Remediation of waste dumps and solid domestic waste (SDW) landfills in Russia

Vladivostok, the Cape of Gornostay, the remediation of a SDW landfill, 2012

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Waste generation and utilization

- ✓ 85 billion tons of solid industrial and domestic waste has accumulated in the territory of Russia
- ✓ Every year in Russia the following types of waste are generated:

Industrial waste – over 3 billion tons

Solid domestic waste – over 40 million tons

Construction waste – tens of millions of tons

- ✓ Annual increase of unused solid waste – 2-2.5 billion of tons
- ✓ The main feature of landfills in Russia is the joint storage of different types of waste
- ✓ The recycling rate for waste in Russia is less than 10%, whereas in highly developed counties 65% of waste is recycled and reused.

Waste disposal facilities

According to the data of the Federal Supervisory Natural Resources Management Service (Rosprirodnadzor), 23963 waste disposal sites have been registered in Russia, among them:

2620 SDW landfills

10150 sites for the disposal of industrial waste

11193 unauthorized dumps

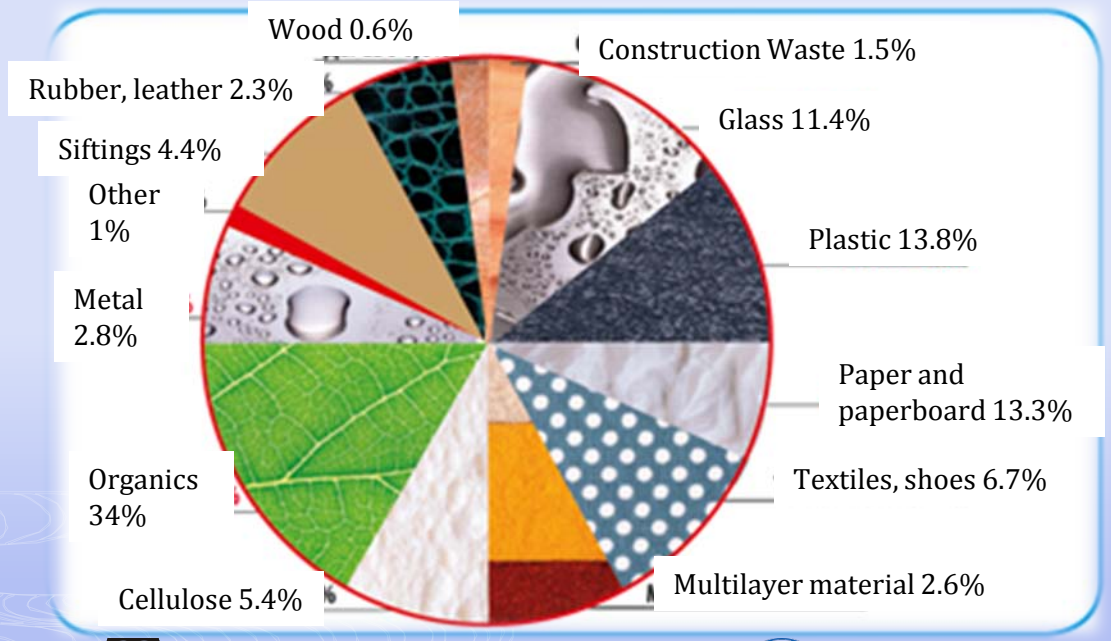
Less than 8% of waste disposal sites meet the established requirements

Waste Management Regulations

- ✓ Federal law of the Russian Federation No. 89-FZ of June 24, 1998 “On Production and Consumption Waste” (as amended on 4th January 2001)
- ✓ Federal law of the Russian Federation No. 7-FZof January 10, 2002 “On Environmental Protection.
- ✓ Decree of the Russian Government No. 155 of February 10, 1997 “On Approval of Rules of Service for Removal of Solid and Liquid Waste
- ✓ Decree of the Russian Government No. 545 of August 03, 1992 “On Approval of the Procedure for Development and Approval of Environmental Standards Governing Emissions and Discharges of Pollutants into the Environment, and Limits on Use of Natural Resources, and Waste Disposal”
- ✓ Decree of the Russian Government No. 766 of July 01, 1996 “On State Regulation and Control of Transboundary Movements of Hazardous Wastes”
- ✓ Decree of the Russian Government No. 461 of June 16, 2000 “
- ✓ Постановление Правительства Российской Федерации от 16 июня 2000 года № 461 “On the Procedure for Development of Waste Generation Standards and Waste Disposal limits”
- ✓ Order of the State Committee on the Environment Protection of the Russian Federation No. 527 of November 27, 1997 "On the Federal Classification Catalogue of Wastes“
- ✓ Decree of the Russian Government No. 818 of October 26, 2000 "On the Order of the State Cadastre of Wastes and Certification of Hazardous Wastes”
- ✓ Order No. 511 of June 15, 2001, issued by the RF Ministry of Natural Resources, “Reference criteria of dangerous waste products according to danger class for environment”
- ✓ Order No. 785 of December 02, 2002, issued by the RF Ministry of Natural Resources , “On Approval of Hazardous Waste Certificate “
- ✓ Form of Federal State Statistical Observation No. 2-TP (Waste) "Information about Generation, Transportation, Use, and Disposal of Toxic Production And Consumption Waste” (established by the decree of Federal State Statistics Service No. 95 of September 11, 1998)
- ✓ Order No. 786 of December 02, 2002, issued by the RF Ministry of Natural Resources, “On Approval of the Federal Classification Catalogue of Wastes

Solid Waste Composition

- ✓ Construction waste, metallurgy slags, waste of fuel and energy companies;
- ✓ Domestic waste and waste combustion products; removed rock mass, including mass contaminated with oil products, radioactive elements and toxic substances
- ✓ Industrial and agricultural waste



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Production and Consumption Waste

- ✓ Production and Consumption Wastes are residuals of raw materials, intermediate and final products generated during the production and consumption. Wastes also include goods (products) that have lost their consumer attributes (Article 1 of the Federal Law of the Russian Federation No. 89-FZ of June 24, 1998 “On Production and Consumption Waste”)

- ✓ In conformity with the reference criteria of dangerous waste products according to hazard class for environment, approved by Order 511 of June 15, 2001, wastes are divided into 5 classes, depending on their possible adverse effect on the environment, as follows:

  extremely hazardous (Class I), highly hazardous (Class II), moderately hazardous (Class III), low hazardous (Class IV), virtually inert (Class V).

Classification of wastes by their possible adverse effect on the environment in accordance with Order No. 511 of June 15, 2001, issued by the RF Ministry of Natural Resources

No.	The degree of impact on the environment	The reference criteria of dangerous waste products according to hazard class for environment	Hazard Class
1	EXTREMELY HIGH	An ecosystem affected by the waste has been irreversibly damaged. Self-recovery of the ecosystem is not possible.	Class I EXTREMELY HAZARDOUS
2	HIGH	An ecosystem affected by the waste has been severely disturbed. Self-recovery of the ecosystem is to take over 30 years after the complete elimination of the impact source.	Class II HIGHLY HAZARDOUS
3	MEDIUM	An ecosystem affected by the waste has been disturbed. Self-recovery of the ecosystem is to take over 10 years after the decrease of the influence of the existing source.	Class III MODERATELY HAZARDOUS
4	LOW	An ecosystem affected by the waste has been disturbed. Self-recovery of the ecosystem is to take over 3 years.	Class IV LOW HAZARDOUS
5	VERY LOW	An ecosystem affected by the waste has been virtually disturbed.	Class V VIRTUALLY INERT

Landfill site selection

Landfill site selection is conducted on the base of the following surveys:

- ✓ **Engineering and Geological survey**
- ✓ **Engineering and Geodesic survey**
- ✓ **Engineering and Hydrometeorological survey**
- ✓ **Engineering and Ecological survey**

Requirements for landfills (in accordance with Guidelines for SDW landfill design, operation and remediation, 1996)

It is not allowed to place a landfill:

- ✓ **in the sanitary protection zones of water sources and mineral springs**
- ✓ **in the protection zones of resorts**
- ✓ **in the area where fractured rocks crop out**
- ✓ **in the area where aquifers crop out**
- ✓ **in recreational areas and the territory of health institutes**

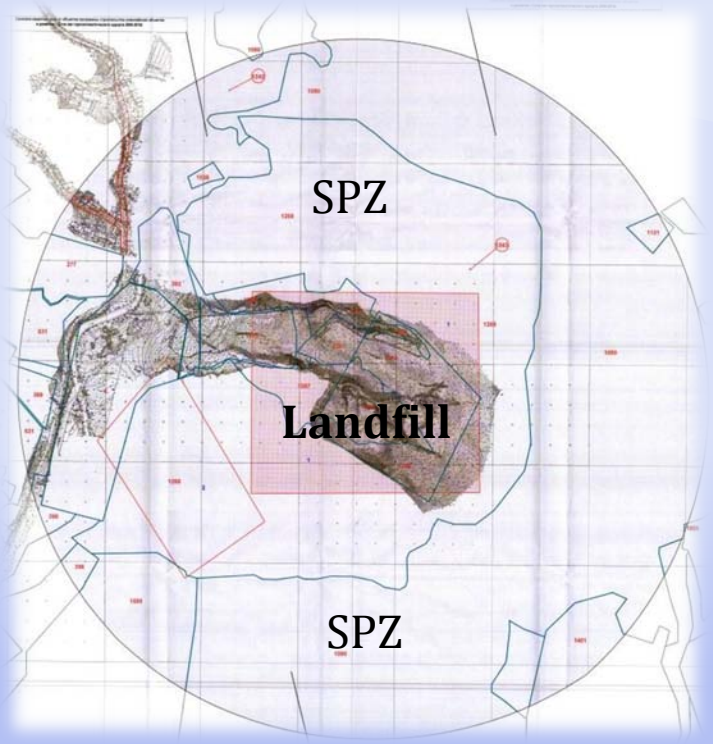
Sanitary protection zone of landfills

Sanitary protection zone (SPZ) is a territory of limited use and is aimed at reduction of adverse impact (chemical, biological and physical) to the levels set by hygienic standards

According to SanPiN (Sanitary and Epidemiological Rules and Regulations) 2.2.1/2.1.1.1200-03, the size of a sanitary protection zone for enhanced landfills is established as 1000 m;

According to Guidelines for SDW landfill design, operation and remediation, the size of a sanitary protection zone for SDW landfills is established as 500 m

The size of a sanitary protection zone for waste incineration plants and waste treatment plants is established as 500 m



Landfill remediation

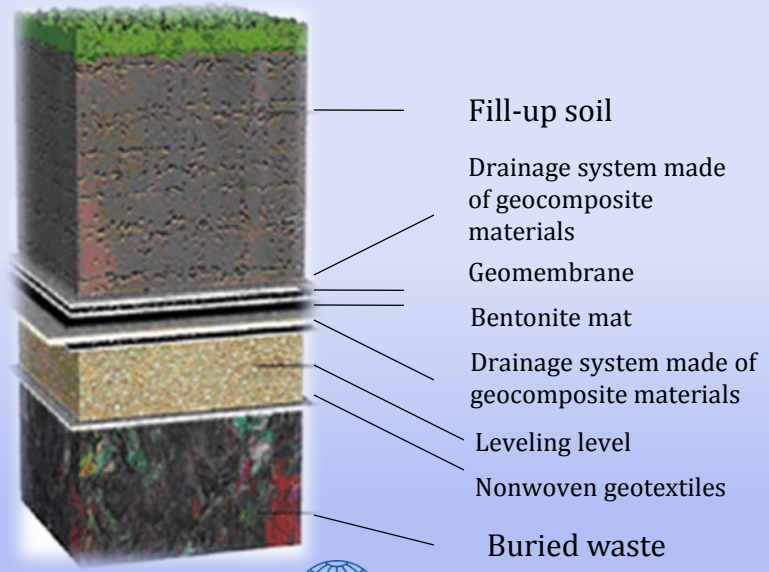
Landfill remediation process is carried out in two stages:

- ✓ **Technical stage**
- ✓ **Biological stage**

Landfill remediation process includes a set of environmental protection and engineering activities.

The most appropriate directions for the remediated land use are as follows:

1. **Forestry**
2. **Recreation**
3. **Agriculture**
4. **Construction**



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Specifics of landfill remediation in Russia

In the Russian Federation environmental requirements for landfill remediation apart from ones mentioned above are not available.

Decisions on a landfill treatment and technical ways of land remediation are made on the basis of general engineering and ecological principles and include the following stages:

- ✓ determination of a hazard level of a landfill
- ✓ evaluation of alternatives
- ✓ development of treatment and remediation techniques

Technical remediation methods can be divided into three groups:

- ✓ excavation, transfer and disposal of the contents of a dump in a licensed landfill
- ✓ destruction of the contents of a landfill on-site (e.g. burning)
- ✓ sealing of a landfill

TehnoTerra LLC activities
Our Capacity

We are capable to carry out all kinds of design and survey work, which is provided by:

- ✓ **Necessary equipment**
- ✓ **Work experience**
- ✓ **Certificates of authorization, licenses, accreditation testimonials of the laboratories**

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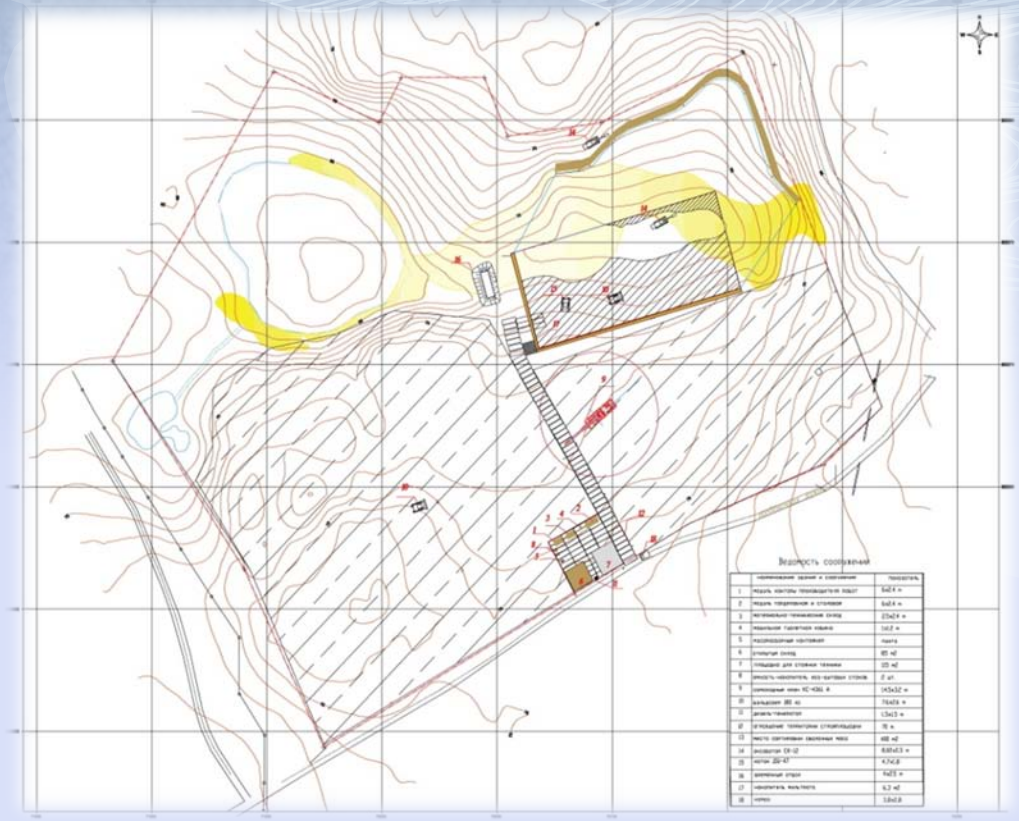
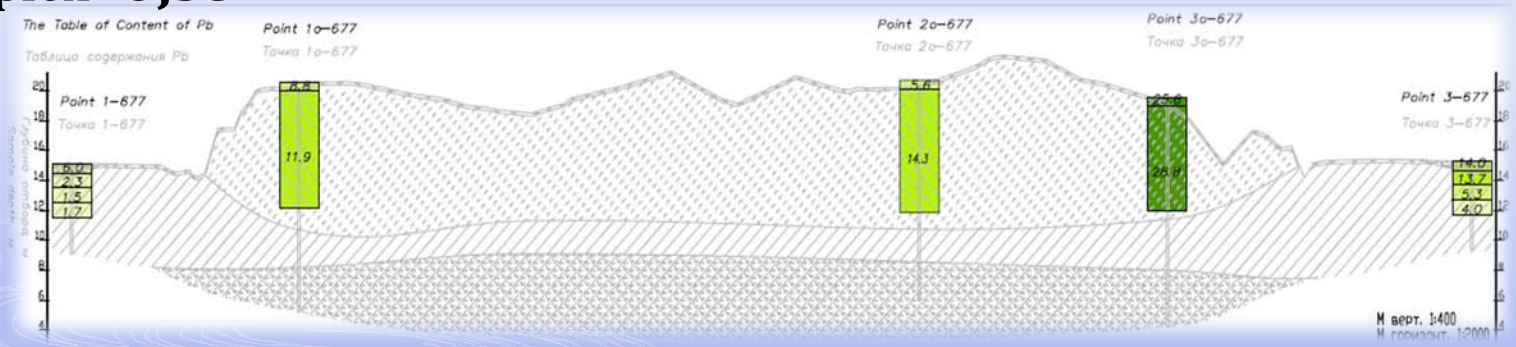
Our Clients

- ✓ The Baltic Marine Environment Protection Commission, a.k.a. Helsinki Commission (HELCOM)
- ✓ Committee for Nature Use, Environmental Protection and Ecological Safety, Government of St. Petersburg
- ✓ Administration of Taimyr Dolgano-Nenetskiy municipal district
- ✓ Administration of Tikhvin region
- ✓ “MosvodocanalNIIproekt” OJSC.
- ✓ “Sochi waste processing complex” OJSC





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TehnoTerra LLC work experience

Our company has more than 5 years of experience in design and survey works. During this period we have designed and successfully implemented dozens of projects related to waste management. The main ones are as follows:

- ✓ Former landfill of Kozitsin plant. Emergency work to prevent the inflow of material, located in the coastal zone of the Gulf of Finland, into water.
- ✓ Construction of a SDW landfill on Dixon Island
- ✓ Construction of a SDW landfill in the town of Dudinka
- ✓ Remediation of a landfill for construction and bulky waste in the town of Dudinka
- ✓ Reconstruction of a SDW landfill in Tikhvin region
- ✓ Waste sorting plant and a SDW landfill on the interfluve between the Buu and the Khobdzy rivers, Sochi. Ecological survey. Design of project documentation (the List of measures for environmental protection, Sanitary Protection Zone project, Health risk assessment, modelling of dangerous hydrogeological processes).
- ✓ A full range of design and survey work for remediation of a landfill, located near the River Kamenka
- ✓ Investigation of pollution and design of remediation project for unauthorized landfill Ust-Tosta (Saint-Petersburg and Leningrad region).

*In a consortium with FCG “Finnish Consulting Group”

Former landfill of Kozitsin plant. Emergency work to prevent the inflow of material, located in the coastal zone of the Gulf of Finland, into water

Before remediation

After remediation

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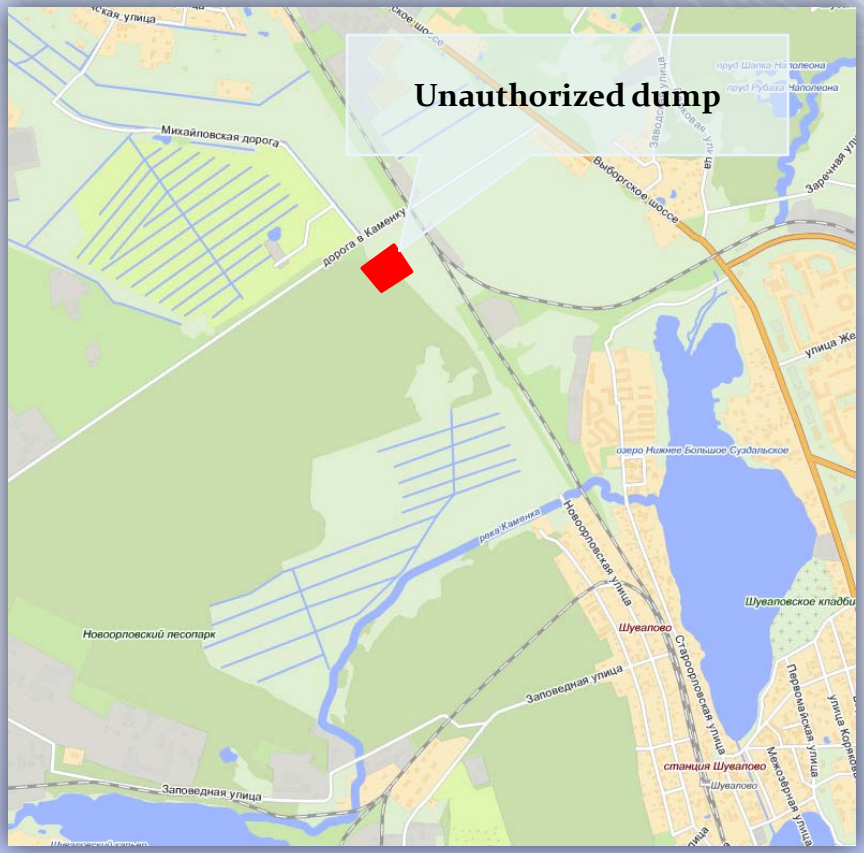
Remediation of an unauthorized dump in Primorsky district of Saint-Petersburg
Joint project of TehnoTerra LLC and the Committee for Nature Use, Environmental Protection and Ecological Safety, Government of St. Petersburg

- ✓ **The dump is located in 83 quarter of Pesochinsky forestry, close to the crossing of the road to the Kamenka River and Mikhailovskaya Road, in Primorsky district of Saint-Petersburg**
- ✓ **The dump has functioned since 2007 - 2008**
- ✓ **Construction and domestic wastes have been disposed**
- ✓ **The occupied area is 5 hectares**



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Performed investigations

Within the project the following investigations were carried out:

- ✓ **Radiological environmental studies and assessment**
- ✓ **Investigation of soil**
- ✓ **Investigation of waste**
- ✓ **Investigation of surface and ground water**
- ✓ **Investigation of the landfill filtrate**
- ✓ **Investigation of bottom deposits**
- ✓ **Landfill gas investigation**
- ✓ **Investigation of athmospheric air**

Waste composition:

- soil
- wood
- brick rubble
- rubber
- polyethylene
- tar
- asphalt chips

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Selecting remediation techniques

Remediation technique	Environmental aspect	Economical aspect	Time aspect	Technologic aspect	The sum of points
Removal of all amount of the waste	3	1	1	1	6
Partial removal of the waste and further creating of an artificial insulating screen	2	2	2	2	8
Removal of bulky waste, recycling of tyres, and creating of an artificial insulating screen on the dump surface	1	3	3	3	10

1 – minimum benefit
2 – intermediate benefit
3 – maximum benefit

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Remediation project of an unauthorized landfill “Ust-Tosna”
Joint project of TehnoTerra LLC and FCG

- ✓ Tosno district of Leningrad region
- ✓ Started in 1970-1980s
- ✓ Industrial, construction and agricultural wastes were stored
- ✓ Occupied area - 10.3 hectares

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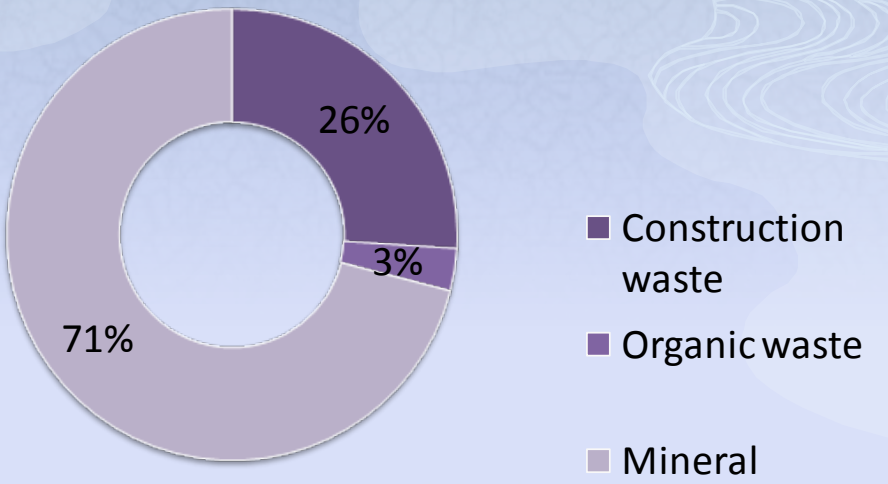
Performed engineering survey

Engineering and ecological surveys:

- ✓ Radiological environmental studies and assessment
- ✓ Geo-ecological sampling of soil of surrounding area
- ✓ Study of wastes
- ✓ Geo-ecological sampling of surface water
- ✓ Geo-ecological sampling of filtrate
- ✓ Geo-ecological sampling of ground water
- ✓ Geo-ecological sampling of bottom deposits from the rivers
- ✓ Landfill gas investigation
- ✓ Geo-ecological sampling of atmospheric air

WASTE COMPOSITION



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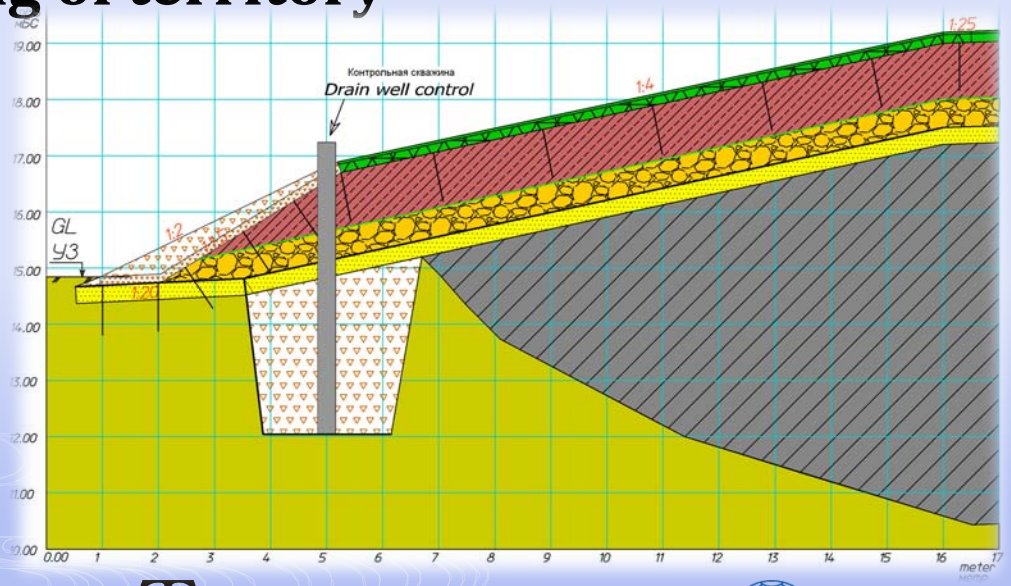
Technological decisions

- ✓ Leveling of the surface and creation of slopes for natural diversion of surface discharge
- ✓ Waterproofing of dump masses to prevent unorganized contact of atmospheric precipitation with contaminated geotechnical mass
- ✓ Creation of a check system to reveal the presence of filtrate and to determine its characteristics
- ✓ Creation of dump mass ventilation system
- ✓ Landscaping of territory



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Comparison of landfill remediation approaches in European countries and Russia

Based on the experience of collaboration with the Finnish company FCG – Finnish Consulting Group

EU	RUSSIA
Technological and environmental criteria are of primary importance. (Planting trees on the remediated territory is undesirable because of the possible damage of a waterproof screen by the roots)	It is obligatory to follow the requirements of the regulations and standards and to take into account the economical aspect (Planting trees is necessary because the remediated territory is included in the lands of the forest fund)
There is a broad legislative framework in the area of remediation of unauthorized dumps.	Regulation instruments focus on licensed SDW landfills.
Special attention to waste disposal sites.	

Thank you for your attention

Always ready to cooperate !!!

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