



Graduate qualification paper:
**«Recultivation of Landfills in the Existing Plan Structure of
the Novosibirsk Agglomeration»**

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Introduction to the study

PURPOSE OF RESEARCH IS : To analyze Russian and foreign experience. Develop recommendations for improving the reclamation of landfill areas. Elimination of this problems.



THE OBJECT OF RESEARCH IS : landfills

THE SUBJECT OF RESEARCH IS : reclamation of landfills, waste collection, treatment and storage system of waste.

STRUCTURE OF THE DISSERTATION

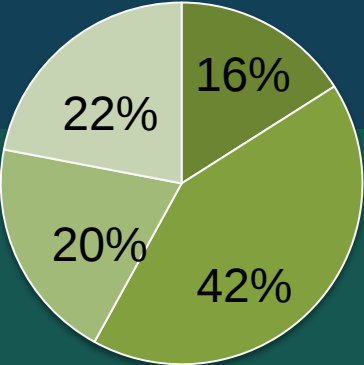
RESEARCH 3 Chapters, each of which consists of subsections. The first Chapter is the experience of different countries and existing methods of reclamation. The second Chapter – a detailed analysis of the two main methods (thermal and biological remediation), the characteristics of the study area. The third Chapter – the landfill of municipal solid wastes the "Gusinobrodsky" and calculations.

The existing collection system and the dynamics of municipal landfill growth demonstrates the absence of an effective municipal solid waste management system.

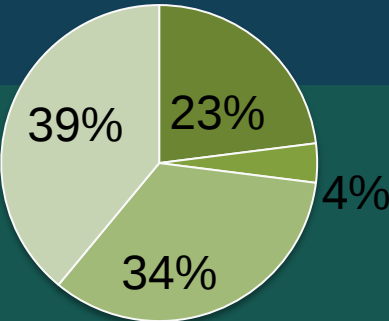


Waste management is one of the most important and complex problems, the solution of which is necessary for the reduction of the environmental risk in the Novosibirsk agglomeration. The amount of accumulated waste within the existing boundaries of the landfill has reached critical levels. Hence there appeared the need to remove the waste, to assist with the territory rehabilitation and to improve the quality of municipal solid waste recycling.

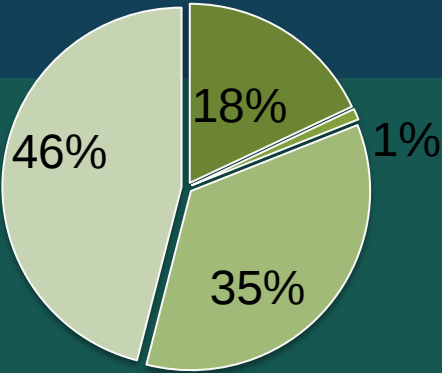
European Union



Belgium



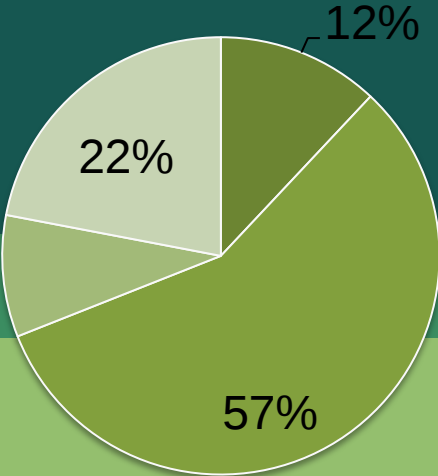
Germany



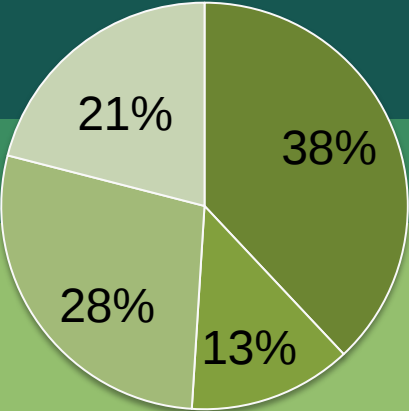
- burning
- compostable
- recycling
- burial at the landfill



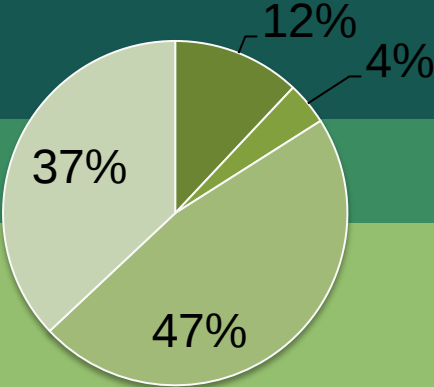
Britain



Austria



Sweden





Biological



Thermal



Creation of recreational areas



Compostable



Recycling



Phytoremediation



Disposal by plasma chemical reactors



Disposal with grate

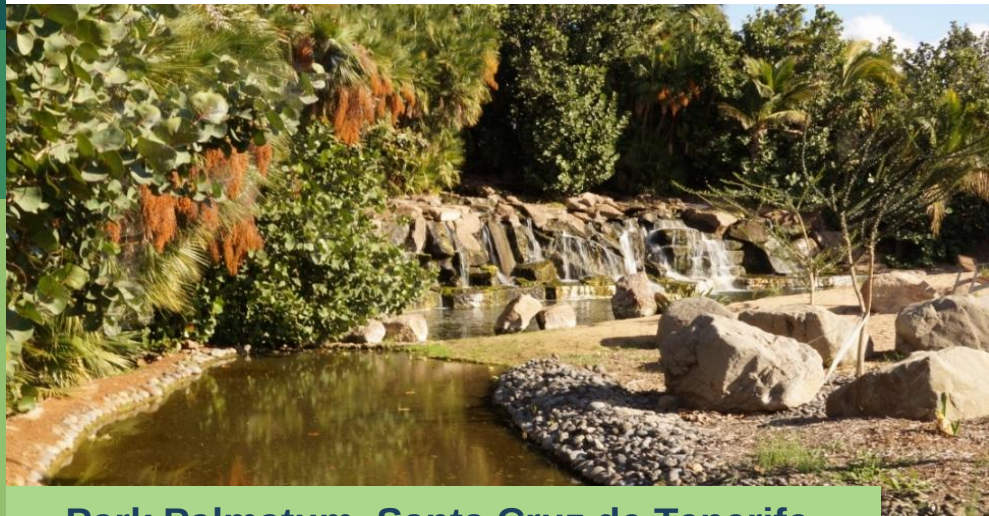
Biological remediation is the most careful and safe method of remediation, however, it is inferior in economic terms to thermal. The relatively expensive cost of building materials pays off badly in further operation.



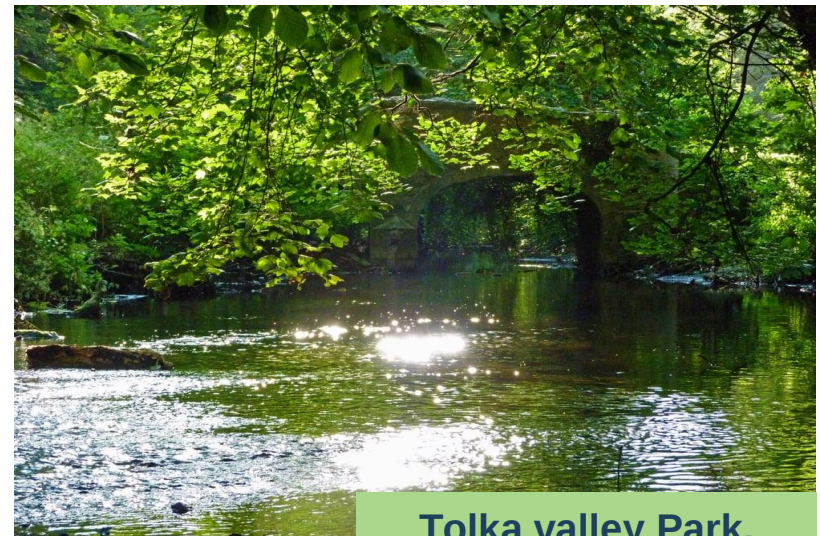
Freshkills Park, Staten island, New York



Ariel Sharon Park, Tel Aviv, Israel



**Park Palmatum, Santa Cruz de Tenerife,
Canary Islands**



**Tolka valley Park,
Dublin, Ireland**

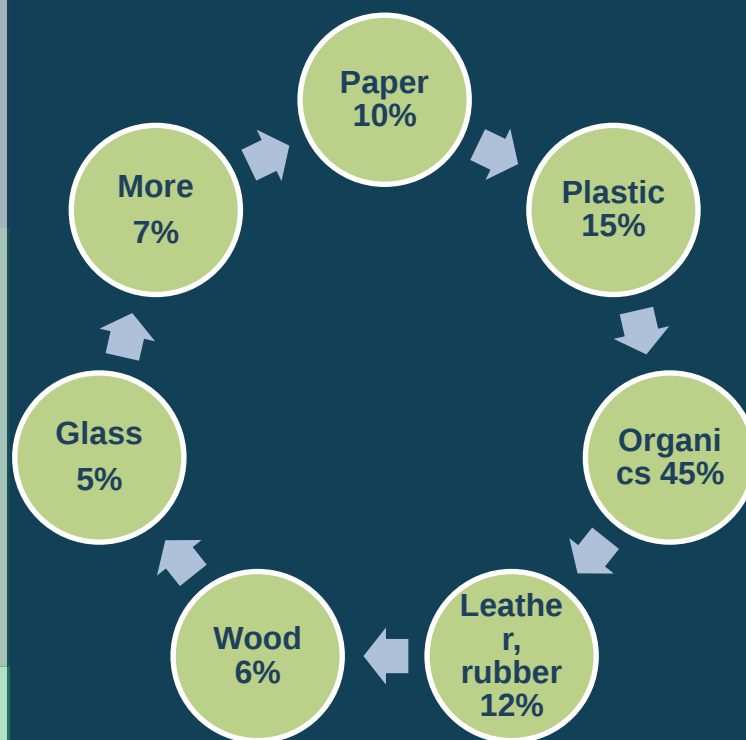


waste incineration plant , Osaka, Japan (Maishima incineration plant, Osaka) 1997-2000

Application of waste products

The main consumer of waste combustion products is the construction market.

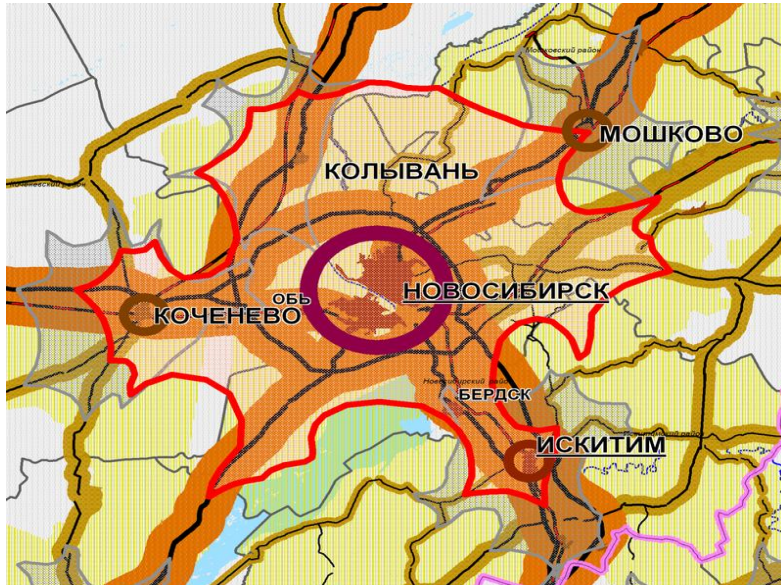




The entire mass of waste emitted daily by the population consists of 25% of food waste, 10% - paper, 50% - polymers, the rest is accounted for textiles, metal, glass and rubber. Performing this work, it is possible to assess the prospects of the project for waste disposal, reduce the environmental burden, improve the sanitary situation, comprehensively solve this problem

«+»	«-»
1. Increasing amount of waste. 2. Constantly growing demand for secondary products. 3. Introduction of modern technologies and equipment	1. Limited opportunities for financing from own funds

In accordance with the instruction of the President of the Russian Federation, following the meeting of the State Council of the Russian Federation held on 21.07.2006, the concept Of long-term socio-economic development of the Russian Federation for the period up to 2020 was developed. It allowed to form the purpose of ecological policy – improvement of quality of the natural environment and ecological conditions of life of the person.

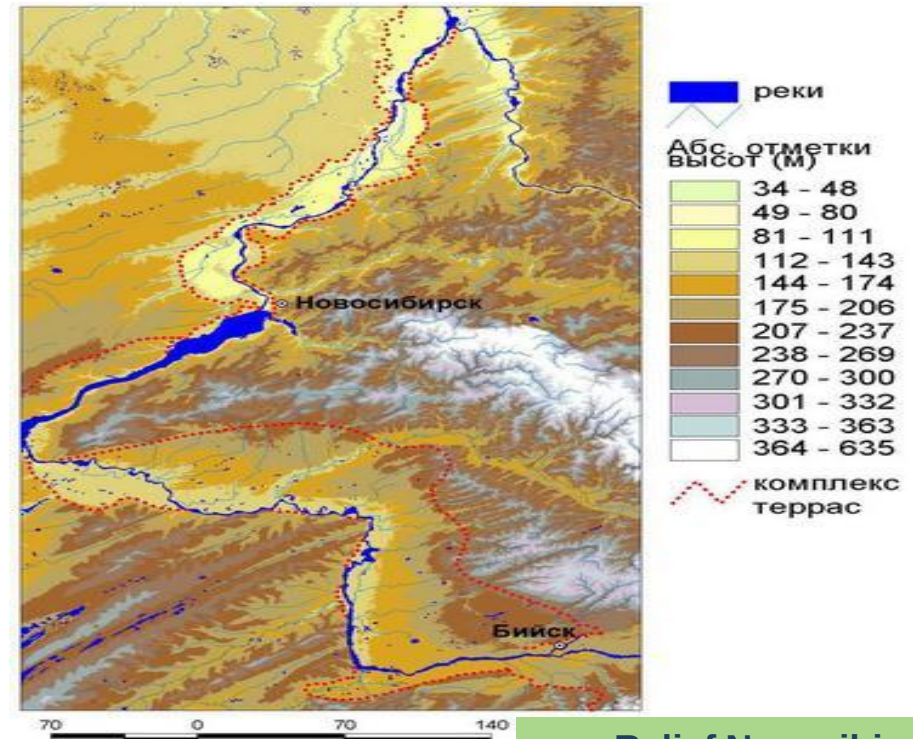


Scheme of the planning of the Novosibirsk agglomeration



The study area is located in the center of the Novosibirsk agglomeration and the Siberian Federal district – Novosibirsk. It is a part of the West Siberian lowland.

The largest urban agglomeration in Siberia with a population of more than 2 million people (at the time of the 2017 census), which is more than two thirds of the population of the Novosibirsk region, more than 10 % of the population of the Siberian Federal district and 1.4 % of the population of the Russian Federation.



Relief Novosibirsk

POLLUTANT	TREATMENT METHOD
Nutrients: N, P	Settling, biodegradation, precipitation, denitrification
Sediments: Suspended solids	Settling, filtration
Hydrocarbons	Biodegradation, photolysis, filtration, adsorption
Heavy metals: lead, copper, cadmium, mercury, zinc, chromium, aluminium	Settling, adsorption, filtration, precipitation, plant uptake
Pesticides	Biodegradation, adsorption, evaporation
Chlorides	Prevention
Cyanides	Evaporation, photolysis
Waste	Removal, regular cleanup and maintenance of urban areas

Professors of the University of Belgrade conducted an analysis of wastewater. The main problems associated with the accumulation and flushing products from urban surfaces is the impact of urban wastewater pollution on the environment.

The primary task in biological remediation is to prevent water contamination.

An example of wastewater treatment is the development and lectures given by professors of the University of Belgrade.



As urbanization increases, the proportion of impenetrable surfaces increases. Urbanization also affects the quality of runoff:

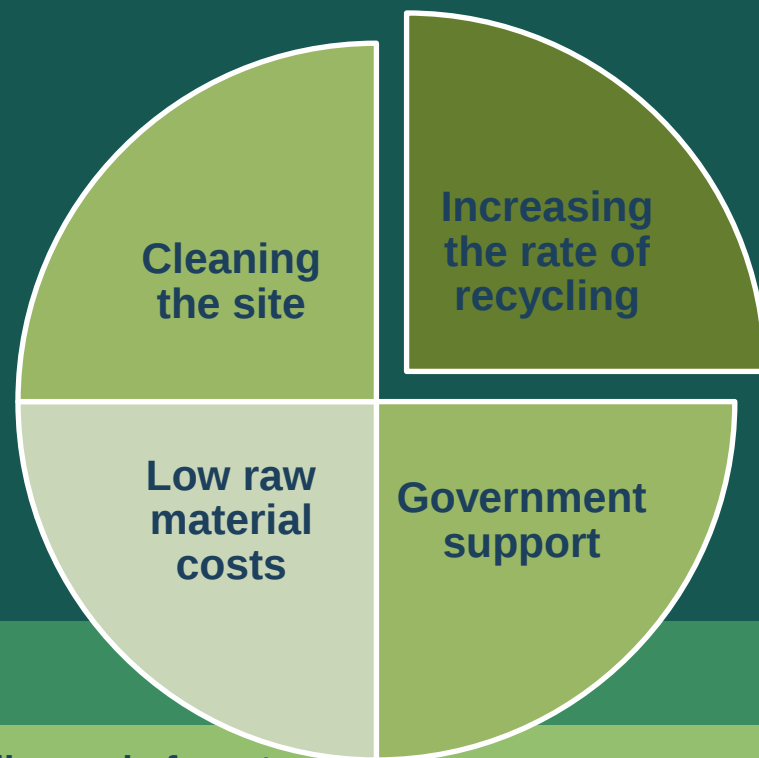
- combustion product,
- materials resulting from wear of vehicle parts,
- industrial pollution products are deposited from the atmosphere on urban surfaces.

Risks



The existing system of solid waste management in Novosibirsk requires further improvement.

Design volumes of municipal solid waste landfills are almost exhausted, which necessitates the implementation of remediation works, taking into account their condition.



Landfills for a long time will remain in Russia the main method of disposal of waste. To date, 93% of the generated waste is exported to landfills. The main task - the arrangement of existing landfills, extending their service life, reducing their harmful effects on the environment.

Opportunities



Category 1. Clean soil-pollution concentration below the threshold. The soil can grow crops.

Category 2. The concentration of contaminants below the threshold level. The soil can be used for agricultural or recreational purposes.

Category 3. The concentration of contaminants is below the threshold, however, the concentration in drainage solutions exceeds the threshold level Soil can be used to limit access.

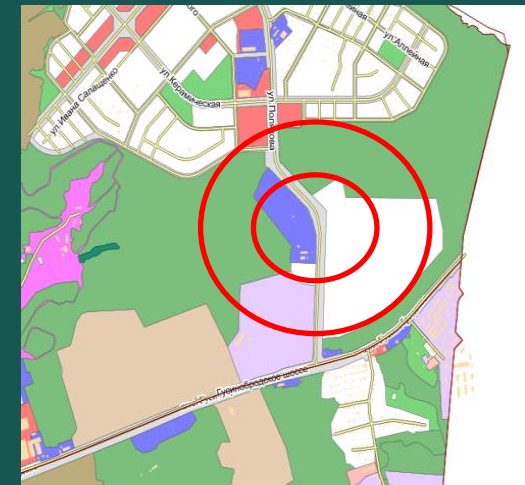
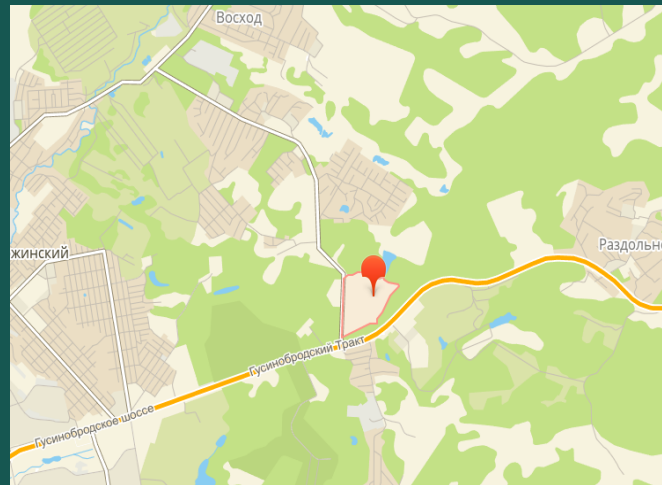
Category 4. The concentration of pollution threshold level, but does not exceed the level of toxicity. Access to the site is limited.

Category 5. The pollution concentration is above the threshold and exceeds the toxicity level.

The subject of the study is Gusinobrodsky landfill, which is located in Dzerzhinsky district of Novosibirsk. The landfill consists of two sites, the total area of which is about 49 hectares.

The landfill accepts municipal solid waste from 1.5 thousand apartment houses and 31.2 thousand individual residential houses of the right bank, with the exception of the houses of the Kalinin district. 95% of rubbish reaching the landfill Gusinobrodskoe, is brought by private companies.

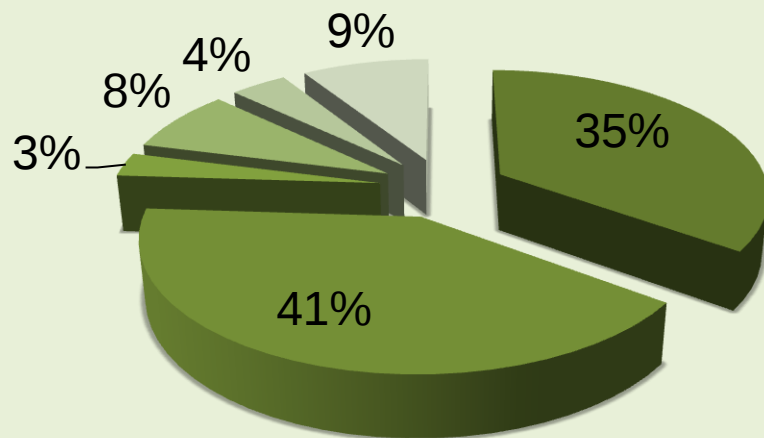
In 2016, 1.78 million cubic meters of waste were sent to the landfill — 45% of all waste received at the landfills of the city.



- Location coordinates: 55.052950286873 83.073091227078
- Operating organization: Novosibirsk "Spetsavtokhozyaystvo".
- Operates since 1962.

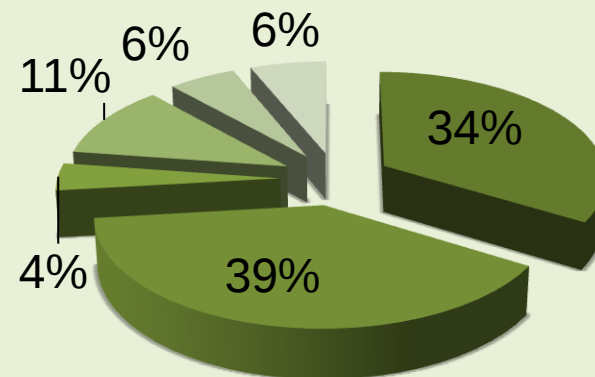
According to the morphological composition of the landfill by mathematical calculation revealed how much reduced the amount of garbage for each year during the first five years.

1 year of operation



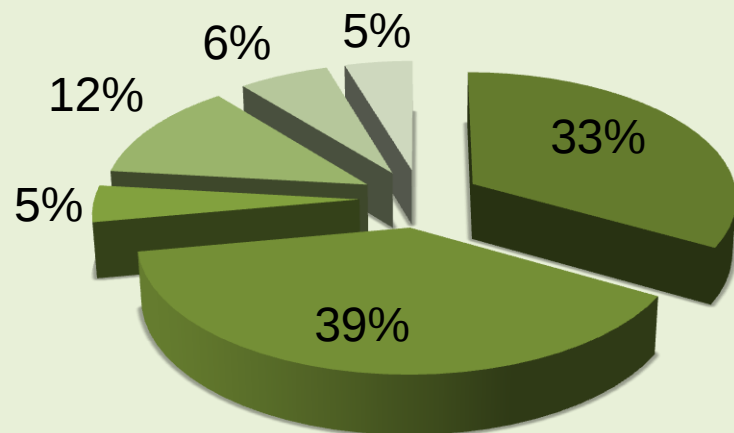
■ Paper
■ Plastics
■ Metals

2 year of operation

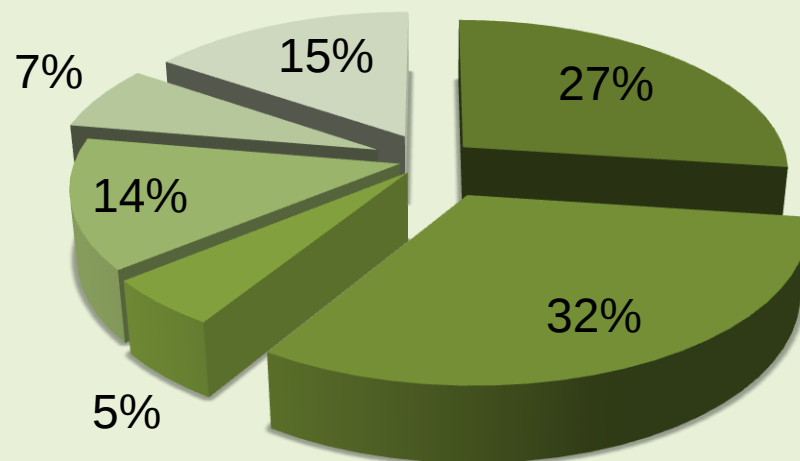


■ Food waste
■ Glass
■ Текстиль

3 year of operation



5 year of operation

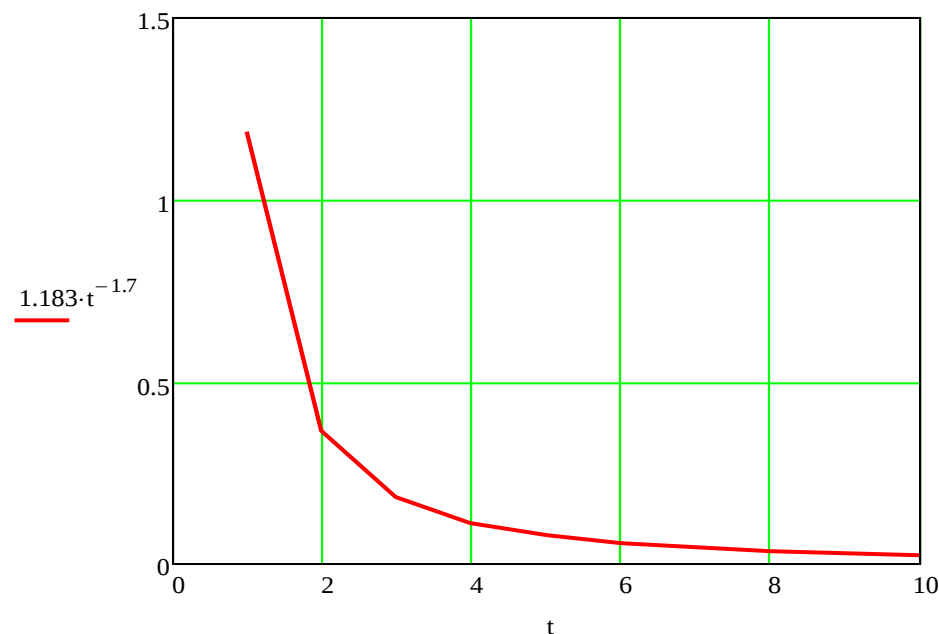


According to the results of the presented calculations, the final table precipitation table is formed

	Volume, м³		The decomposition, month	Slump, м
	1 год	5 лет		
Paper	623000	3115000	3	17,91
Food waste	729800	3649000	1	17,37
Plastics	53400	267000	2280	0,0001
Glass	142400	712000	12000	0,00001
Metals	71200	356000	156	0,0001
Textile	160200	801000	300	0,00001
		8900000		35,28022

The situation, dynamics of the first five years of biological recultivation "Gusinobrodsky" landfill is predicted by the Most perspective method for cleaning of the polluted soils in ecologicalthe plan is a biotechnological approach.

Thus, we obtain the approximate form of a graph of drawdown in all layers of the hill of the landfill



The graph clearly shows the deceleration of the drawdown rate after the first 4 years. This is due to the organic component of waste. The model does not take into account the possibility of uneven drawdown, for example, in the case of a rupture of the covering film

The purpose of considering alternatives in the environmental assessment process is to make the analysis and comparison of results systematic and accessible to stakeholders, and to ensure that environmental criteria are taken into account when selecting the best option. Alternatively, the following options were considered:

- no activity (zero option);
- options for the use of alternative fuels;
- options for technical and technological solutions

The amount of energy produced by the combustion of existing waste, taking into account the sorting

	heat of combustion		percentage of total weight	mass fraction	estimated amount of energy produced by combustion	
	кКал/кг	кДж/кг	%	т	кКал	кДж
Household waste	4650	19700	41	24420778,75	113556621,2	481089341,4
Paper	4150	17600	35	20847006,25	86515075,94	366907310
Fabric scraps, scraps	4200	17800	9	5360658,75	22514766,75	95419725,75
Wood	6250	26500	3	1786886,25	11168039,06	47352485,63
Total:			88		233754502,9	990768862,8

For heating of 1 cubic metre of room volume requires a 147.6 kJ of thermal power.

To heat for 1 hour 80 liters of water to a temperature of 55 degrees, it will take 15379.92 kJ of thermal power.

The average computer power consumption per hour is 1584 kJ.

Characteristic	Technology	Workplaces
22 reactors with the capacity of 1500 tons / day are taken into operation. Capacity: 120,000 tons per year Area: 7 000 square meters Project cost: 1,300 million rubles Industrial and household waste processing 1500 tons per day Production and transmission to consumers of electricity 50 MW / h The construction of the plant pays off for: 2.5 years in the general case, provided that there is a market need for manufactured products (building materials, energy).	Grate: 743076,7 MJ = 206410.2 kW * h Plasma-thermal installations: 972066.12 MJ = 270018.4 kW * h Sulfur production 1.5 tons per day Recovery of metals 150 tons per day Production of vitreous slag for the manufacture of blocks of insulation from mineral wool 300 tons per day The technology adopted for the disposal of waste is incineration on the grate.	The average number of working personnel is from 90 to 105 people per day (30 people / shift). Mode of operation - continuous, non-stop The number of working hours per year is 8760. The number of working hours per year for one production line is 8088 (in a planned stop, the lines are displayed in turn for 2 weeks 2 times a year).



Choose your future

