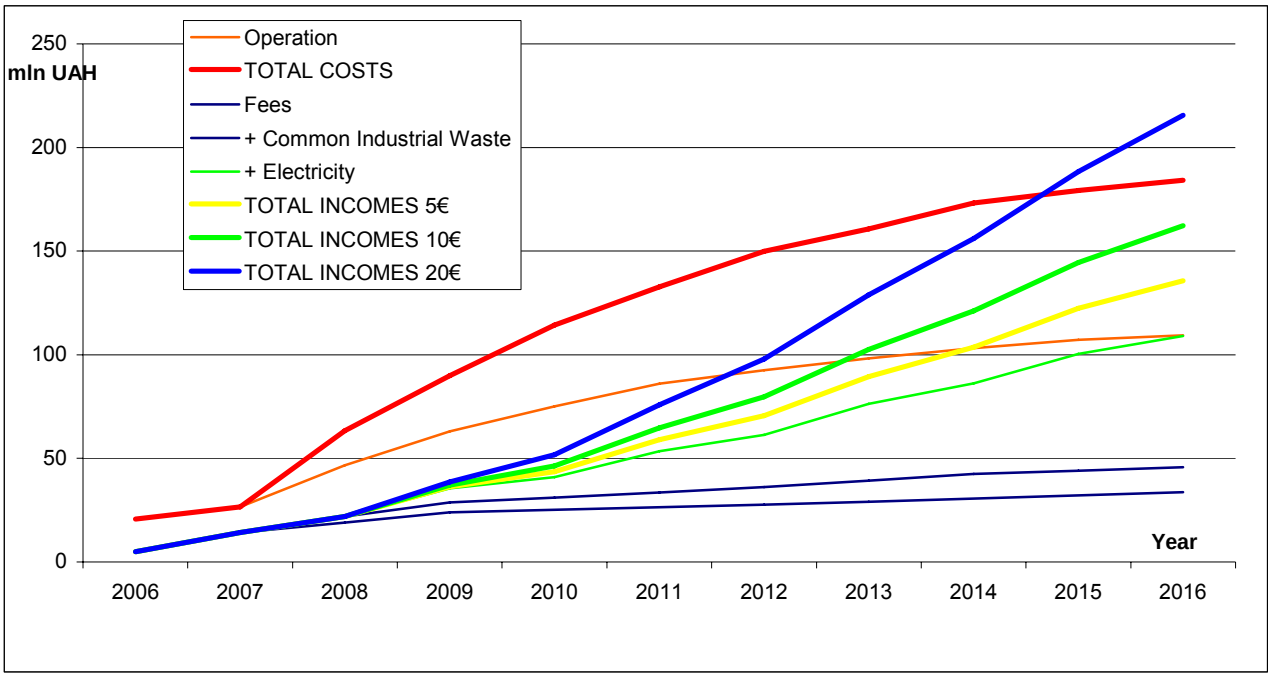
10.3. FINANCIAL ANALYSIS

All the previous figure can be summarized as on Table 40 and Graph 10.

mln UAH	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Fees	4.936	14.161	18.990	23.936	25.132	26.391	27.712	29.097	30.553	32.086	33.691
Common Industrial Waste	0.000	0.000	3.000	4.800	6.000	7.200	8.400	10.200	12.000	12.000	12.000
Carbon rights	0.000	0.000	0.000	0.767	2.716	5.615	9.144	13.135	17.459	22.013	26.617
Electricity	0.000	0.000	0.000	1.180	4.160	8.602	14.011	20.128	26.758	33.740	40.793
Secondary raw materials	0.000	0.000	0.000	5.635	5.635	11.270	11.270	16.905	16.905	22.540	22.540

TOTAL INCOMES	4.936	14.161	21.990	36.318	43.643	59.078	70.537	89.465	103.675	122.379	135.641
Operation	20,725	26,593	46,680	63,095	75,034	86,139	92,522	98,217	103,151	107,272	109,450
Amortization	0,000	0,000	16,720	26,802	39,349	46,620	57,360	62,536	70,111	71,919	74,665
TOTAL COSTS	20,725	26,593	63,400	89,897	114,383	132,759	149,882	160,753	173,262	179,190	184,115

Table 40 Key-figures



Graph 10 Key-figures

10.3.1. Profitability Analysis

The curve of the Incomes crosses the curve of the operation costs around 2014. 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: 0.27 UAH/kWh and 5€/CO_2e tonne. 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 95 mln UAH and the incomes from carbon rights should be 62 mln UAH, although the operation costs and the amortizations should be constant.

At least, the key-incomes could be the carbon rights. The hypothesis of 5 € is a minimum. If it is 10 €, the total costs should be covered in 2018, and if it is 20 € the total costs should be covered in 2014.

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. But no official wants to say how much the ARC is able to invest.

Some grants should be welcome to initiate a virtuous circle for the SHWM.

11.Socio-economical and financial aspects

11.1. Purchasing power

The ARC is one of the rich regions of Ukraine, notably for the reason of the strong development of tourism and the linked boom of the construction. The economic growth has been quite high recently and resulted in the growth of wages. In 2004, the average income by inhabitant is officially up to 540 UAH/month (note: 90 €/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 and the official figures of unemployment seem now decreasing.

	2000	2001	2002	2003	2004	2005
Average salary of working people, UAH	225	301	358	433	543	
Number of people engaged in economic activities, thousands						
Number of registered unemployed people (end of the year), people				42,148	41,060	40,758

It must be noticed that if the rate of unemployment officially registered on January 1, 2005 is 3.4%, the rate calculated for 2002 according to the methodology used by ILO is >10%.

The dynamics of the average monthly wages by administrative units is set out in Table 41

	2000	2001	2002	2003	2004
AR Crimea	**225**	**301**	**358**	**433**	**543**
Cities					
Alouchta	218	291	355	432	550
Armiansk	347	409	361	441	758
Dzhankoy	239	359	438	534	631
Evpatoria	213	279	328	390	462
Kerch	254	352	418	499	588
Krasnoperekopsk	303	363	411	532	672
Saki	219	274	308	369	469
Simferopol	288	370	432	515	637
Sudak	249	317	382	480	576
Feodossia	293	378	437	515	576
Yalta	257	334	393	469	588
Rayons					
Bahchysaraiskiy	186	251	293	356	418
Bilohisrkiy	131	180	233	265	330
Dzhankoiskiy	111	144	180	222	309
Kirovskiy	135	178	230	294	353
Krasnohvardiyskiy	117	174	220	300	445
Krasnoperekopskiy	143	187	231	283	349
Leninskiy	155	197	237	280	343
Nyzhniohirskiy	121	172	208	253	333
Pervomayskiy	119	164	214	257	321
Rozdolnenskiy	154	196	230	285	359
Sakskiy	135	193	247	290	370
Simferopolskiy	193	291	366	383	474
Sovetskiy	141	199	230	276	358
Chornomorskiy	283	375	469	576	728

Table 41: Average monthly nominal wages in different administrative units, UAH

The consumer price index of various categories of goods was used as the key characteristic of inflation process (Table 42)

	2000	2001	2002	2003	2004
Consumer price index, including:	116.7	107.2	98.3	108.5	110.7
Foods	120.6	110.5	96.0	111.7	113.8
Non-foods	107.8	99.5	100.6	102.2	104.9
Services	113.5	102.5	103.9	102.8	103.9
Industrial producer price index	124.2	108.4	94.2	111.1	111.9

Table 42: Consumer price index

The data on the unemployment dynamics are set out in Table 43

	2003		2004		2005	
	Number of unemployed people	Unemployment rate[10], %	Number of unemployed people	Unemployment rate, %	Number of unemployed people	Unemployment rate, %
AR Crimea	**42,148**	**3.5**	**41,060**	**3.4**	**40,758**	**3.4**
Cities	**16,121**	**2.4**	**14,713**	**2.2**	**13,740**	**2.1**
Alouchta	1,010	3.2	1,194	3.8	1,228	3.9
Armiansk	973	6.0	923	5.8	847	5.3
Dzhankoy	676	2.8	414	1.7	427	1.8
Evpatoria	2,646	3.7	2,459	3.4	2,350	3.2
Kerch	3,475	3.7	2,736	2.9	2,450	2.6
Krasnoperekopsk	914	4.7	942	4.8	791	4.1
Saki	446	2.7	448	2.8	361	2.3
Simferopol	2,650	1.2	2,654	1.2	2,285	1.0
Sudak	1,021	5.8	778	4.3	787	4.4
Feodossia	1,138	1.8	1,133	1.8	1,010	1.6
Yalta	1,172	1.4	1,032	1.2	1,204	1.4
Rayons	**26,027**	**4.8**	**26,347**	**4.8**	**27,018**	**5.0**
Bahchysaraiskiy	3,181	5.9	2,498	4.6	2,657	4.9
Bilohisrkiy	2,115	5.5	2,470	6.3	3,266	8.4
Dzhankoiskiy	1,448	3.1	1,582	3.4	1,753	3.8
Kirovskiy	2,706	8.2	2,567	7.7	2,573	7.8
Krasnohvardiyskiy	3,532	6.4	3,374	6.1	2,807	5.1
Krasnoperekopskiy	1,875	10.4	2,322	12.7	2,046	11.2
Leninskiy	1,693	4.1	1,368	3.3	1,154	2.8
Nyzhniohirskiy	1,224	3.7	1,797	5.4	2,497	7.5
Pervomayskiy	1,126	4.8	1,070	4.6	1,090	4.7
Rozdolnenskiy	1,789	8.4	1,610	7.6	1,681	7.9
Sakskiy	1,531	3.2	1,541	3.2	1,444	3.0
Simferopolskiy	1,478	1.6	1,300	1.4	1,083	1.2
Sovetskiy	855	3.8	1,191	5.3	1,378	6.2
Chornomorskiy	1,474	7.5	1,657	8.4	1,589	8.1

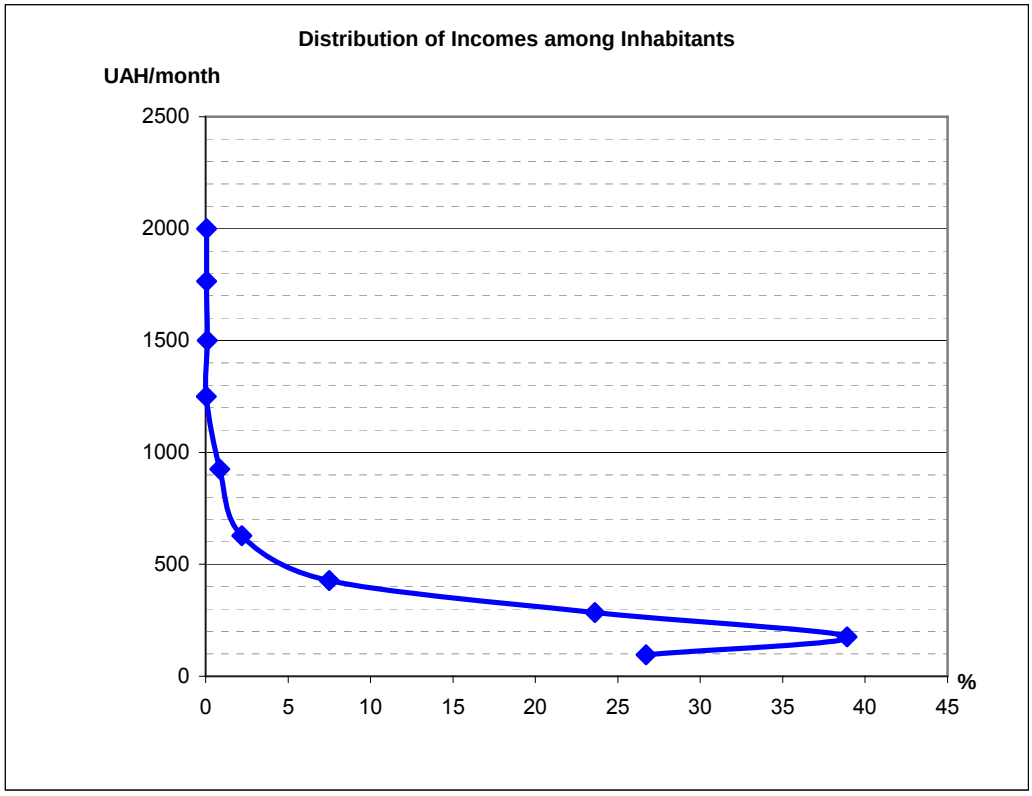
Table 43 The unemployment level in different administrative units

The economical recovery of Ukraine maintains for some years at a strong level. The mid term perspectives are favourable. It can be expected for the next years that the particular situation of the ARC will be better that the Ukrainian average. Experts are forecasting a strong development of tourism and construction. A large part of the regional economy is set on these two productions. For what these statistics are reliable, they indicate a lower rate of unemployment and a decreasing in cities and in the tourism areas. This expected increasing of the regional richness should improve the purchasing power of the inhabitants.

[10] The official level of unemployment is based on the relation between the number of unemployed, registered by the state employment services, and the average annual number of working-age population.

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:

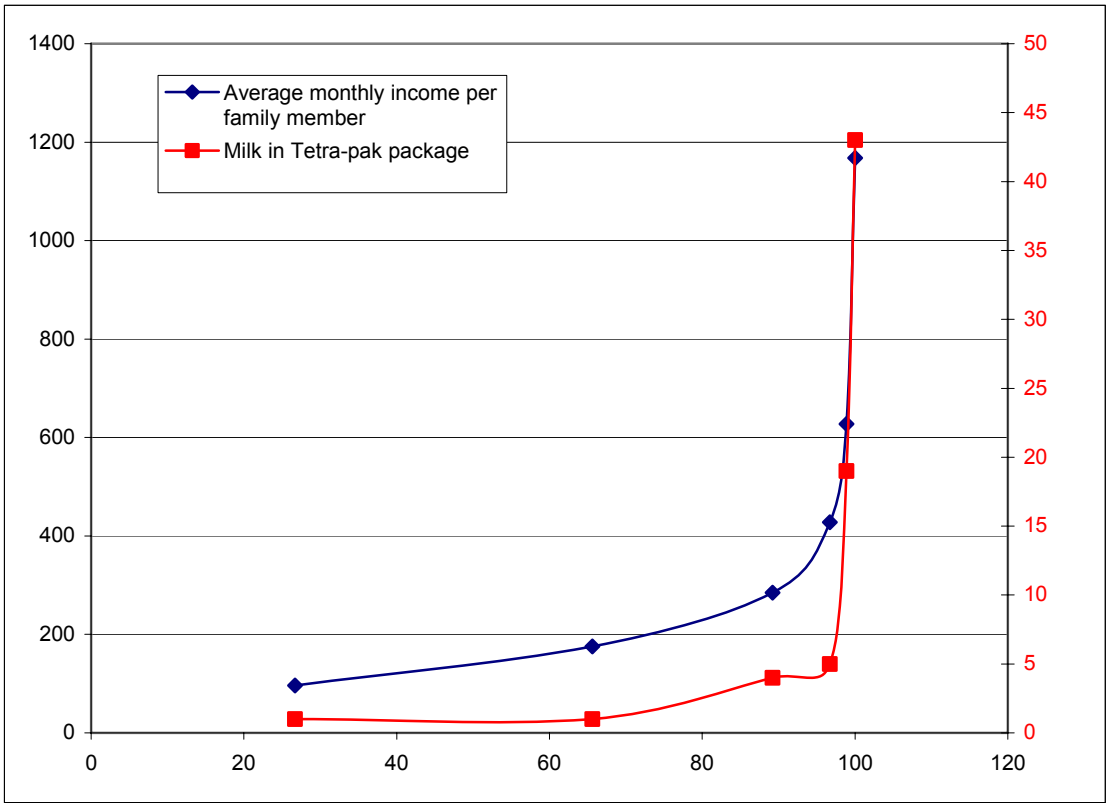


Graph 11 Distribution of incomes within the Donetsk Oblast

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**[11].

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.

[11] *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 which 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:

- Collective housing;
- Private sector;
- Enterprises and other organizations.

The direct payment takes two aspects:

- 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");
- 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	7.74 UAH/m^3	27.86 UAH/year (assuming that it's 1.2 m^3 per person)
Enterprise	Enterprise	Public utility	Number of m^3	12.95 UAH/m^3	
Residents of private sector					
Private sector	Inhabitants	Public utility	Number of residents	8.64 UAH/m^3	51.84 UAH/year (assuming that it's 2 m^3 per person)
(The figures provided in the table represent average values)					

Table 44 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.

	tariff multi-storey housing buildings UAH/m^3	tariff private houses UAH/m^3	tariff budget org. UAH/m^3	tariff others UAH/m^3	landfill starting date	landfill area, (ha)	depth m	distance to landfill, km	volume of SHW landfilled, th. m^3	planned year of closing
Total									***2,291***	
Cities									***1,416***	
Simferopol	6.30	6.30	6.60	7.20	1981	25.6		1.0	580	2007
Alouchta					1959	6.9		7.0	143	2035
Armiansk	5.41	5.41	13.07	14.25	2004	6.9	3.5	5.5		2018
Dzhankoy					1972	18.6	4.0	2.0	20	2032
Evpatoria	6.80	8.70	15.05	15.05	1973	28.0	6.0	10.0	200	2010
Kerch					1970	20.0		1.8		
Krasnoperekopsk					1989	19.0	3.0			2018
Saki					1978	5.0	5.0	8.0	65	2010

Sudak	7.95	7.95	7.95	7.95	1960	3.0	20.0	1.0	30	
Feodossia		5.00	5.00	8.00	1974	3.0		9.0	108	
Yalta	12.36	12.36	16.44	16.44	1973	5.8		12.0	270	2007
Rayons									***875***	
Bahchysaraiskiy										
Bilohisrkiy					1981	2.8		5.0	40	2007
Dzhankoiskiy										
Kirovskiy										
Kranohvardiysiy	10.83	10.83	12.39	12.39	1976	7.8		2.0	16	2007
Krasnoperekopskiy										
Leninskiy										
Nyzhniohirskiy					1979	4.0	4.2	2.5	12	2001
Pervomayskiy					1993	3.6	2.5	3.5	8	2008
Rozdolnenskiy	12.38	12.38	12.96	14.14	1987	5.0	5.0	8.0	15	2018
Sakskiy	12.00	12.00	12.00	12.00	1999	3.0	1.5	4.5	784	2012
Simferopolskiy										
Sovetskiy										
Chornomorskiy	2.34	2.34	20.27	22.12	1970	7.5				

Table 45 Tariffs in 2003

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 46 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 9) per family but can receive from a family from 12 UAH to 32 UAH.

12.1.2. Recovery

12.1.2.1. Collective buildings

As it is shown by the table provided above, the load by inhabitant may be 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 17). 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 or EIB. 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 34).

12.2.4.2. Resources

Out of the budget and of the grants and loans described elsewhere, the Plan should also account on the investments of UkrEkoKomResurcy.

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 **7 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 47.

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Private sector											
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	1.022	4.470	6.890	10.735	11.269	11.834	12.425	13.046	13.699	14.388	15.110
Collective H.											
Fee UAH/inh/y	8.00	9.00	10.00	11.00	12.00	12.00	12.36	12.73	13.11	13.50	13.91
Amount M UAH	3.914	9.691	12.100	13.201	13.863	14.557	15.287	16.051	16.854	17.698	18.581
TOTAL M UAH	4.936	14.161	18.990	23.936	25.132	26.391	27.712	29.097	30.553	32.086	33.691

Table 47 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:

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
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 20 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 ARC.

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 Regional Committee of Ecology of ARC 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 Regional Committee of Ecology of ARC.

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, Regional Committee of Ecology of ARC and regional department of "UkrEkoKomResurcy".

The Government of Crimea should negotiate with the IFIs (World Bank, EBRD, EIB) the financing of an investment programme for the implementation of the Plan.

13.Environmental impact and risks; preliminary assessment

See § 9.1.

Annexes

Annexe 1 RESOLUTION of Supreme Council of the Autonomous Republic of the Crimea "On the Waste Management Programme of the Autonomous Republic of the Crimea for 2003–2007" #699-3/03 of 22 October 2003

Annexe 2 General plan of sanitary cleaning of South Coast of Autonomous Republic of Crimea from Solid Domestic Waste, 2004

Annexe 3 Decision of the permanent commission of the Council of Ministers of the Autonomous Republic of the Crimea 'On waste treatment', September, 2005

Annexe 4 MINUTE of the meeting on the solid household and municipal waste (SMHW) management in the Autonomous Republic of the Crimea, August 18, 2005

Annexe 5 Crimean Regional Strategy of Solid Domestic Waste Treatment, Crimean Academy of Sciences & Russian Academy of Natural Sciences, 2005

Annexe 6 Decision of the Council of Ministers of the Autonomous Republic of the Crimea (ARC) dated February 24, 2006, N° 85.

Annexe 7 Conclusion on the considered investment projects submitted to the tender, Ministry of the Construction Policy, Architecture and Housing and Municipal Economy of the Autonomous Republic of the Crimea, 27 September 2005

Annexe 8 Detailed population of the settlements

Annexe 1 RESOLUTION of Supreme Council of the Autonomous Republic of the Crimea On the Waste Management Programme of the Autonomous Republic of the Crimea for 2003–2007

In pursuance of Laws of Ukraine "On Recreation", "On Providing of the Sanitary and Epidemiological Well-being of the Population", "On Environmental Protection", "On the Atmospheric Air Protection", "On the State Programme of Toxic Waste Management", Resolution #668 of the Cabinet Ministers of Ukraine of 28 June 1997 "On the Programme of Municipal and Industrial Waste Recycling for the period till 2005", and Resolution #2199-2/01 of the Supreme Council of the Autonomous Republic of the Crimea of 19 December 2001 "On the Measures to Implements the Law of Ukraine "On Waste" in the Republic of the Crimea"

The Supreme Council

of the Autonomous Republic of the Crimea resolved:

1. to approve The Waste Management Programme of the Autonomous Republic of the Crimea for 2003–2007 (annexed);

2. To charge the Council of Ministers of the Autonomous Republic of the Crimea:

2.1. to organise the implementation of the said Programme jointly with the executive committees of the city councils and rayon state administrations;

2.2. to inform annually the Supreme Council of the Autonomous Republic of the Crimea of the progress of The Waste Management Programme of the Autonomous Republic of the Crimea for 2003–2007;

2.3. to carry out the corresponding procedures to attract additional funds for the implementation of the activities, envisaged by the said Programme.

3. The process of implementation of the present Resolution shall be under control of the Permanent Committee of the Supreme Council of the Autonomous Republic of the Crimea on Industry, Construction, Transport, Communications, and Fuel-Energy Complex, and Permanent Committee of the Supreme Council of the Autonomous Republic of the Crimea on Agrarian and Land issues, Ecology, and Rational Nature Use.

Chairman

of Supreme Council

of the Autonomous Republic of the Crimea

Simferopol, 22 October 2003

#699-3/03

APPROVED

By the Resolution #699-3/03 of the Autonomous Republic of the Crimea of 22 October 2003

PROGRAMME

of Waste Management
in the Autonomous Republic of the Crimea for 2003-2007

1. General Provisions

The state of affairs in the sphere of waste management in the Autonomous Republic of the Crimea is unsatisfactory.

The leading role in the structure of the economy of the Crimea is and will be played by the industries, generating hundreds of tonnes of waste. About 265 t of industrial waste is disposed of annually in the republic, out which only 10-11% - mainly the valuable resources - are processed and recycled.

The rest of waste is accumulated at the enterprises and on the municipal waste landfills. By the early 2002, over 10 mln t of domestic waste have been accumulated in the republic. The processing rate is only 11% of the total generation rate; the rest is accumulated on the landfills and waste storage facilities.

The waste is one of the main factors of environmental pollution and adverse impact on practically all its components.

The infiltration from the landfills, the dust generation and other factors, causing the migration of the toxic substances, lead to the pollution of the underground and surface waters, deterioration of the atmospheric air, land resources etc.

The waste-processing technologies are obsolete, the cost of energy resources is high, the scope of activity of the organisations in charge of state procurement has narrowed.

The lack of comprehensive mechanism of implementation of the activities coupled with the obsolete waste management system have led to the current negative situation in the republic in the sphere of generation, collection, storage, processing, and disposal of waste.

2. The purpose of the Waste Management Programme for 2003-2007

The purpose of the Waste Management Programme for 2003-2007 (hereinafter - "the Programme") is to identify the most urgent and prospective activities to implement the main directions of modernisation of the waste management system in compliance with the requirements of the environmental and sanitary-epidemiological legislation.

To achieve the set goal the following tasks need to be accomplished:

prevention of accumulation of waste, including the toxic waste, and limiting of its adverse influence on the environment and human health;

rational use of the raw-material and energy resources;

scientifically grounded adjustment of ecologic, economic, and social interests of the population regarding the waste generation and recycling.

3. Main directs of activities

3.1. Storage, collection, and transportation of waste

Tasks:

technical and information assistance to the agencies, operating in the sphere of waste management;

problem identification, development and implementation of the acceptable systems and technologies of waste collection and transportation;

Introduction of scientifically grounded approach to the issues of waste collection and transportation.

3.2. Management of hazardous waste (management of toxic waste of industrial and communal origin, including the activities, connected with the prevention of adverse impact, resulting from improper waste management).

Tasks:

economically feasible and environmentally safe disposal of hazardous waste at the rayon, city, and local levels;

collection and dissemination of the information on the scientific, technological, economic, and legal; aspects regarding the methods of hazardous waste disposal and environmental rehabilitation;

technical and information assistance to the agencies, operating in the sphere of hazardous waste management;

introduction of scientifically grounded approach to the issues of hazardous waste management.

3.3. Solid domestic waste management.

Tasks:

construction of waste-processing plants in the cities of Simferopol, Kerch, Feodossia, Evpatoria, and a complex plant for the cities of Alouchta and Yalta;

construction of waste-sorting stations in the towns and settlements;

continuation of the works in reconstruction of Public Company "Polyvtor";

organising of selective collection of the recyclables, packing, and waste;

expansion of the network of stationary and movable waste collection points;

equipment of the communal enterprises with the required technical means.

3.4. Management of waste, generated by medical institutions (solid and liquid waste from medical institutions, including the hygienic, biological, infectious, caustic, chemical or pharmaceutical waste, cytotoxic and radioactive waste from clinics, surgery departments, dental hospitals, children and ambulatory centres, anatomic laboratories, communal medical institutions, located in the rayons and cities of the republic).

Tasks:

identification of the waste, generated by medical institutions, and risk management during handling;

collection and dissemination of the technical-scientific and departmental experience in medical waste management;

production cooperation with foreign enterprises and international organisations in the sphere of medical waste managements;

forming of the information data base on technologies and techniques of medical waste management; introduction of innovations in medical waste management, identification and solving of problems in the sphere.

3.5. Management of wastewaters and treatment facilities' waste (sludge management, including the installation of treatment facilities).

Tasks:

technical-scientific and marketing study of the use of wastewaters and treatment facilities;

technical and information assistance to the agencies, operating in the sphere of management of wastewaters and treatment facilities;

development and introduction of acceptable systems and technologies in the management of wastewaters and treatment facilities.

3.6. Agricultural waste management.

Tasks:

certification and repairing of the pesticides and herbicides storage facilities;

identification of the manufacturer of the special containers;

processing of pesticides and herbicides at the waste-processing plant in Simferopol (a special line).

3.7. Bone waste and cattle carcasses.

Tasks:

reconstruction of Krasnogvardiskoye "Veterinary Sanitary Utilisation Plant".

3.8. Atmospheric air protection.

Tasks:

enforcement of the control of observation of the maximum permissible emission and issue of permits for emission;

merger of the data bases on the sources of atmospheric pollution, registered by the departments of the Republic Sanitary Epidemiological Service and Republic Committee on Ecology and Natural Resources;

creation of a public data base on the observations of atmospheric pollution on the territory of the main localities of the Autonomous Republic of the Crimea;

development and adoption, by 2004, of the common standards for maximum permissible emission for Simferopol, Yalta, Evpatoria, Saki, Krasnoperekopsk, Feodossia, Sudak, Kerch, Bahchysarai, and Novy Svet;

development and implementation of activities within Programme "Climate".

3.9. Minimisation and recycling of waste (minimisation of waste generation, organising of waste sorting and processing; salvage marketing).

Tasks:

ensuring of recyclable packaging collection and reuse by the enterprises, institutions, and organisations of different patterns of ownership, using recyclable materials for packing and transportation of goods, or by their subcontractors;

introduction of economically and ecologically feasible technologies and methods of waste minimisation and recycling;

technical and information assistance to the agencies, operating in the sphere of waste management;

introduction of scientifically grounded approach to the issues of waste minimisation and recycling.

3.10. Sanitary burial of waste (development of projects and construction of sanitary landfills, including the issues of watertightness, gas emission from solid domestic waste landfills, and determination of the waste accumulation rates).

Tasks:

coordination of activities of different waste-management agencies in the field of development of sanitary landfills;

technical and information assistance to the agencies, operating in the sphere of waste management;

development and introduction of acceptable systems and technologies in the management of sanitary waste burial.

3.11. Normative-legal support of the waste management activities

Tasks:

popularisation of knowledge and experience in waste management, including waste minimisation, recycling, management systems, audit, and environmental protection;

collection and dissemination of the legal information and experience in the sphere of waste management.

3.12. Social protection and environmental insurance of the personnel, involved in waste management.

Tasks:

development and implementation of activities in social protection of the personnel, involved in waste management.

4. Stages and terms of Programme tasks accomplishment

4.1. Preparatory stage - year 2003.

4.2. Stage of accomplishment of the high-priority tasks of the Programme - years 2003-2004.

4.3. Stage of further Programme implementation - years 2005-2007.

5. Expected results of Programme implementation

The expected result of Programme implementation is to accomplish such main economic and special tasks of the Autonomous Republic of the Crimea as the development of the economic structure, the solving of the problems of energy supply in the republic, the creation of new jobs, the improvement of the ecological conditions in compliance with the following list of priorities:

reduction of the amounts of waste generation and accumulation;

increase of the waste recycling rate, primarily for the waste, which can produce substantial ecological and economic effect, but is not fully used at the time being (packaging, recyclables);

mitigation of the adverse impact of hazardous waste on the environment and human health;

assessment of the value of waste to satisfy the demand of the economy of the republic, to substitute for import, and to increase export;

assessment of the waste generation patterns (intersectoral, interregional, regional, and territorial) and volumes;

use of approved and effective technologies and equipment;

reduction of the share of budget expenses in the financing of the projects, involving of businesses, attraction of domestic and foreign investors.

The main expected ecological and social-economic results of the Programme implementation are:

the implementation of the main principles of ecologic policy of the Autonomous Republic of the Crimea in waste management;

the legal regulation of affairs in the sphere of waste management in the Autonomous Republic of the Crimea;

meeting of the conditions, requirements, and regulations regarding safe waste management on the territory of the Autonomous Republic of the Crimea;

minimisation of waste generation and accumulation, including: the implementation of activities, aimed at

mitigation of the adverse impact of waste on the environment of the Black and Azov seas;

reduction of the level of pollution of the Back and Azov seas and mitigation of the adverse impact on their ecosystems;

reduction of risk for human health, connected with the pollution of the coastal sea waters;

protection of the coastal zone of the Black and Azov seas from pollution by the waste soils of the Autonomous Republic of the Crimea;

ensuring of complete collection and timely deactivation and disposal of waste in compliance with the rules of ecologically safe waste management;

providing of selective collection, sorting, transportation, and disposal of recyclables (packing);

minimisation of waste generation and impact-resistive activities;

providing of comprehensive use of raw-material resources;

ensuring of maximum rate of utilisation of waste by means of direct reuse or alternative use of the recyclable components;

ensuring of safe disposal of waste, which is not subject to reuse;

introduction of typical methods of clearing of the territories, contaminated with waste, including the coastal areas and the territorial sea waters;

creation of the waste management facilities, based on the approved advanced technologies, in compliance with the ecological safety requirements;

carrying out of activities in social protection of the personnel, involved in waste management;

introduction of mandatory waste registration, basing on the classification and certification data.

6. Programme financing and implementation mechanism

The mechanism of Programme implementation is formed by means of creation of permanent rayon and city (for the cities of republic standing) committees on waste management and coordination of their activities by the permanent Committee on waste management under the Council of Ministers of the Autonomous Republic of the Crimea (hereinafter - "the Committee").

The financial support of the Programme implementation is provided on the basis of the acting legislation from the following funds:

the budget of the Autonomous Republic of the Crimea;

local budgets (with regard for the environmental activities, financed under the programmes of social-economic development);

the Crimea Republic Department "KrymEkoKomResurcy";

own funds of the enterprises;

other sources.

The following direction of activities are financed from the budget of the Autonomous Republic of the Crimea:

the state ecological and sanitary-epidemiological inspections, scientific-research activities and development of documents for construction and renovation of the specialised enterprises, installations, landfills, complexes, structures, and other sites and facilities;

introduction of low-cost, soft, and energy-saving technologies;

creation of information-analytical systems, data banks;

construction and renovation of waste-management facilities.

Local budgets finance the activities in:

the development of urban sanitation schedules;

construction of waste-management facilities on the territory of the corresponding rayon/city of republic standing;

development and maintaining of the register of sites of waste generation, processing, recycling, and disposal;

drawing up and maintaining of the register of sites of waste generation, processing, recycling, and disposal;

liquidation of unauthorised and uncontrolled waste dumps;

other activities, identified within the local programmes of waste management.

A part of the revenues of the Crimea Republic Department "KrymEkoKomResurcy" are used to finance the activities in:

the Programme implementation and the investment projects, aimed at the introduction of new technologies in waste management as well as activities, associated with waste collection and sorting;

transportation, processing, and recycling of the recyclables (packing);

creation and development of the material-technical base in the form of investment projects to support selective collection, sorting, transportation, processing, and recycling of recyclables all over the Autonomous Republic of the Crimea.

The Programme activities, which are not planned to be financed from the budgets, are considered and approved by the Programme managing organ every month, and implemented under investment contracts.

7. Development of human resources

The need for development of the education system and improvement of the legal conscience among the population from childhood in the sphere of waste management and communal hygiene implies:

the development and introduction of a system of training, skill conversion, and professional development of specialists, decision-makers of the enterprises, institutions, and organisations, involved in waste management;

the development of the system of hygienic education;

the development of popular scientific literature;

the conducting of special international scientific-practical conferences on education in the sphere of waste management with the participation of the western and national experts;

the development of special course "Waste management and Risk management" for the professional training and post-diploma training;

creation and introduction of a system of continuous special education for the personnel, professionally involved in the waste management;

introduction of the waste-management issues into the curricula of secondary and higher educational institutions of the Autonomous Republic of the Crimea.

8. International cooperation

The international cooperation in the sphere of waste management in the Autonomous Republic of the Crimea is carried out by means of:

observation of the requirements of international conventions and programmes on the territory of the Autonomous Republic of the Crimea;

harmonization of the normative legal acts of the Autonomous Republic of the Crimea in the sphere of waste management with the international acts and technical documents (standards, specifications, guidelines);

participation in the activities of the international organisations in the development and introduction of new methods, technologies, and equipment for waste management.

9. Conclusion

The development and implementation of a set of Programme activities is expected to produce a comprehensive system of waste management, based on proper positioning of waste-processing facilities, and to allow producing new products, using the recyclable components of waste, at the same time reducing the load on the existing and planned landfills.

The implementation of the set of Programme activities in optimisation of the system of management of the sanitary-epidemiological situation will provide for protection of human health and ecological safety of the environment.

The Programme activities are set out in the Annex below.

Annex to the Programme of Waste Management in the Autonomous Republic of the Crimea for 2003-2007

Main Programme direction and activities

N°	Activity	Responsible organisation	Sources of financing	Cost, x1000 UAH	Term of implementation years
1	**Storage, collection, and transportation of waste**				
1.1	The analytical corpus of data on the volumes of generation, processing, and recycling of waste, based on the formed and maintained registers of the sites of waste generation, processing, recycling, disposal, certification of waste, and waste-disposal sites in compliance with the resolutions of the Cabinet Ministers of Ukraine #1216 of 03.08.98, #1360 of 31.08.98, and #2034 of 01.11.99.	The Republic Committee of the ARC on Ecology and Natural Resources, The Republic Committee of the ARC on Housing and Communal Economy, Executive Committees of the Municipal Councils and Rayon State Administrations	Local budgets	According to cost estimates	2003-2004
1.2	Development of activities, providing for the introduction of selective collection of recyclable waste. Development and expansion of the salvage procurement system: purchase of stationary and movable collection points; development of the schemes of location and movement of the salvage procurement stations.	State Company "UkrEkoKomResurcy", State Procurement Enterprise "Crymvtorresursy", the Republic Committee on Housing and Communal Economy, Executive Committees of the Municipal Councils and Rayon State Administrations	Local budgets	According to cost estimates	Starting from 2003
1.3	Development and introduction of a regional system of environmental monitoring in the Autonomous Republic of the Crimea with regard for waste management.	The Republic Committee of the ARC on Ecology and Natural Resources, Executive Committees of the Municipal Councils and Rayon State Administrations	Local budgets	According to cost estimates	2003
2	**Hazardous waste management**				
2.1	Creation of a republic information-analytical system on hazardous waste management, including the recyclable waste	Ministry of Industry, Transport, and Communication, the Republic Committee of the ARC on Housing and Communal Economy, Executive Committees of the Municipal Councils and Rayon State Administrations	Local budgets		2004-2005

N°	Activity	Responsible organisation	Sources of financing	Cost, x1000 UAH	Term of implementation years
2.2	Repacking of the prohibited and unidentified pesticides and herbicides; reconstruction of storage facilities, located on the territory of Dzhankoy and Bahchysarai rayons.	"Rayagrokhim" of Dzhankoy rayon, "Rayagrokhim" of Bakhchisaray rayon	State Budget of Ukraine	150.0 68.8 200.0	2004 2003 2004
2.3	Repacking of prohibited, unsuitable, and unidentified pesticides	Krasnoperekopsk Rayon Administration	Local budgets	50.5	2004
3	**Solid domestic waste management**				
3.1	Development of recommendations on designing of the waste-processing plants	Republic Committee on Housing and Communal Economy	Budget of the ARC		2003
3.2	Designing of the waste-processing plants in the cities of Simferopol, Kerch, Feodossia, Evpatoria, Sudak, Alouchta, and Yalta	Republic Committee on Housing and Communal Economy, Executive Committees of Municipal Councils	Local budgets	About 150.0 for each site	2003-2007
3.3	Construction of a waste-processing plant in Simferopol	Executive Committee of the Municipal Council	Investment	EURO 14.5 mln	2004-2005
4	**Agricultural waste management**				
4.1	Creation of movable pilot plant for deactivation of the glue residue of potassium ferrocyanide for the wineries	Ministry of Agroindustrial Complex of the ARC	Investment	180.0	2003-2004
5	**Wastewaters management**				
5.1	Design, construction, extension, and reconstruction of the sewage treatment facilities: Bahchysarai Feodossia Simferopol Sudak (design) Kerch Saki Dzhankoy Shchelkino Yalta (STS Simeiz) Belogorsk Evpatoria	Republic Committee on Housing and Communal Economy, PE "Crymvodokanal", Executive Committees of Municipal Councils, Rayon State Administrations	Local budgets	 886.0 243.0 3,600.0 170.0 5,300.0 1,500.0 2,500.0 650.0 2,800.0 1,200.0 2,400.0	 2004 2004 2004 2004 2003-2007 2003-2007 2003-2007 2003-2007 2003-2007 2003-2007 2003-2007

N°	Activity	Responsible organisation	Sources of financing	Cost, x1000 UAH	Term of implementation years
	Krasnoperekopsk			2200.0	2003-2007
	Morskoye			According to cost estimates	2003-2007
	Orekhovo, Saki rayon			According to cost estimates	2004
	Mikhailovka (design)			According to cost estimates	2003-2004
	Novodeforovka			According to cost estimates	2003-2004
	Sovetskoye			According to cost estimates	2003-2004
6	**Medical waste management**				
6.1	Construction of thermal processing plant for incineration of the medical waste	Ministry of Health of the ARC	Investment	660.0	2003-2004
7	**Bone waste and cattle carcasses**				
7.1	Reconstruction of Krasnogvardiskoye "Veterinary Sanitary Utilisation Plant".	Ministry of Agroindustrial Complex of the ARC	Local budgets	Under a separate programme	2004-2006
8.	**Waste minimisation and recycling**				
8.1	Activities in minimisation of waste, reduction waste inflow to the landfills through selective waste collection	Republic Committee on Housing and Communal Economy, State Enterprise "UkrEkoKomResurcy", Executive Committees of Municipal Councils, Rayon State Administrations	Local budgets, Investment	Under a separate programme	Permanent
8.2	Reorganisation and extension of Public Company "Polivtor"	Ministry of Industry, Transport, and Communication of the ARC, State Enterprise "UkrEkoKomResurcy"	Local budgets, Investment	According to cost estimates	2003-2004
8.3	Design and construction of an industrial plant to process the waste of the Kamysh-Burun Iron-ore integrated works	Ministry of Industry, Transport, and Communication of the ARC	Local budgets, Investment	According to cost estimates	2004

N°	Activity	Responsible organisation	Sources of financing	Cost, x1000 UAH	Term of implementation, years
9	**Sanitary waste burial**				
	Design, new construction, reconstruction, and extension of service life of the SHW landfills:	Republic Committee on Housing and Communal Economy, Executive Committees of Municipal Councils, Rayon State Administrations	Local budgets, Investment		
	Belogorsk (design)			180.0	2003-2004
	Kirovskoye (design)			175.0	2003-2004
	Kerch (design)			290.0	2003-2004
	Sudak (design)			230.0	2003-2004
	Stary Crym (design)			175.0	2003-2004
	Simferopol (construction)			3,084.0	2003-2004
	Feodosiya (design)			276.0	2003-2004
	Yalta (construction)			2,662.0	2003-2004
	Armyansk (construction)			220.0	2004
	Azovskoye (construction)			485.6	2004
	Dzhankoy (design)			150.0	2004
	Volnoye (construction)			36.062	2004
	Krasnogvardeiskoye (corrections)			30.0	2004
	Chernomorskoye (construction)			200.0	2004
	Krasnoperekopsk			500.0	2004
10	**Normative-legal support of the waste management activities**				
10.1	Development of recommendations on creation of the System of Information-Analytical Support of the Management Process of the Sanitary-epidemiological situation in the Republic of the Crimea	Republic Committee on Housing and Communal Economy	Budget of the ARC		2003
10.2	Development of a typical programme of waste management (for rayons, cities, and villages)	Executive Committees of the Municipal Councils, Rayon State Administrations	Local budgets		2003

N°	Activity	Responsible organisation	Sources of financing	Cost, x1000 UAH	Term of implementation years
10.3	Submitting of recommendations on the creation of a body in charge of waste management	Council of Ministers of the Autonomous Republic of the Crimea	Budget of the ARC		2004
10.4	Application to the Cabinet Ministers of Ukraine to propose to transfer enterprises "Crymvtorresursy" (salvage) to the State Company "UkrEkoKomResurcy" with the subsequent registration of the Crimea Republic Department "Crymecoresursy" at the place of location in order to receive tax to the Budget of the ARC.	Council of Ministers of the Autonomous Republic of the Crimea			Oct-Nov 2003
11	**Human resources development**				
11.1	Training and retraining of the specialists, involved in waste management on the basis of existing educational institutions and professional training centres	Republic Committee on Housing and Communal Economy			2003-2004
11.2	Organising of activities in introduction of the waste-management issues into the curricula of secondary and higher educational institutions.	Ministry of Education of the ARC			Permanent

Annexe 2 General plan of sanitary cleaning of South Coast of Autonomous Republic of Crimea from Solid Domestic Waste

DRAFT

General plan of sanitary cleaning of South Coast of Autonomous Republic of Crimea from Solid Domestic Waste

2004

1. Main ideas

1.1.

From international practice it is evident that sanitary cleaning in health resort and recreational zones and principles of waste deactivation there differ dramatically from other natural or urban territories.

Though on most territories effective are the following principles:

- deactivation of waste on the territory it is generated,
- minimization of accumulated volumes,
- organization of selective collection, etc.,

In resort zones it is required only to effectively remove the waste outside these zones with subsequent utilization.

The suggested project is based on this principle.

1.2.

The following plan looks as the most efficient for the South Coast of Autonomous Republic of Crimea:

- waste in urban areas is being collected according to the existing scheme with subsequent utilization but in port cargo terminals zones that have equipment for separation and pressing of the waste, not at the sanitary landfills.

  Here, commercially valuable waste fractions are selected to be transported to industrial Crimean zones to be processed there into commercial output.

  The rest of the waste left after the sorting (about 80% of the generated volume) is pressed into high-density briquettes (up to 1.2 t/m^3), packed in polyethylene film and stored in the port terminal for short term;

- the waste is being transported from the place it is stored for short term in the ports either to the place of industrial processing by sea in dry cargo lighters or (in case of unnavigable weather) to operating SHW sanitary landfills to be kept there till the weather is good for navigation.
- industrial processing of SHW at Eastern Crimea plants is the most practical one by the “Waste into Energy Transformation” option.

Either Kamysh-Burun Iron-Ore Industrial Complex (K-B IOIC) utilities or Kamysh-Burun cogeneration heating power plant (K-B CHPP) solid fuel satellite furnace could be used for this option.

1.3.

Using K-B IOIC industrial site it is possible:

- to install modernized sintering machines for waste incineration with obtaining building lime;
- to construct traditional incineration plant with the system of producing thermal and electrical power, conversion of ash-and-slag waste into filler for concrete products and deep recycling of separated SHW fractions.
- to incinerate the waste in K-B CHPP solid fuel grate satellite furnace, obtaining thermal and electrical power to be supplied to outside customers.

1.4.

Any SHW collection, transportation and treatment option is subject to seasonal waste generation variation. The main SHW volume falls on May – September.

Taking in account these considerations and comparing cost price of 1 kilowatt-hour obtained at incineration plant and at CHPP (in Moscow it is 23 kop. and 97 kop. correspondingly) it is suggested to direct the power obtained at incineration to recycling plants created within the territory of this incineration plant in order to manufacture commercial output.

However, in this case, it is necessary to consider regional sales costs.

2. Approximate estimation of productive capacity

2.1. Estimation of generated SHW volumes at SC of AR Crimea

According to official data for 2001 AR Crimea population numbers 2.031 million persons; 46 % of them live in cities and towns of SCC and generate about 330,000 tons of SHW.

Name of the city	Population		Volume of accumulated SHW thousand tons year **)		TTL
	October – April	*) May – September	October – April	May – September	
Sevastopol	365.8	380	54.87	41.8	96.67
Kerch	157.2	235	23.58	25.85	49.43
Evpatoria	122.0	196	18.30	21.56	39.29
Yalta	100.0	213	15.0	23.43	38.43
Feodossia	70.0	120	10.50	13.2	23.7
Alupka	40.0	85	6.0	9.35	15.35
Alouchta	50.0	92	7.50	10.12	17.62
Saki	40.0	104	6.0	11.44	17.44
Sudak	30.0	65	4.50	7.15	11.65
TOTAL			146.25	184.9	331.15

*) Number of temporary population was estimated at number of beds available in sanitary institutions and (approximately) at private sector.

Term of stay for the temporary population was set as 5 months.

**) On recommendation of K.D.Pamfilov AKKh at RF GOSSTROY it is assumed that the rate of accumulation equals 260 kg/person/year as in the resort zone Anapa-Sochi.

These data determine the structure of the system of SCC sanitary cleaning from SHW, capacity of transport-collecting and transport-removing agencies, facilities and areas necessary at port terminals for waste sorting and pressing plans, also SHW thermal processing facilities with production of thermal and electrical power.

2.2. Estimation of facilities for SHW sorting, processing and packing in high-density bales

Morphological analysis of SHW given for the resort zone Anapa – Sochi shown that in resort zone SHW contains more utilizable fractions than in cities (up to 30% against 20%). It follows thence, that for development of a system of SCC sanitary cleaning from SHW in Kerch industrial zone, there is a need to have production facilities for SHW recycling, for treatment of total volume up to 110,000 tons per year.

Therefore, to provide the waste pressing it is necessary to create at port terminals in SCC large cities four – five SHW pressing stations with capacity of from 40,000 to 50,000 tons per year each. It is efficient to install at the same industrial sites waste sorting facilities.

As a result there will be created compact facilities for SHW complex treatment.

The bales could be removed both by dry cargo lighters with dead-weight of up to 500 tons (5 vessels are needed) for processing, and by long-length trucks to sanitary landfills for temporary storage (in this case there is no need in removing garbage trucks).

3. Main features of projects financing schemes in Ukraine

In its essence, this project is of concessive nature. The main legislative act in the sphere of regulation of concession relations in Ukraine is the Law *"On Concessions"* (the Law of Ukraine "On Concessions" N 997-XIV of 16 July 1999 (further – the Law on Concessions)) passed in 1999. This is a frame law and it provides possibility to consequently pass number of subject statutory acts. The only act of the kind nowadays is the Law of Ukraine *"On Building and Operation of Highways Concessions"* (the Law of Ukraine "On Building and Operation of Highways Concessions" N 1286-XIV of 14 December 1999 (further – the Law on Highways Concessions)), passed simultaneously with the basic law on concessions.

In fact, highway construction is nowadays the only sphere of Ukraine's economics where concession mechanisms have been applied. Now, basing on concession agreement, under construction is the highway Lviv – Krakovets, which is a part of Germany – Poland – Ukraine transport corridor. The projects on

concessions of sections of the highways Western Border of Ukraine – Kiev and Kharkiv – Kiev are on different stage of realization.

General terms and conditions of concession agreements.

In accordance with the Law of Ukraine on concessions both central and local bodies of executive power can act as concedent. Ukrainian or foreign legal entity and natural person can act as a concessionaire. Besides it should be noted that in building and operation of highways concessions only *legal entity* can act as a concessionaire (Article 1 of the Law on concessions).

Field of concession agreements application is restricted mostly to spheres of housing and communal services and road-transport economy, but there also provided possibility to apply concession mechanisms in other spheres: gas-transport economy and power industry, etc.

The Law of Ukraine establishes both maximum and rather long minimum term of a concession agreement: agreement is being made for the period not less than 10 years, but not longer than 50 years (Article 9 of the Law on concessions).

It appears to be interesting, that in case the concessionaire conduct a business that have to be licensed, he has to obtain the corresponding licence. In that way, the right of concessionaire to exercise special activities does not arise from the concession agreement, but, in fact, is delegated by the government on the administrative and legal act basis – by issuing the license.

Concessionaire does not accrue property rights of the concession object. Moreover, the property created during execution of the concession contract, unless otherwise agreed by the agreement's terms and conditions, also belongs to the government or municipal body.

Unless otherwise agreed by the concession contract, risk of accidental loss or damage to the concession object bears concedent. At that, the property that constitutes the concession agreement object, is being covered by the concessionaire for benefit of that member of the agreement, who bears risk of its accidental loss or damage.

Although the legislation on concession, in general, gives equal rights to Ukrainian and foreign investors, the foreigners, nevertheless, have a number of additional guarantees. So, if a concessionaire is the foreign investor, disputes that arose in the course of realization of the concession agreement, can be heard in the international arbitration court, named in the concession agreement (Article 16, Clause 2, of the Law on concessions).

The Law "On Concessions" provides the Government right to approve model concession contracts for particular types of concessions, but, as it is known, such model contracts have never been approved.

Organization of competitions.

The concessionaire to make an agreement with is chosen on the base of competition. Procedure of the competition is regulated by the Law "On Concessions" and *subordinate legislation* ("Conducting of building and operation of highways concession competition and making concession contracts for the property that belongs to the government or municipal body and are given to concession Regulations" approved by Resolution of Cabinet of Ministers of 12 April 2000. "Procedure of conducting of building and operation of highways concession competition" approved by Resolution of Cabinet of Ministers of 4 October, 2000.)

On the whole, competitions rules make up in such a way that, in fact, using them it makes sense to conduct a competition to make large concession agreements. For minor projects to follow these rules can be too onerous.

The competition lasts unreasonably long – applications for taking part in the competition are submitted within 120 days from the day the competition is announced and are considered within 120 days from the last day the applications can be submitted. Therefore, the competition procedure itself amounts seven months which seems to be too long a term for smaller concession agreements municipalities do. Number of documents that concessionaire has to submit also looks too onerous to get ready for a smaller concession agreement. Another flaw in the legal rules for the competition procedure is ambiguity in the procedure of signing the concession agreement after the winner in the competition is announced. In the first place, the term the agreement has to be signed is not provided. In the second, questionable is the procedure that allows making certain amendments that "are not connected with its essential conditions" after the winner in the competition

is announced. These provisions open possibilities for arbitrary behaviour of officials and a larger stage for corruption outside the competition procedure.

1. Sharing of responsibility among the project parties

Under current concession legislation the most practical way is to split responsibility of the parties and participation of the Government of the Crimea (or its authorized bodies, companies) in this project. So, special waste treatment equipment (sorting waste lines, separated fractions compactors, presses for bundling remains for incineration or burying) can be supplied by investor. General-purpose equipment (sea and motor transport, port terminal, hangars, handling machinery for displacement and loading of bales, nonexpendable pallets, etc) have to be bought, erected and installed by SCC cities' administrations. In case the project financing is organized according to the "BOOT" scheme and credit line for this equipments is opened for the investor, it also can be supplied by the investor on terms the loan will be repaid from tariff payments for the services of the created plant.

In this case legal and organizational form of the plant's activity on SCC waste deactivation have to provide share holding of the Government of AR Crimea who will own the general-purpose equipment after "BOOT" scheme termination. The following forms of the Government of AR Crimea participation may be considered:

- corresponding profile immovable property (industrial structures) that are given to the concedent on account of share holding;
- any immovable property on SCC as against security at the concedent financing on the project by loan;
- corresponding profile plants that are given to concedent on account of share holding;
- corresponding profile machines, installations, transport and lifting assets that are given to concedent on account of share holding. "BOOT" scheme operation is based on establishing by decree special rate in payment for services of the objects that are under construction. These rates include repayment of all the contractor-concedent expenditures on erecting and operation of the objects – regular rate does not include these expenditures on the object construction. The "BOOT" scheme terminates when investor recovers all his expenditures, including service of the loan and his profit. During the period "BOOT" scheme is in force all the income from the object operation belongs to concedent. The ownership is transferred to the Government of AR Crimea directly after the "BOOT" scheme termination. This procedure is stipulated and specified with fixation in documents.

Annexe 3 Decision of the permanent commission of the Council of Ministers of the Autonomous Republic of the Crimea 'On waste treatment'.

September, 2005 city of Simferopol

Having heard the report of the chairman of the Republic Committee of the Autonomous Republic of the Crimea on the environment protection, co-reports of the Chief State Sanitary Doctor of the Autonomous Republic of the Crimea and the head of the Department of Civil Defence of ARC 'On the terms of solid household waste management in the Autonomous Republic of the Crimea, the permanent commission on the waste treatment matters after proper discussion

Decided:

1. Information on the terms of SHMW management in the Autonomous Republic of the Crimea shall be taken into consideration.
2. Ministry of the Construction Policy, Architecture and Housing and Municipal Economy of the Autonomous Republic of the Crimea should analyse the execution of the Programme of the waste treatment in the Autonomous Republic of the Crimea, years 2003-2007, adopted by the Decision of the Supreme Council of the ARC, N°.699/-3/03 dated 22.10.2003. The Ministry should apply to the Government with proposal to include into the draft budget of ARC for 2006 financing arrangements of the Programme. The guidelines of the Programme should be included in the Strategy of development of the Autonomous Republic of the Crimea before 2010.
3. Ministry of Economics of the Autonomous Republic of the Crimea, Main Department of Foreign Affairs and Inter-Regional cooperation of the Council of Ministers of the Autonomous Republic of the Crimea should organize a tender of investment projects of construction of waste treatment complexes according to defined terms. It should also assist in carrying out of the complex state expertise of the projects defined by the tender commission.

4. Executive committees of the city councils of Simferopol, Kerch, Yalta, Feodossia should define the location of the waste treatment complexes taking into consideration the requirements of the land and nature protection legislation.

5. Organs of the executive power and self-government are obliged:

5.1. To enhance control of the institutions engaged in waste treatment and of the implementation of the nature protection legislation in the field of waste management.

5.2.Jointly with the regional organs of the State Tax Administration revise the lists of the enterprises activity of which is to be limited according to the decision of the Government of Ukraine dated 03.08.1998, N°.1218 "On Adoption of the Procedure of development, adoption and revision of limits of waste generation and disposal", item 8. Specified lists should be submitted to the Republican Committee on Nature Protection before 01.02.2006.

5.3. To develop and adopt the scheme of the systematic sanitary treatment of the territory within their jurisdiction using the facilities of the communal enterprises, street and house committees, public organizations. The local budgets should comprise funds for sanitary cleaning of the territory, technical renovation of the communal enterprises engaged in collection, transportation and disposal of solid household waste.

5.4.To develop complex measures in the field of waste management aimed at prevention or reduction of the waste generation and to avoid their negative impact on the environment and human health, years 2006-2010 and to submit them to the Republican Committee on Nature Protection before 0.11.05. The plan of actions should include the following items:

-arrangements regarding the approximation of the active SW landfills to the requirement of the sanitary and nature protection legislation (legalization of the state acts allowing to use the land site, obtaining permits and limits for waste location, reconstruction, shutdown and recultivation of the landfills, construction of new landfills etc.;

-provisions as for technical renovation of the communal enterprises engaged in collection and transportation of waste;

-implementation of the selective secondary raw material collection technology, its further processing;

-construction of the waste treatment complex using new technologies for sorting and disposal of solid waste (cities of Simferopol, Yalta, Kerch, Feodossia, Evpatoria).

6. While forming the draft list of the nature protection measures for 2006, the Republican Committee of Nature Protection of ARC should foresee priority financing of design, reconstruction and construction of new SW landfills including those in the rural area. A possibility of financing the procurement of special equipment for waste collection and elimination should also be considered.

7.The Republican Department 'KrymEkoKomResurcy' of ARC must enhance its activity on improvement and extension of the system of purchases of raw material, fixed and mobile stations for secondary materials purchases, setting up of the receiving terminals in the cities and districts of the Republic.

8. The Republican Committee of Nature Protection of ARC, Republican Sanitary Inspectors must enhance their control on the sanitary and nature protection legislation in the field of waste management.

9. The implementation of the present decision is to be carried out by the Ministry of the Construction Policy, Architecture and Housing and Municipal Economy of the Autonomous Republic of the Crimea. Information on the fulfilment of the decision should be submitted to the secretary of the Permanent Commission of the Council of Ministers of the Autonomous Republic of the Crimea on the waste management matters before 0.02.06 (tel.652-27-24-29).

First Deputy Chairman

of the Council of Ministers of ARC V. Yasiuk

Annexe 4 MINUTE of the meeting on the solid household and municipal waste (SMHW) management in the Autonomous Republic of the Crimea

August 18, 2005

The meeting was attended by the members of the Council of Ministers of the ARC, representatives of local authorities, self-governing bodies, 'Ukrvtorresursy' corporation and others.

The agenda: Preparation of the tender on the construction of the waste treatment plants in the ARC at the expense of the investment funding.

It was decided:

1. The information heard should be taken into consideration.

2. Ministry of Economics of the ARC must extend the deadline for delivering documents for the participation in the tender on the construction of the waste treatment plants in the ARC at the expense of the investment funding till September 16, 2005.

3. Ministry of the Industrial Policy, Transport, Telecommunications and Fuel and Energy Complex of ARC, Ministry of the Construction Policy, Architecture and Housing and Municipal Services of ARC before August 22, 2005 should advise to the Ministry of Economics of ARC information on the considered projects on the construction of the waste treatment plants.

4. Main Department of the Foreign Relations and Inter-Regional cooperation of the Council of Ministers of ARC before August 23, 2005 should provide information on the tender to the economic entities which have already applied to the Council of Ministers of ARC.

5. Ministry of the Construction Policy, Architecture and Housing and Municipal Services of ARC, Ministry of the Industrial Policy, Transport, Telecommunications and Fuel and Energy Complex of ARC, Republican Committee of ARC on the environment protection before August 25, 2005 should send their offers on the criteria of selection of the investment projects on the construction of waste treatment plant on the territory of ARC to the Ministry of Economics of ARC.

6. Ministry of Economics of ARC, Main Department of Foreign Relations and Inter-regional cooperation of the Council of Ministers of ARC must agree on the criteria of selection of the investment projects on the construction of waste treatment plant on the territory of ARC with District State Administrations of ARC.

7. Ministry of the Construction Policy, Architecture and Housing and Municipal Services of ARC jointly with District State Administrations of ARC before August 26, 2005 must define possible location of the waste treatment plant in order to hold a tender and choose the technology of SHMW treatment basing upon a specified land site.

8. Ministry of Economics of ARC, Main Department of Foreign Relations and Inter-regional cooperation of the Council of Ministers of ARC must analyse the submitted offers and projects on the matters related with management, treatment and disposal of SHMW on the territory of the ARC and before September 21, 2005 shall prepare the tender of investment projects on the construction of the waste treatment plants in ARC at the expense of the investment funding.

Annexe 5 Crimean Regional Strategy of Solid Domestic Waste Treatment

Crimean Resort Territories without Waste

The first stamp:

Ministry of Building Policies, Architecture and Housing and Communal Services of Autonomous Republic of Crimea

The second stamp:

Administration of the Council of Ministers of Autonomous Republic of Crimea

Incoming N: 123/01-23 Date: 10.01.06

The Crimean Academy of Sciences

The Russian Academy of Natural Sciences

The Crimean Republican Association “Ecology and World”

The State Unitary Company “Ecotechprom”, RF, Moscow

CJSC “Rusutilsyryio”, RF, Moscow

“Krymtransvtorpererabotka”, Ltd

Crimean Regional Strategy of Solid Domestic Waste Treatment

The Crimea

Simferopol

2005

The Crimean Academy of Sciences

"Crimean Regional Strategy of Solid Domestic Waste Treatment"

The Strategy has been elaborated by the group of authors including:

Tarasenko V.S., Doctor of Geology and Mineralogy, Professor, the President of the CAS

Ganopolskiy A.M., Doctor of Engineering, Professor, Fellow of the RANS

Shmigalskiy V.N., Doctor of Engineering, Professor, Fellow of the CAS

Podznoyev G.P., Candidate of Engineering, Associate Professor, Associated member of the CAS

Khmara A.Ya., Candidate of Geology and Mineralogy, Corresponding member of CAS

Vagapov E.R., "Krymtransvtorpererabotka", Ltd promoter

Abliazizova D.D., The National Academy of Environmental and Resort Construction postgraduate student

The researches have been done within the frame of the CAS project "Crimean Resort Territories without Garbage"

Content

Foreword

Researches from the Crimean Academy of Sciences began to develop regional strategy of waste treatment. Scientists from the Russian Academy of Natural Sciences, experts from the State Unitary Company "Ecotechprom" (Moscow, Russia), as well as the company "Krymtransvtorpererabotka" (Simferopol) participate in this work. The main task is to establish solid domestic waste (SHW) utilization technologies that are reasonable for the Crimean resort territory and to develop an optimum plan for infrastructure of waste treatment plants placement on the territory of the Crimea, taking in account natural and climatic, ecological, geological, social-demographic and economical factors.

1. Current situation with SHW treatment in the Crimea

The problem of solid domestic waste utilization is one of the most critical ecological problems in the Autonomous Republic of Crimea (ARC). Approximately 60 million m^3 of SHW has been accumulated on 28 municipal refuse dumpsites – it is difficult to call them SHW landfills. About 700 000 m^3 of SHW is brought to these landfills-dumpsites annually. Practically all the landfills (dumpsites) are not properly organized. They don't have anti-leachate membrane, and other barriers that prevent environmental pollution, don't have observation holes and appropriate permit documentation. More than a half of existing dumpsites don't meet non-pollution requirements. The rated age of landfills used as dumpsites in the cities of Simferopol, Yalta, Alouchta, Feodossia, Kerch have already expired but they are still used violating technological and sanitary norms. South Coast of the Crimea (SCC) is in the worst state: the dumpsites are overloaded, they suffer from spontaneous combustion, there is not enough soil to bury garbage, and there are no systems for leachate collection and treatment there. The dumpsites in the city of Staryy Krym, in the villages of Azovskoye, Krasnogvardeiskoye, Oktiabrskoye, Leninskoye, Razdolnoye, etc. don't meet sanitary requirements: they are not fenced around, garbage is not being buried, also their territory, transport and equipment do not undergo disinfection.

In the Crimea there are 240 domestic waste landfills in rural settlements. More than a half of them (in Bielogorsky, Krasnogvardeisky, Leninsky, Razdolniensky, Simferopol and other rayons) don't meet sanitary requirements.

The existing critical problems of sanitary cleaning of the Crimean territory from SHW question fulfilment of programmes of social and economical development of ARC; President V. Yushchenko's programmes "The Crimean Seacoast", "Drinking Water in the Crimea" are among them.

2. Main principles and priorities of the Strategy

The regional strategy of SHW treatment is based on the following principles and priorities:

- Ecological:
  - Minimal impact on the environment, especially in resort zones. Neutralization of the waste, minimization of accumulated volumes, organization of selective collection etc.
  - In resort zones – to effectively remove the waste outside these zones with subsequent utilization and burial on specialized territories.
- Social:
  - SHW should not be accumulated in or close to residential zones. It is necessary to create sanitary corridors and start reconstruction of the dumpsites with subsequent landscape recultivation.
- Economical:
  - SHW is an important secondary resource for development of the territories. Optimum relationship between resources (secondary resources), fuel and energy and biotechnology (compost, biogas) recycling is being reasoned taking into account the specificity of already formed economical districts.

According to mutual arrangements between the Crimean Academy of Sciences, Government of Moscow and the Russian Academy of Natural Sciences a delegation of Crimean scientists has visited Moscow to study how sanitary cleaning is being done in the city; SHW is collected, utilized and buried. The whole technological chain of the municipal SHW treatment in gigantic megapolis was shown to the delegation including: collection and transportation, selective collection of waste, separation of SHW at utilizing complexes, ecologically and economically efficient two-stage removal of SHW to distant sanitary landfills

using SHW reloading stations, SHW burying at organized landfills, SHW incineration at waste treatment plants producing thermal and electrical power, usage of secondary resources obtained from SHW in construction and chemical industries.

Especially impressive is the scale of processing and usage of plastics with production of secondary polyethylene teraphthalate (PETPh) which is supplied to the plants in Russia and abroad (India, China, etc.) where synthetic fibre, straps-tape, plates and dishes, cast haberdashery items, etc. are manufactured.

Due to powerful municipal communal services industry created within the last years that collects and buries SHW, Moscow transformed into the beautiful, ecologically clean city without garbage in the streets and smoking dumpsites on its outskirts.

Moscow gradually changed SHW treatment: from collection and transportation of waste to poorly organized landfills and dumpsites to selective collection, processing of the most valuable fractions (plastic, metal, and paper) and burying most of the waste at well organized landfills and, at last, to non-waste recycling technologies.

Advanced technologies used in many economically developed countries do it possible to select and process valuable fractions, incinerate SHW at incineration plants obtaining thermal and electrical power and utilize ash and cinder obtaining building materials.

In our estimation, the Crimea can work it's way to ecologically safe SHW treatment system technologies on organized landfills and to full SHW recycling technologies in the shortest time basing on technological and technical-organizational assistance and mutually beneficial co-operation with Moscow municipal communal services bodies and Russian business structures.

2 stages have to be highlighted in the Crimean Regional Strategy of SHW treatment:

- First stage – of urgent emergency measures (reconstruction and recultivation of the existing dumpsites, establishing order in housing and communal services in Crimean cities and towns, creation of SHW most valuable fractions processing industry with commercial output).
- Second stage – of long-term actions on organization of non-waste recycling technologies that result in producing thermal and electrical power, building materials and other items of production.

3. The first stage of urgent emergency measures

At the first, two – three years long, stage the first task is to establish order in housing and communal services in Crimean cities and towns:

- to organize sites for collecting and receiving solid waste in every city block;
- to begin to introduce selective collecting of solid waste (at least in certain shopping and warehouse areas where to install containers for ***paper, cardboard, polymers, other domestic garbage***);
- to install containers for ***polymers*** and ***other domestic garbage*** in residential districts;
- to create specialized containers and garbage-removal trucks stock;
- to organize in cities' industrial zones and close to the existing SHW landfills the following plants: SHW sorting, pressing and reloading.

At sorting complexes commercially important fractions (plastic, paper, cardboard, metal) will be picked and transported then to be processed into commercial output.

The rest of the waste (about 80%) is pressed into high-density briquettes (to 1.5 t/m^3) and transported by garbage trucks to organized SHW landfills to be ecologically safely buried with subsequent landscape recultivation of the territory.

Functional layout of the system of sanitary cleaning of the Crimea from SHW is shown on Figure 1.

This layout shows also the long-term prospects (of the second stage) – organization of large waste treatment plants that produces thermal and electrical power, building materials.

3.1. Reconstruction of the old municipal SHW dumpsites (centre of insanitariness and ecological disaster)

It is generally should be started with allotment of sites (areas of several hectares near the dumpsites) and creating of cells for burying high-density SHW briquettes according to combined high-pit pattern for hydrogeological conditions with high level of ground water and according to pit pattern for conditions with low level of ground water.

In order to prevent leakage of leachate to environment the reconstructed SHW landfills have to be equipped with anti-leachate membrane and drainage system which takes leachate and dispose it to treatment plant. Modern technologies of waste storage have to be used at the reconstructed landfills which protect them from inflammation, weathering and diffusion, penetration of rodents and birds. Special measures will be taken to suppress producing of methane, to isolate the landfill working area with soil on daily basis, etc.

The old landfills' bodies have to be recultivated: certain cells in ecologically poor zones could be partially processed so that SHW briquettes will be reburied at organized sites with subsequent landscape recultivation and technical measures to prevent the influence of the landfill on environment will be taken.

Old municipal landfills cannot be effectively utilized at incineration or other waste treatment plants. It is objective reality of old cities and it aggravates ecological and social problems. That is why the stage of urgent measures includes necessity of the dumpsites reconstruction, converting them into civilized SHW landfills with subsequent landscape recultivation (banking, covering with soil, afforestation, etc.) and providing ecological safety at the adjacent territory.

Basic technology of sanitary cleaning of urban areas is proposed in the investment project "Reconstruction and subsequent recultivation of Simferopol SHW landfill" developed by the company "Krymtransvtorpererabotka", Ltd, Simferopol, 2005.

The Crimean Regional Strategy of SHW Treatment

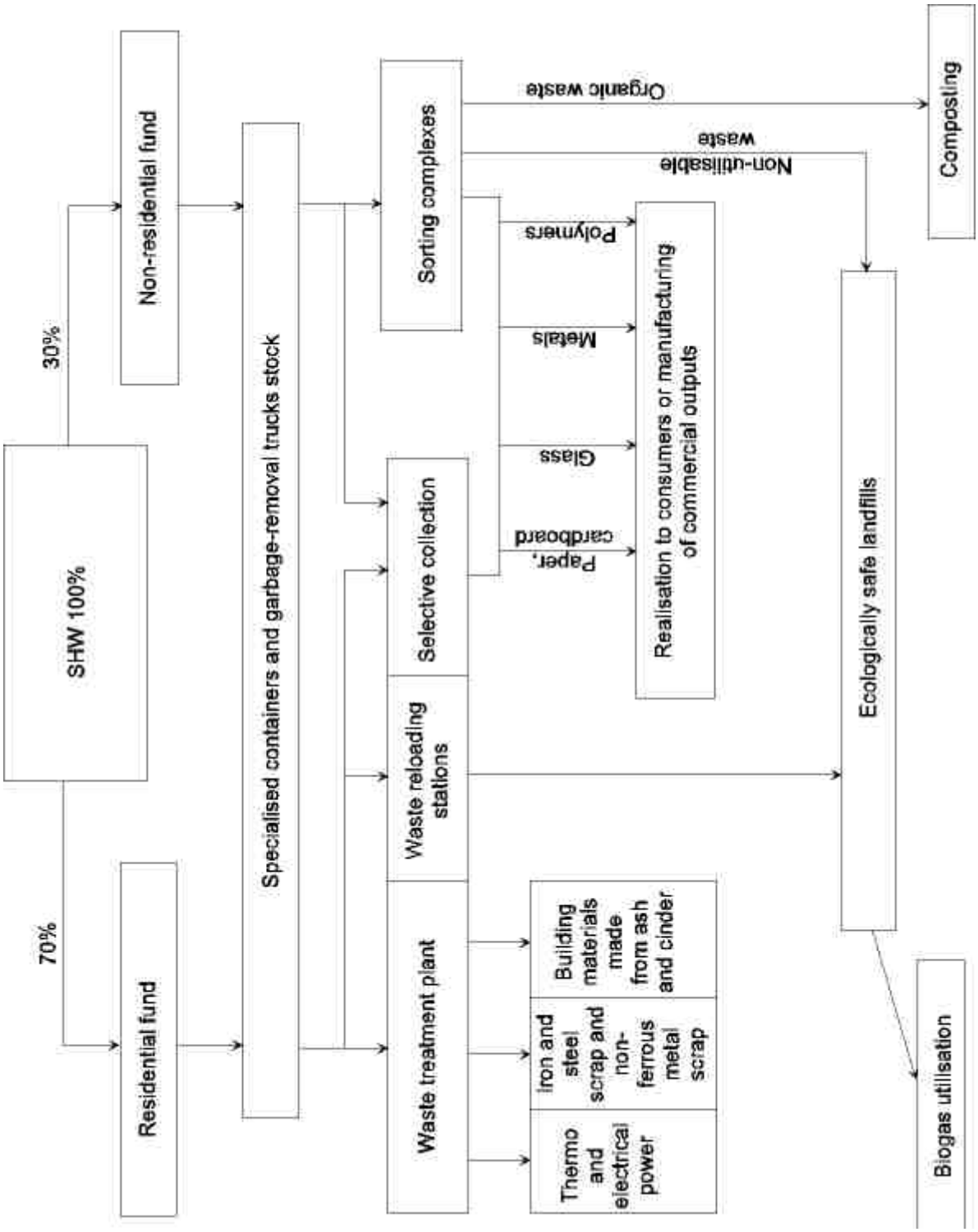


Figure 1. Functional layout of the system of sanitary cleaning of the Crimea from SHW

South Coast (SCC) is an especially important resort zone in the Crimea. It is the main resort, recreational and tourist part of ARC and Ukraine. Recreational development of towns and villages means first and foremost their sanitary cleaning.

The Crimean regional strategy of SHW treatment provides sanitary cleaning of SCC by collection, sorting, removal and disposal of solid domestic waste outside the resort zone. Such technological solutions are applied at internationally known resorts in Southern France, Italy and Spain.

Attention and support should be given to “Project of SCC area sanitary cleaning from solid domestic waste system reconstruction” created by “Krymtransvtorpererabotka” (Simferopol).

Technological system of SCC area cleaning presented in the Project includes:

- Collection of SHW in urban resort areas according to the existing scheme
- Transportation of SHW to port cargo terminals zones. There, in roofed hangars, equipment for separation and pressing of the waste will be installed.
- Selection of commercially valuable waste fractions (plastic, paper, cardboard, metal) and transportation to waste treatment plants to be processed into commercial output.
- The rest of the waste (about 80%) is pressed into high-density briquettes (up to 1.5 t/m^3) and transported by sea in dry cargo lighters or powerful (up to 36 tons) garbage trucks to base "Western" SHW landfill to be ecologically safely buried with subsequent landscape recultivation of the territory.
- Reconstruction of old dumpsites in SCC towns and villages in order to provide their ecological safety with subsequent landscape recultivation.

Indices of the investment project efficiency

- Social – beginning of SCC area sanitary cleaning will improve living conditions of the local population
- Ecological – sanitary and epidemiological situation in SCC towns and villages will improve
- Economical – number of tourists and visitors to SCC recreation centres will increase by 2006 which provide economic growth.
- **The Project author (also, the investor) – "Krymtransvtorpererabotka", Ltd, guarantees that within a year after the investment agreement with the Ministry of Economy is signed it will create infrastructure to collect, utilize, remove and bury SHW and to provide sanitary cleaning of the SCC area.**

To bury SHW removed from SCC, and in prospect also from the western and central economic areas, the author of the Project envisaged creating of a large SHW sanitary landfill "Western" (Figure 2,3. "Western" SHW sanitary landfill; Characteristics and organization of the "Western" SHW sanitary landfill.) It is supposed to be placed in favourable geological structures and lithological stratum of Simferopol elevation (on the border of Saki and Simferopol administrative rayons). In the nearest future it is possible to use Saki SHW landfill.

4. The second stage of long-term actions on sanitary cleaning of the Crimea territory from SHW

It is a long-term (up to 10-15 years) capital- an resource-intensive stage which supposes creation of full SHW recycling industry and in prospect industrial and construction waste treatment industry with production thermal and electrical power, building materials and other valuable materials.

It is proposed to create four large waste treatment plants.

4.1. Western waste treatment plant (WTP)

near SHW landfill "Western". 100 000 tons of waste come from SCC, 120 000 tons – from Simferopol, 18 000 tons – from Saki, 40 000 tons – from Evpatoria. At first SHW will be buried (1st stage), than utilized with producing thermal and electrical power, building materials from ash and cinder, also wastes from stone quarrying and sawing

Thermal and electrical power obtained at WTP can be used for burning wastes from stone quarrying and sawing of saw limestone at Saki-Evpatoria deposit obtaining limestone-cinder solutions, cements and concretes. In general, SHW and wastes from construction industry and stone quarrying can be efficiently used in obtaining critical building materials.

4.2. Northern waste treatment plant

(Armiansko-Krasnoperekopsk industrial and urban agglomeration).

At the first stage, 100 000 tons of SHW come to existing SHW landfill (Armiansk, Krasnoperekopsk, Razdolnoye, Pervomayskoye). Large chemicals plants are in operation in the region: SJSC "Titan", OJSC "Crimean Soda Plant", etc.

Enormous quantities of industrial waste are stored there (phosphogypsum, sulphuric acid production sludge).

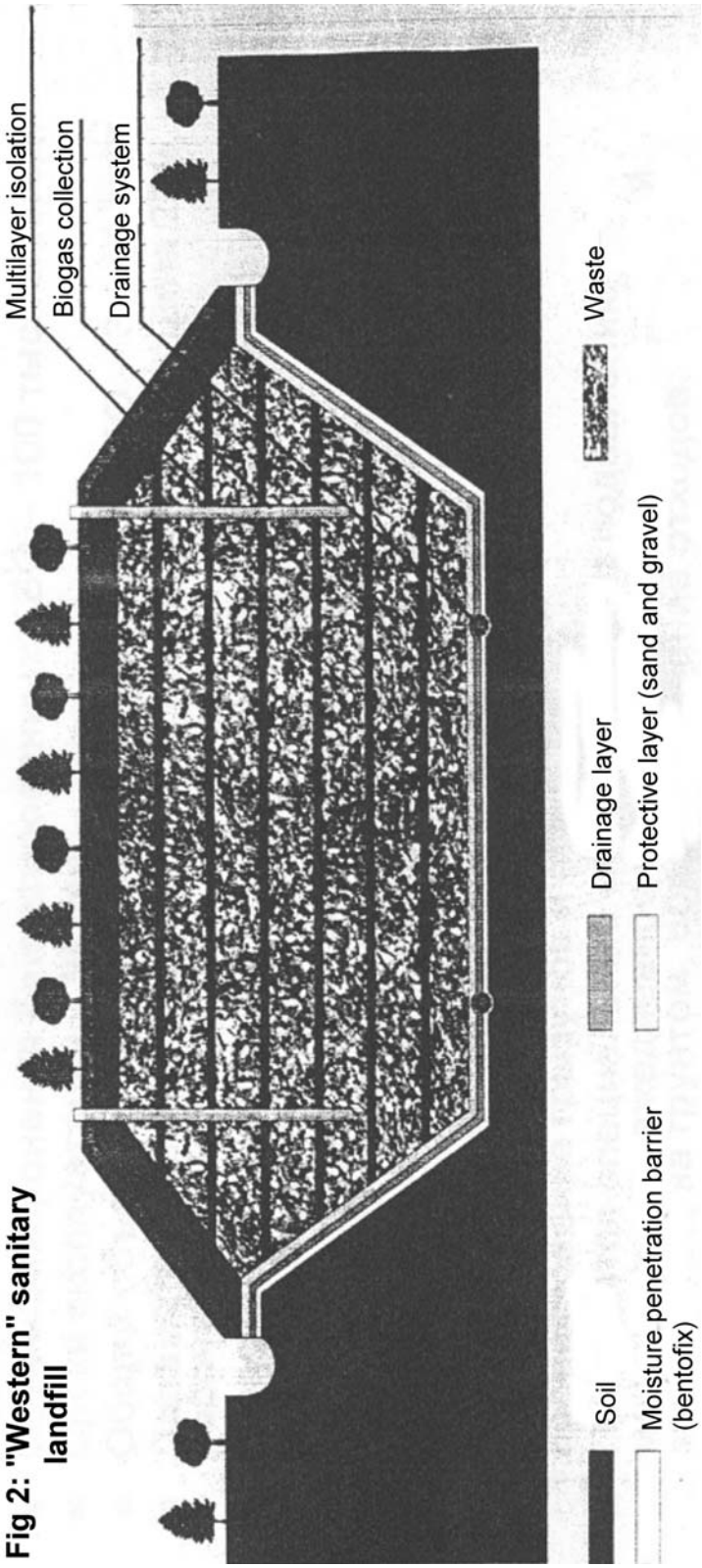


Figure 3. Characteristics and organization of the "Western" SHW sanitary landfill

Service zone: Southern (SCC) and Western economic areas

Amount of SHW briquettes to be buried - 100,000 t/year

Operation life – 30 years.

Total amount of SHW briquettes to be buried - 3 million t

Characteristics of the landfill: length – 500 m, width – 300 m, depth – 20 m, useful capacity – 3 million m^3

Pit pattern for hydrogeological conditions with low level of ground water

In order to prevent leakage of leachate to environment the SHW landfills is to be equipped with anti-leachate membrane and drainage system which takes leachate and dispose it to the treatment plant

Modern technologies of waste storage are used at the landfill which exclude inflammation, weathering and diffusion, penetration of rodents and birds

Special measures are being taken to suppress producing of methane, to isolate the landfill working area with soil on daily basis, to disinfect the waste.

There has to be introduced technology of SHW and industrial wastes combined processing.

4.3. North-Eastern waste treatment plant.

North-Western Economic Area is an agricultural area of ARC, the area of irrigated cropping, where the agro industrial complex is being developed.

Both SHW (70 -100 000 tons per year) and organic waste from agrarian and agrarian-food processing plants accumulated there.

At the first stage of urgent measures it is planned to reconstruct the old SHW dumpsites in order to provide ecological safety and to prolong their operation life.

At the second stage it is recommended to construct waste treatment plant of agrotechnical recycling – processing of organic waste from agrarian and agrarian-food processing plants with production of compost and biogas.

4.4 Eastern waste treatment plant

will be constructed at Kerch peninsula and will serve to Kerch industrial agglomeration and agricultural Leninskiy rayon.

SHW amount to 70 -100 000 tons. 100 000 tons of industrial waste accumulated there.

At the first stage it is planned to create large eastern SHW sanitary landfill with facilities to bury waste in briquettes (including removal from South-Eastern Crimea by sea).

At the second stage – creation of waste treatment plant with obtaining thermal and electrical power, building materials, valuable iron-ore concentrate utilizing ferriferous sludge from Kamysh-Burun Iron-Ore Industrial Complex (IOIC).

Nowadays the progressive countries have programmes on development and introducing new efficient and ecologically allowable methods of SHW and industrial waste utilization.

Now, one of such promising methods is pyrolysis which allows to process biogenous waste of any composition with obtaining such valuable products as crude oil, pyrocarbon (coal char) and burning gases. Classical pyrolysis – thermal destruction of organic substances by high temperature heating in absence of air, can give (output in % of dry source material):

pyrocarbon (coal char) – 40-50%

primary tar – 20-25%

burning gases – 10-12%

The book value of the products obtained is considerable high then pyrolysis operating costs.

More prospective is the method with low-temperature thermochemical pyrolysis when source organic material interacts with carbon monoxide and steam over a catalyst. This process at temperature of 350-400^{o}C and pressure of 3 atm results in (in % of source material mass):

pyrocarbon (coal char) – 45-50%

crude oil – 25-30%

burning gases – 14-17%

Obtained crude oil characteristics doesn't practically differ from natural oil products and is good for processing into petrol, kerosene and wax using traditional technology. Crude pyrocarbon can be used as rubber extender or as solid fuel; after activation by steam and hydrochloric acid – as sorbent and lighter (activated charcoal).

An important pyrolysis advantage is that its end gas practically doesn't contain any carbon monoxide, nitric and sulphur oxides and external heat loss is considerably less that is to the full in line with Kyoto Protocol.

Using main principles of thermochemical SATP-reactor operation it is possible to economically efficiently utilize such large-volume accumulations of technogenic waste as iron-bearing sludge waste from Kerch IOIC agglomeration plant accumulated in Churbash sludge pit that holds 64 million tons of waste. It can cause large-scale ecological catastrophe in case the sludge storage overfills and supporting dam (200 m from the coastline) collapses when sludge will go into Kerch Strait and to housing estate of the plant "Zaliv".

Mixing finely ground biogenous waste with iron-bearing sludge and using hydrocarbon components as reducing agent (like coke) and iron oxides as hydrocarbon destruction catalyst, it is technologically possible to obtain at temperature 550-650^{o}C reduced powdered (or metallized) iron as end product for foundry.

Using this pattern for processing 64 million tons of sludge containing 30-35% of iron at technological complex with annual capacity of 2 million tons of sludge, technologically adequate demand for organic waste will amount 3,200 t/day which by pyrolysis will give 530 t/day of pyrocarbon and 260 t/day of crude oil.

5. Ecological passport of SHW sanitary landfills and waste treatment plants placement on the territory of the Crimea

When selecting sites for waste treatment plants in order to minimize their impact on the environment it is necessary to follow the criteria given below:

5.1. Ecological criteria

Ecological nature conservation network has been created in the Crimean resort territories which includes well-known biological centres (wildlife preservations, game reserves, monuments of nature, landscape art monuments, etc), additional biological centres and bio-corridors that are being planned (Figure 4).

It is forbidden to place industrial objects, resorts and recreation centres or any objects of communal or municipal property on these territories.

In connection with President V. Yushchenko's programme "The Crimean Seacoast" any economical activity in the Crimean resort territories (especially in 10 km coastal zone) must correlate with the needs and tasks of the resort to improve health and organize recreation of the people. In this zone the activity that goes against its target use and can produce bad impact on therapeutic characteristics and sanitary state of the territories is forbidden.

That is why waste treatment plants must be removed outside resort zones, also outside protected and nature-conservative zones of the Crimean ecological network.

5.2. Geological (geodynamic, structurally tectonic, lithological, seismic and other) criteria

The Crimea is characterized by its complex geological structure shown in geodynamic phenomena (erosive and abrasive, karst, landslide, seismic). That is why, it is necessary to take in account a variety of above geological factors while selecting a site for future construction. Sites for SHW sanitary landfills can be placed in exhausted quarries of 30-50 hectares in area with argillaceous bed- rock and level of ground water lower then the pits bottom. The sites can also be placed in undeveloped land, in areas formed from clays and heavy loams that are poorly permeable, effusive rocks.

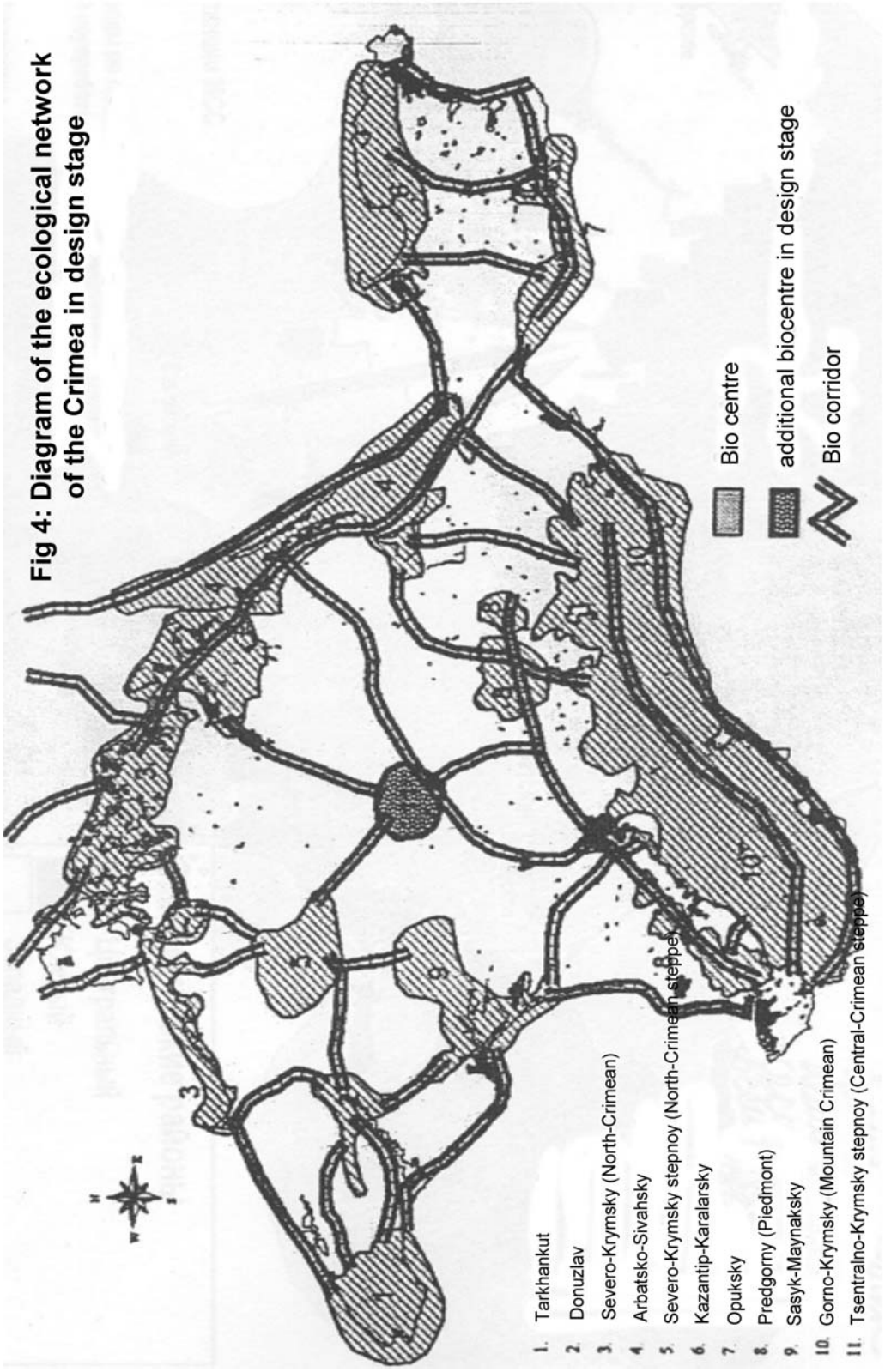
It is planned to place two new large SHW sanitary landfills:

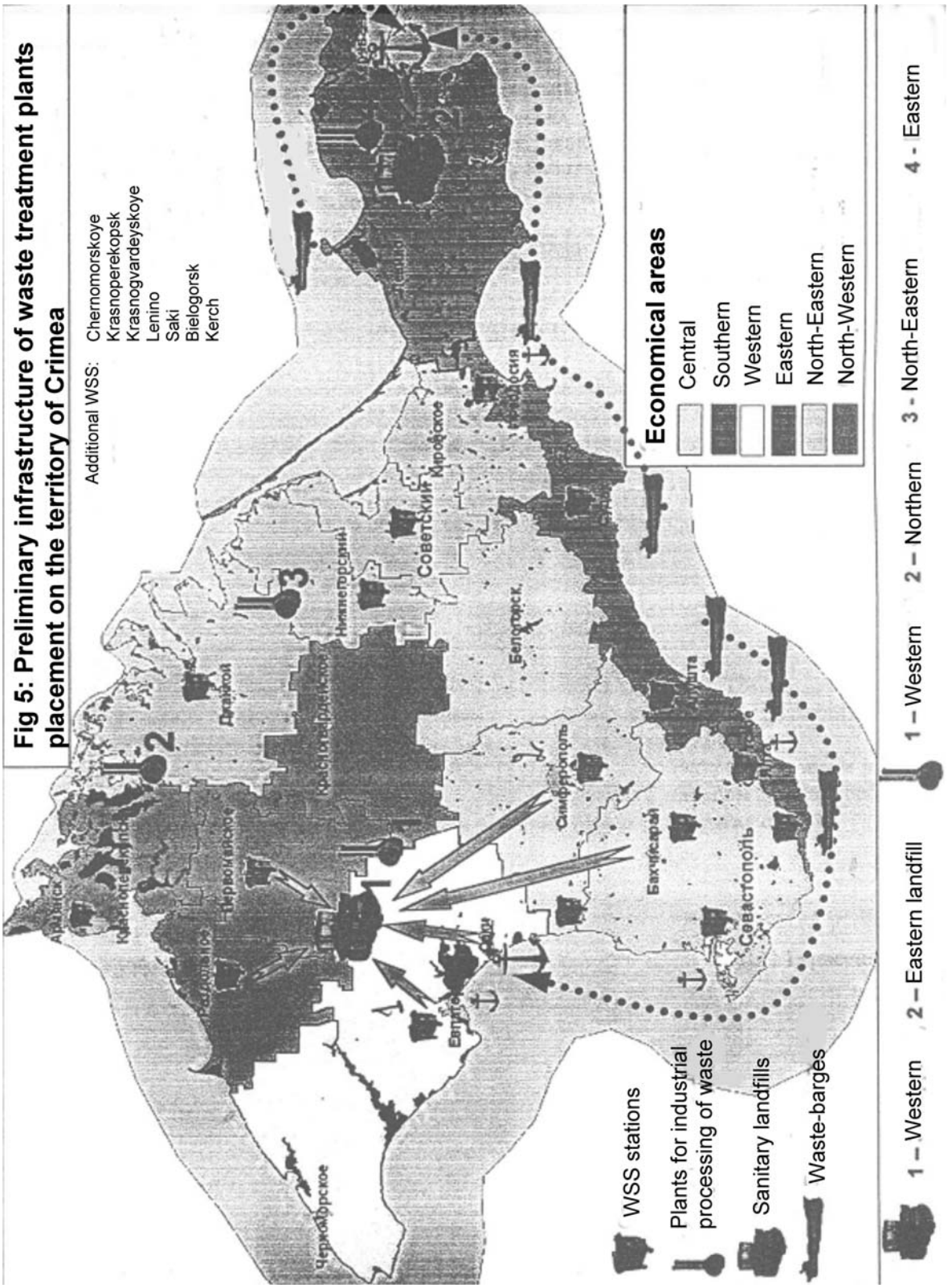
- Western sanitary landfill on Simferopol elevation (on the border of Saki and Simferopol administrative rayons).
- Eastern sanitary landfill at Kerch peninsula (near the city of Kerch)

It is planned to create four waste treatment plants:

- Western waste treatment plant – in the area of SHW sanitary landfill "Western"

- Northern waste treatment plant – in favourable geosynclinal geological structure and substantially clayey (loamy) stratum between the cities of Armiansk and Krasnoperekopsk.
- North-Eastern waste treatment plant – in favourable geological structures and lithological stratum between the city of Dzhankoy and settlement Nizhnegorsky.





5.3. Eastern waste treatment plant – in favourable geological structures and lithological stratum near SHW sanitary landfill Eastern.

To come to final decision regarding the choice of the sites it will be necessary to analyse archival geological documents, to carry out field geological engineering survey, including drilling operations with study of core samples from the field holes. This task could be done by geological parties acting on ARC territory using investing companies' requirements specification.

Preliminary infrastructure of SHW sanitary landfills and waste treatment plants placement on the territory of the Crimea is shown in Figure 5.

6. Plan for attracting investments

The Plan is developed by the investor – the company “Krymtransvtorpererabotka” and was stated in competitive projects on reconstruction of sanitary cleaning system for cleaning SCC territory and Simferopol from solid domestic wastes.

This plan is rather efficient and doesn’t exclude participation of government administrative and municipal structures of ARC in management and monitoring activity of the company “Krymtransvtorpererabotka”, also receiving of set income by republican and municipal budgets.

7. Conclusion

Current situation with SHW treatment in the Crimea is a serious obstacle for realization strategic tasks of stable ecological, social and economical development of the Crimea resort area.

Crimean Regional Strategy of Solid Domestic Waste Treatment developed by CAS scientists and scientists from other scientific centres can become the first step in effective reconstruction of sanitary cleaning system for cleaning territory of the Crimea from SHW.

President of CAS,

Professor Signature Tarasenko V.

Annexe 6 Decision of the Council of Ministers of the Autonomous Republic of the Crimea (ARC) dated February 24, 2006, N° 85.

On adoption of the location pattern of the enterprises engaged in waste disposal in the Autonomous Republic of the Crimea (ARC)

In order to meet the requirements stated by article 19 of the Law of Ukraine 'On waste' and to protect the environment from the negative impact of waste, to secure thrifty use of recycled resources, to provide necessary conditions for the organization, collection, sorting, transportation, processing and disposal of waste as secondary resources and in compliance with the proposals developed by the Working Commission set up by the decision of the Council of Ministers of the Autonomous Republic of the Crimea dated November 17, 2005, No. 811-p "On setting up a Working Commission for the preparation of proposals on the implementation of guidelines of the waste treatment system upgrading in the Autonomous Republic of the Crimea".

The Council of Ministers of the Autonomous Republic of the Crimea **decided:**

1.To consider expedient to locate:

-waste sorting stations (plants) on the territory of the Autonomous Republic of the Crimea at the following settlements: cities of Alouchta, Armiansk, Dzhankoy, Evpatoria, Kerch, Krasnoperekopsk, Saki, Simferopol, Sudak, Feodossia, Yalta, Bahchysarai, Bielogorsk, Stary Krym, Shchelkino, urban villages Krasnogvardeiskoye, Lenino, Nizhnegorsky, Pervomaiskoye, Razdolnoye, Sovetskiy, Chernomorskoye;

-waste disposal plants on the lands of Saki, Simferopol, Leninsky districts, Alouchta city council and in the city of Kerch.

2. Local self-governing bodies jointly with the Republican Committee of the Autonomous Republic of the Crimea on land resources are recommended before 1st of July, 2006 to define the land sites for allocation of the mentioned above enterprises.

3. Ministry of the Construction Policy, Architecture and Housing and Municipal Economy of the Autonomous Republic of the Crimea shall announce a competition for the best technology on further waste disposal after they are preliminary sorted.

4. Ministry of Economy of the Autonomous Republic of the Crimea, Ministry of the Construction Policy, Architecture and Housing and Municipal Economy of the Autonomous Republic of the Crimea, Republican Committee of the Autonomous Republic of the Crimea on Environment Protection, Republican Committee of the Autonomous Republic of the Crimea on Land Resources must provide their proposals as for the location on the territory of the Autonomous Republic of the Crimea of two inter-district landfills for burial of waste which cannot be eliminated.

5. The execution of this Decision shall be controlled by the first Deputy Chairman of the Council of Ministers of the Autonomous Republic of the Crimea S.V. Khil.

Chairman of the Council of Ministers of the Autonomous Republic of the Crimea
A.Burdyugov

Minister of the Council of Ministers of the Autonomous Republic of the Crimea V.Ganysh

Agreed by……

Annexe 7 Conclusion on the considered investment projects submitted to the tender

Ministry of the Construction Policy, Architecture and Housing and Municipal Economy of the Autonomous Republic of the Crimea

Conclusion

on the considered investment projects submitted to the tender

Ministry of the Construction Policy, Architecture and Housing and Municipal Economy of the Autonomous Republic of the Crimea considered the materials submitted to the tender on the construction of waste disposal plants in the Autonomous Republic of the Crimea.

Offer N° 1.Corporation "Ukrvtorresursy"

Presented offer foresees the construction of two waste sorting complexes in the cities of Simferopol and Yalta as well as one joint 10 ha landfill for location of briquettes. The cost of the project makes 120,7 mln UAH (100 % investment). The Corporation plans to organize waste collecting from the municipal communal enterprises, its further selective sorting of recycling resources (about 30%). The waste left after the sorting will be compressed into briquettes, transported and buried on the joint landfill. It is foreseen to use for the project purposes the technological equipment produced by the Spanish company "IMABE IBERIKA".

Conclusion. This is an expensive project and it may result in considerable growth of tariffs collected from the population for waste transportation and burial. The project does not foresee waste collection and transportation directly from the places of waste generation and only waste collection from the communal enterprises is implied. This project has not been yet implemented by the Corporation on the territory of Ukraine.

Offer N° 2.VSP "UkrEkologia" Ltd.

This offer includes organization of selective solid waste collection, construction of waste sorting complex and a landfill for placing briquettes (2 to 10 ha big). The projects for cities of Feodossia and Evpatoria have been presented and the sites for the complex construction have been chosen. Each project costs 18,9 mln UAH and 100% of investments is foreseen. The company offers full range of services on selective waste collection and its transportation from the place of their generation, further waste sorting including secondary raw materials excerption (about 30%).All waste left after the sorting is supposed to be compressed into the briquettes and then transported and buried on the landfill. According to the plan, technological equipment manufactured by the Swedish company ‘PRESONA” will be installed. Similar project lead by the company was implemented in the city of Khartsizsk (Donetsk oblast).

Offer N° 3.The state company "UkrEkoKomResurcy".

This offer implies organization of selective waste collection, construction of waste sorting complex. The cost of the project will be defined for each of the cities and will foresee 100% investment. The company offers full range of the services on selective waste collection and its transportation from the places of its generation, further waste sorting including secondary raw materials excerption (about 30%). All the waste left after the sorting is supposed to be compressed into the briquettes and then transported and buried on the active landfill provided the waste becomes the company’s property. Technological equipment manufactured by the machine building plant "Avtolivmach" will be used for the project implementation.

Conclusion. This project clearly offers full range of the services on selective waste collection and its transportation from the places of its generation, further sorting, briquetting and its disposal on the landfill. As the project implies the use of the technological equipment manufactured by the machine building plant "Avtolivmach", its price will be considerably lower. Planned briquettes allocation on the active dumpsites which will be run by the company will result in considerable expenses for their reconstruction.

Offer N° 4. "Krymtrnsvorpereraotka".

The offer foresees the construction of several waste sorting complexes at several settlements of the Southern Shore of the Crimea and briquettes transportation by sea to the city of Saki for their allocation on the active landfill 5 ha large. The cost of the project is 20.0 mln UAH. Joint stock company “Ecoinvest” with

46% share of investment will be set up. The company plans to collect waste from the communal enterprises of the city, further waste sorting including secondary raw materials excerption (about 20 %). All the waste left after the sorting is supposed to be compressed into the briquettes and then transported and buried on the joint landfill.

Conclusion. The project does not foresee any SW collection and transportation from the places of its generation. Only waste collection from the communal enterprises is planned. The compressed briquettes transportation via the sea to the city of Saki will result in rise in tariff cost because of big expenses for the reconstruction and recultivation of the landfill. The calculation and the conclusion on the possibilities and terms of use of the landfill were not presented. This project has not been yet implemented by the company on the territory of Ukraine.

Offer N° 5."MUT STOCKERAU" company.

This offer regards the construction of waste sorting complexes. The cost of the project will be defined for each of the cities and foresees 100% of investment. The company offers waste collection from the communal municipal enterprises, waste sorting including secondary raw materials excerption (about 37%). All the waste left after the sorting will be composted at the specially constructed composting fields. Technological equipment manufactured by the Austrian company 'MUT' will be installed.

Conclusion. The project does not foresee any SW collection and transportation from the places of its generation. Only waste collection from the communal enterprises is planned. Proposed technology of waste composting will result in considerable rise in tariff cost because of big expenses for the construction of the composting field, manufacturing and sale of compost. This project has not been yet implemented by the company on the territory of Ukraine.

Based upon said above, Ministry of the Construction Policy, Architecture and Housing and Municipal Economy of the Autonomous Republic of the Crimea submits the following offers:

-to recognize the investment projects submitted by All-Ukrainian specialized enterprise "UkrEkologia" and the state company "UkrEkoKomResurcy" as the ones which meet the qualification requirements and confirming professional and technical competence of the participants;

-to recommend to the seeking companies to take part in the second stage of the competition and present the draft business plans on the construction of waste treatment complexes in the cities of Simferopol, Evpatoria, Feodossia, Kerch, Yalta, where the main criteria will be the prime cost of the waste disposal (tariff) after the project is implemented in the given settlement according to the project.

Appendix: table on 2 pages.

Minister of the Construction Policy, Architecture and Housing and Municipal Economy of the of the Autonomous Republic of the Crimea

G.Babenko

Table of the materials submitted to the tender on the construction of the waste treatment plants in the Autonomous Republic of the Crimea

Company-competitor, its address, manager	Terms of investment	Description of the technological process	Ecological safety	Period of designing and construction	List of the projects implemented by the company
Krymrtansvtorpererabotka' Ltd., City of Simferopol, 13 Fenerli str. Founder: E.Vaganov, partner of 'Rosutilsyrie' and 'Ecoengineering' Ltd.(Moscow)	Cost of the project-20 mln UAH. (several waste sorting complexes should be built, place of location --Southern shore of the Crimea)Setting up a joint stock venture 'Ecoinvest':51%-ARC,46%-'Krymrtansvtorpererabotka' Ltd.,3 %-city of Simferopol	Solid household waste collection, sorting and pressing of waste. Selection: 20%-secondary raw materials, 80%-waste briquetting by pressing. Briquettes transportation by sea and further allocation on the active landfill (5ha) in the city of Saki after it is reconstructed and recultivated	No available data	Period of designing-9 months. Construction-12 months. Stage by stage reconstruction and recultivation of the landfill--36 months. Installation of the equipment-6 months.	Moscow, Dmitrovsky landfill
SUAP 'Avstroinvest" Ltd. City of Kharkov, 3-a Novgorodskaya str., director-M. Pirringer, by proxy of the 'MUT STOCKERAU' Co.	The cost of the project will be defined for each city.100% investment.	SW collection, sorting and pressing.Selection:20%-secondary raw material, 63%compost.Construction of composting fields.	Technological equipment of the Austrian company 'MUT' is used.	No data	Not submitted
Corporation 'Ukrvtorresursy', Kiev oblast, Belotserkovsky district, village of Ozernoye,6 Lipki str., general director-I.Sarkanich	The cost of the project is 120,7mln UAH. It includes construction of 2 waste sorting plants in Simferopol and Yalta as well as one joint landfill (10 ha)	SW collection from the communal enterprises, sorting and pressing.Selection:30%-secondary raw material, 70% -briquetting. Construction of composting fields.	Technological equipment of the Spanish company 'IMABE IBERIKA' is used. ISO9001 certificate is available.	18 months	Not submitted
State company 'UkrEkoKomResursy', Kiev, 4 Klovsky slope str., president-S.Novokhatskaya	The cost of the project will be defined for each city.100% investment.	SW selective collection, sorting and pressing.Selection:30%-secondary raw material, 70% -briquetting. Briquette location on the active landfills after they are reconstructed provided they become the property of the investor.	Sorting lines produced according to the Italian technology by the machine-building plant 'Avtolivmash'	12 months	Not submitted
VSP 'UkrEkologia' daughter company in Simferopol, 198 Kechkemetskaya str., director --V. Ulanov	Cost of the project: city of Feodossia-18,9 mln UAH; city of Evpatoria-18,9 mln UAH. Construction of waste sorting complexes and new landfills is planned. 100% of investment	SW selective collection, sorting and pressing. Selection: 30%-secondary raw material, 70% - briquetting.	Technological equipment of the Swedish company 'PRESONA' is used	Design period--6 months. Installation of equipment and construction of landfills--12 months	city of Khartsizsk, Donetsk oblast

Annexe 8 Detailed population of the settlements

Population (x1000)	Districts	Cities	Cities	Municipal districts	Urban settlements	Village councils	Rural settlements
Sevastopol		**378.6**					
Sevastopol			***340.4***				
Balaklavskiy District				***20.7***			
Inkerman					*11.1*		
Orlinovskiy Council						*6.8*	
Orline							2.0
Gontcharne							0.7
Kizilove							0.1
Kolkhozne							0.1
Novobobrivske							0.3
Ozerne							0.2
Pavlovka							0.4
Peredove							0.7
Pidguirne							0.1
Reservne							0.2
Rodnikovske							0.5
Rozsotchanka							0.2
Tilove							0.7
Chiroke							0.6
Ternivskiy Council						*2.8*	
Ternivka							2.0
Ridne							0.8
Gagarinskiy District Leninskiy District Nakhimovskiy District				***17.5***			
Katchinskiy Council						*9.0*	
Katcha							5.1
Vichneve							0.8
Orlovka							0.9
Ocipenko							0.6
Poliouchko							1.6
Andreevskiy Council						*3.5*	
Andreevka							1.7
Soniatchniy							1.8
Verkhniosadivskiy C.						*5.0*	
Verniosadove							2.4
Dalne							0.5
Kamichli							0.1
Pirogovka							0.3
Povorotne							0.2
Frontove							1.0
Fructove							0.5
AR Crimea	**14**	**16**	**11**	**3**	**56**	**243**	**956**
Cities		**12**	**11**	**3**	**35**	**14**	**62**
Simferopol		**363.3**					
Simferopol Centralniy District			***341.6***				

Population (x1000)	Districts	Cities	Cities	Municipal districts	Urban settlements	Village councils	Rural settlements
Zaliznitchniy District				***17.3***			
Grecivskiy Council						*17.3*	
Grecivskiy					10.6		
Aeroflotskiy					2.1		
Komsomolske					4.5		
Bitumne							0.1
Kiyvskiy District				***4.4***			
Agrarne					4.4		
Alouchta		**52.6**					
Alouchta			***30.2***				
Partnenitskiy District				***6.3***			
Partenit							6.1
Bondarenkove							0.1
Tchaika							0.1
Isobilnenskiy Council						*4.5*	
Isobilne							2.3
Verkhnia Kutuzovka							1.0
Nijnia Kutuzovka							1.0
Rozoviy							0.2
Lutchistivskiy Council						*1.3*	
Lutchiste							1.0
Lavanda							0.2
Cemidviria							0.1
Malomaiatskiy Council						*4.7*	
Maliy Maiak							2.2
Vinogradniy							0.2
Zaprudne							0.8
Kiparisne							0.4
Lavrove							0.3
Lazurne							0.1
Nijne Zaprudne							0.1
Puchkine							0.2
Utios							0.4
Maloritchenskiy Council						*3.9*	
Maloritchenske							1.3
Generalske							0.3
Ribatche							1.3
Soniatchnogorske							1.0
Privitnenskiy Council						*2.1*	
Privitne							1.8
Selenogoria							0.3
Armiansk		**25.2**					
Armiansk			***22.9***				
Suvorivskiy Council						*2.3*	
Suvorove							1.3
Volochine							0.1
Perekop							0.9
Dzhankoy		**40.6**					
Dzhankoy			***40.6***				

Population (x1000)	Districts	Cities	Cities	Municipal districts	Urban settlements	Village councils	Rural settlements
Evpatoria		**121.7**					
Evpatoria			***106.3***				
Zaozernenskiy D.				***4.7***			
Novoozernivskiy D.				***10.7***			
Novoozerne					6.6		
Mirniy					4.1		
Kerch		**152.6**					
Krasnoperekopsk		**30.8**					
Saki		**27.1**					
Sudak		**28.7**					
Sudak			*14.6*				
Vecelevskiy Council						*1.1*	
Gruchivskiy Council						*3.4*	
Gruchovka							2.0
Perevalovka							0.7
Kholodovka							0.6
Danitchnivskiy Council						*3.0*	
Datchne							2.4
Lisne							0.6
Mijritchenskiy Council						*0.7*	
Mijritchtchia							0.5
Voron							0.2
Morskiy Council						*2.4*	
Morske							2.2
Gromovka							0.2
Soniatchnodolinskiy C.						*2.3*	
Soniatchna Dolina							1.4
Bagatovka							0.7
Mindalne							0.1
Priberejne							0.1
Feodossia		**106.6**					
Feodossia			***72.4***				
Koktebelskiy Council						*3.4*	
Koktebel							2.8
Nanikovye							0.6
Ordjonikidze						*2.8*	
Primorskiy						*14.2*	
Chebetorvskiy Council						*4.9*	
Chebetorvka							3.4
Kurortnye							0.3
Krasnokamianka							1.2
Beregova						*2.1*	
Beregovye							2.0
Stepovye							0.1
Nacipnivskiy Council						6.9	
Nacipnye							1.7
Blijnye							2.7
Vinogradnye							0.3
Pidguirnye							0.3

Population (x1000)	Districts	Cities	Cities	Municipal districts	Urban settlements	Village councils	Rural settlements
Pionerskye							0.1
Soniatchtchnye							1.0
Yujnye							0.8
Yalta		**142.7**					
Yalta			***80.1***				
Aloupka			***8.7***				
Gasprinskiy Council					*11.0*		
Gurzufskiy Council				*11.0*			
Gurzuf					9.3		
Krasnokamianka							1.0
Danilovka							0.5
Lininye							0.1
Partizanskye							0.1
Koreizkiy Council						*6.4*	
Livadiskiy Council						*4.6*	
Livadia							1.6
Vinogradnye							1.3
Kurpati							0.4
Oreanda							0.9
Vissokoguirnye							0.1
Guirnye							0.1
Kuibichevye							0.1
Okhotnitche							0.1
Massandrivskiy C.						*11.8*	
Massandra							7.7
Vidradnye							0.6
Voskhod							0.5
Nikita							2.4
Sovietskye							0.6
Cimeizkiy Council						*6.8*	
Cimeiz							4.0
Beregovye							0.5
Goluba Zatoka							0.4
Katsiveli							0.6
Parkovye							0.5
Ponizibka							0.4
Opolznevye							0.4
Foroskiy Council						*2.6*	
Foros							2.0
Sanatornye							0.5
Oliva							0.1
Rayons							
Bahchysaraiskiy	**90.7**						
Bilohisrkiy	**64.8**						
Dzhankoiskiy	**78.9**						
Kirovskiy	**55.8**						
Krasnohvardiyskiy	**91.7**						
Krasnoperekopskiy	**30.8**						
Leninskiy	**66.3**						

Population (x1000)	Districts	Cities	Cities	Municipal districts	Urban settlements	Village councils	Rural settlements
Nyzhniohirskiy	**53.5**						
Pervomayskiy	**38.2**						
Rozdolnenskiy	**35.7**						
Sakskiy	**78.5**						
Simferopolskiy	**149.8**						
Sovetskiy	**35.3**						
Chornomorskiy	**32.6**						