Global WtERT Congress 2023
Zhejiang University, Hangzhou, China
November 6th - 8th, 2023

ENERGY MANAGEMENT OF MUNICIPAL SOLID WASTE IN THE CONTEXT OF LOW CARBON DEVELOPMENT (CASE STUDY RUSSIA)

Energy utilization

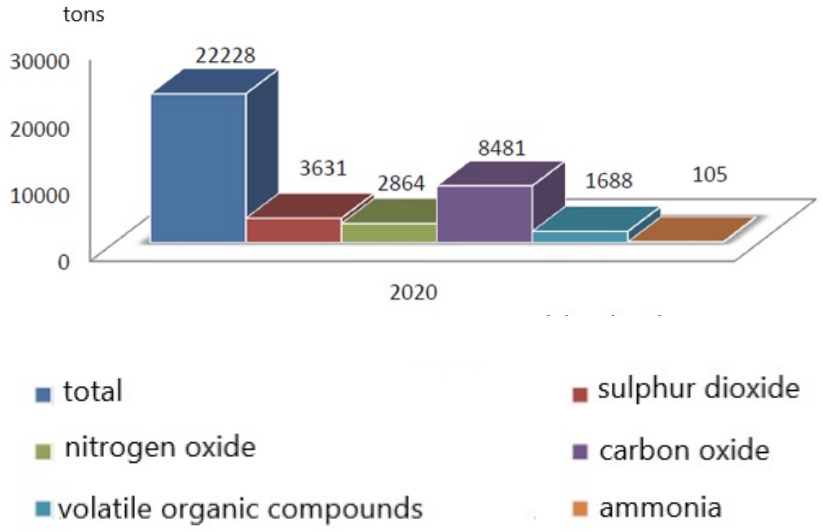
ENERGY–EFFICIENT ECONOMY

Sustainable development

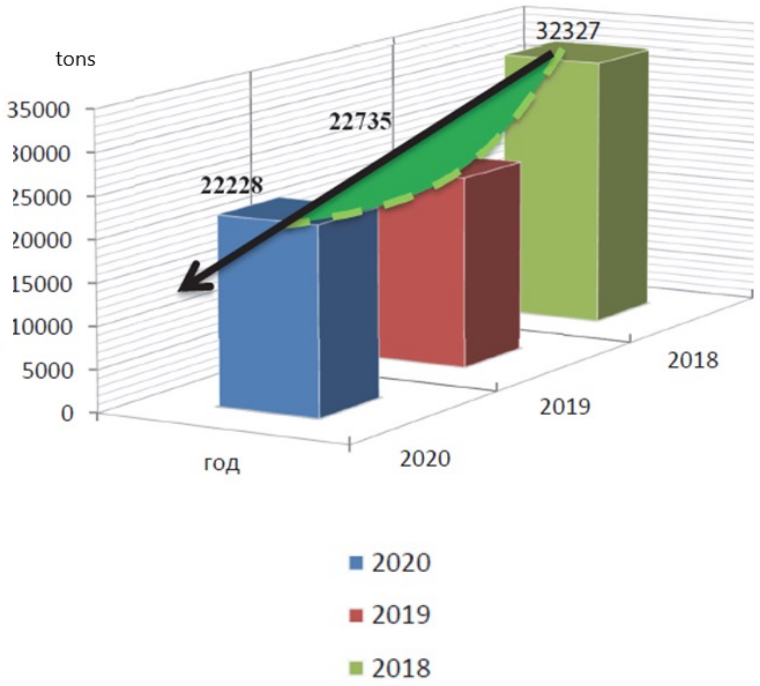
常将有日思无日，莫将无时想有时

ENERGY SECURITY IN RUSSIA

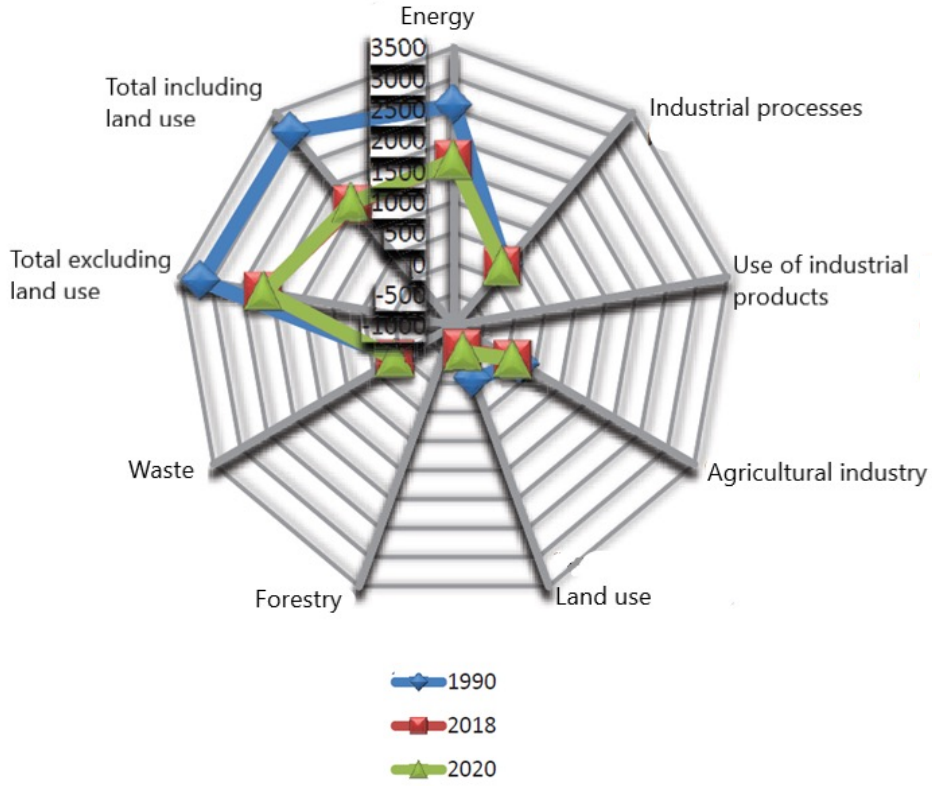
Charts



Emissions of pollutants from mobile and stationary sources piecemeal, tons



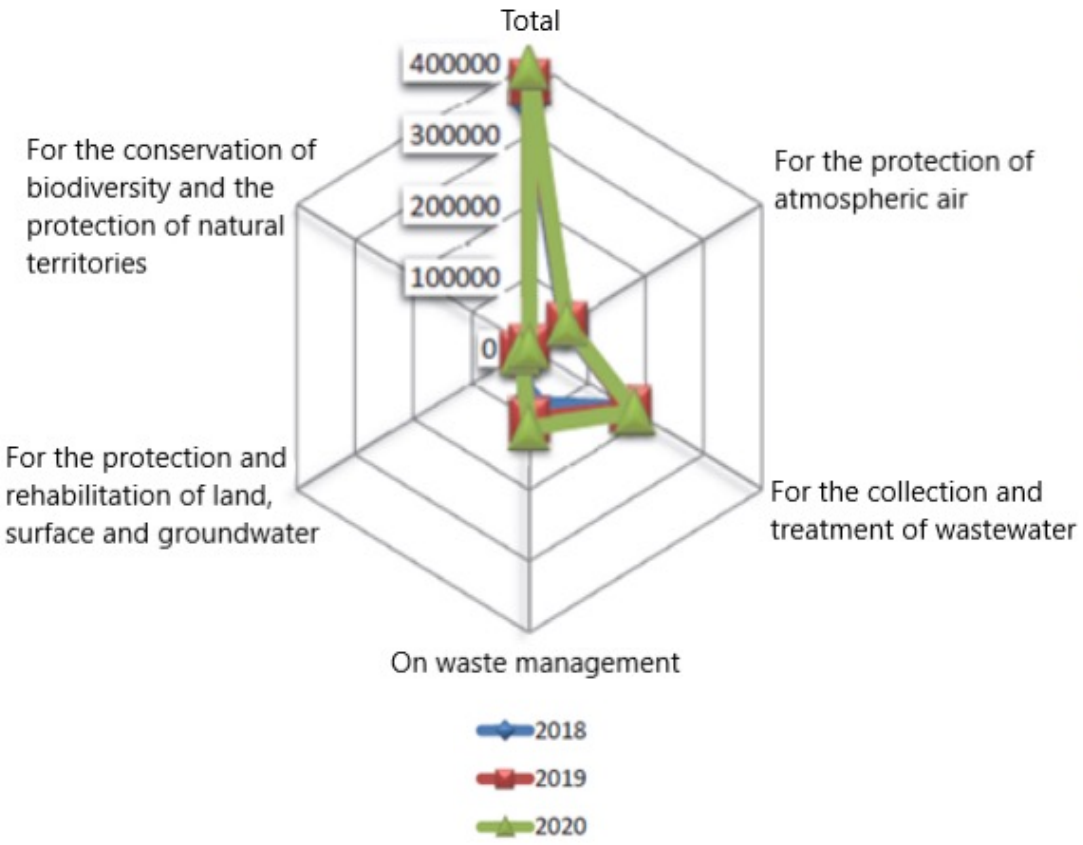
Emissions of pollutants throughout the complex of harmful substances by year, tons

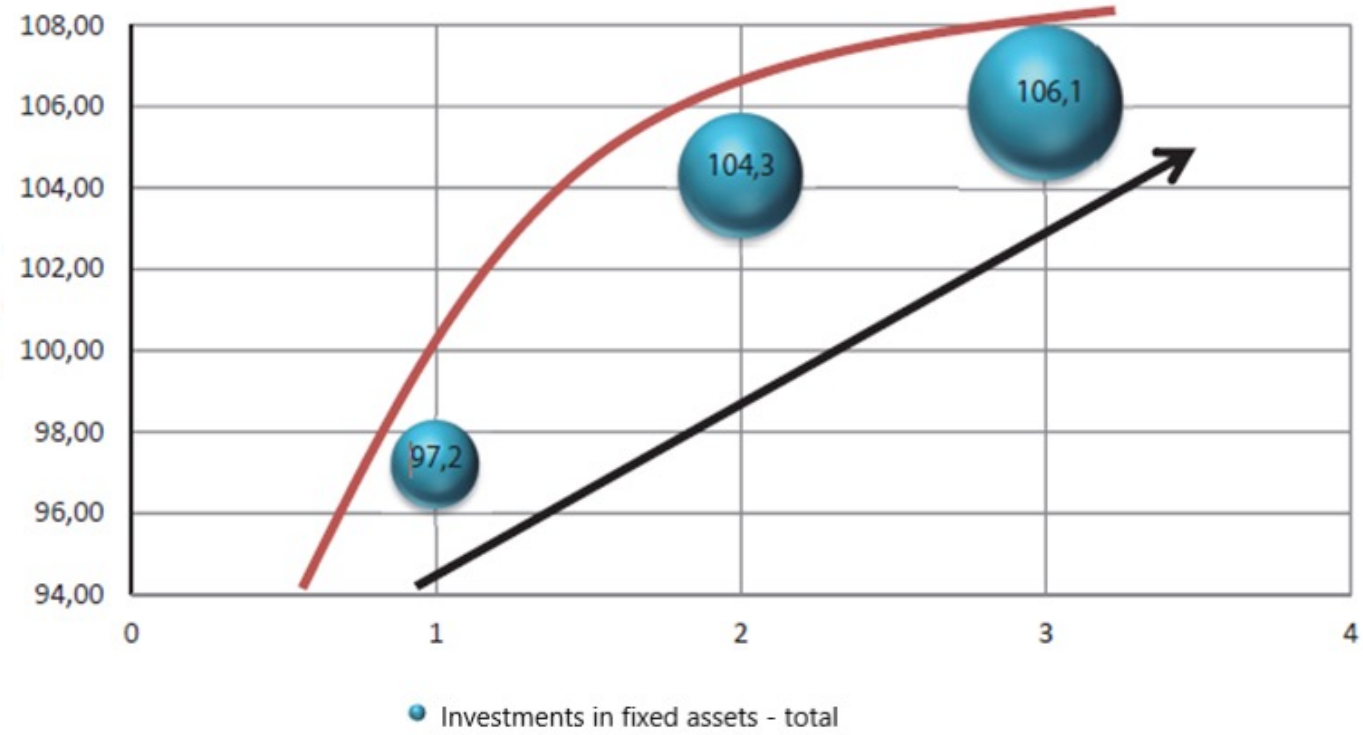


Greenhouse gas emissions by economic sector (million tons of CO2 equivalent per year)

compiled by the author according to Rosstat, 2023

Charts





The actual costs of environmental protection in Russia by year in millions of rubles.

Change in the volume of investments in fixed assets in the direction of environmental protection, by calculation steps (for the zero-step adopted – 2017), as a percentage

compiled by the author according to Rosstat, 2023

Conclusion

Energy

DRIVERS OF ENERGY UTILIZATION GROWTH:

Low-carbon economy

LOW-CARBON ECONOMY IN WASTE MANAGEMENT LEADS TO

1. The number of areas occupied for landfills is being reduced

2. Renewable energy is being generated

Indicators in Russia

In Russia provide for an increase in the share of waste recycling by incineration of non-recyclable waste residue with energy production

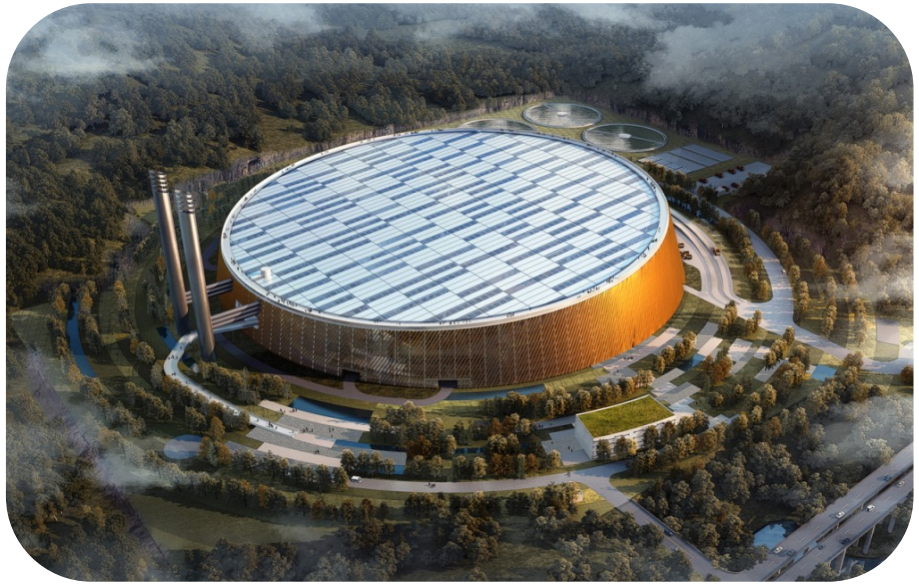
from 2% in 2019 → **to 24% in 2026**

waste will decrease
from **93%** to **36%** in **2026**

Incineration plants

Manager Resource Center, Copenhagen, Denmark

Factory in Krakow, Poland



Shenzhen East Waste-to-Energy Plant, Guangdong, China

Renewable energy source

Comparison

Cities and agglomerations of the world	Applied technologies, %		
	Recycling of waste into secondary raw materialsand composting	Waste-to-Energy	Waste disposal
Moscow Region (Russia)	3	5	92
Lisbon (Portugal)	20	63	13
London (United Kingdom)	34	56	10
Stockholm (Sweden)	35	65	–
Vienna (Austria)	40	60	–
Zurich (Switzerland)	40	60	–

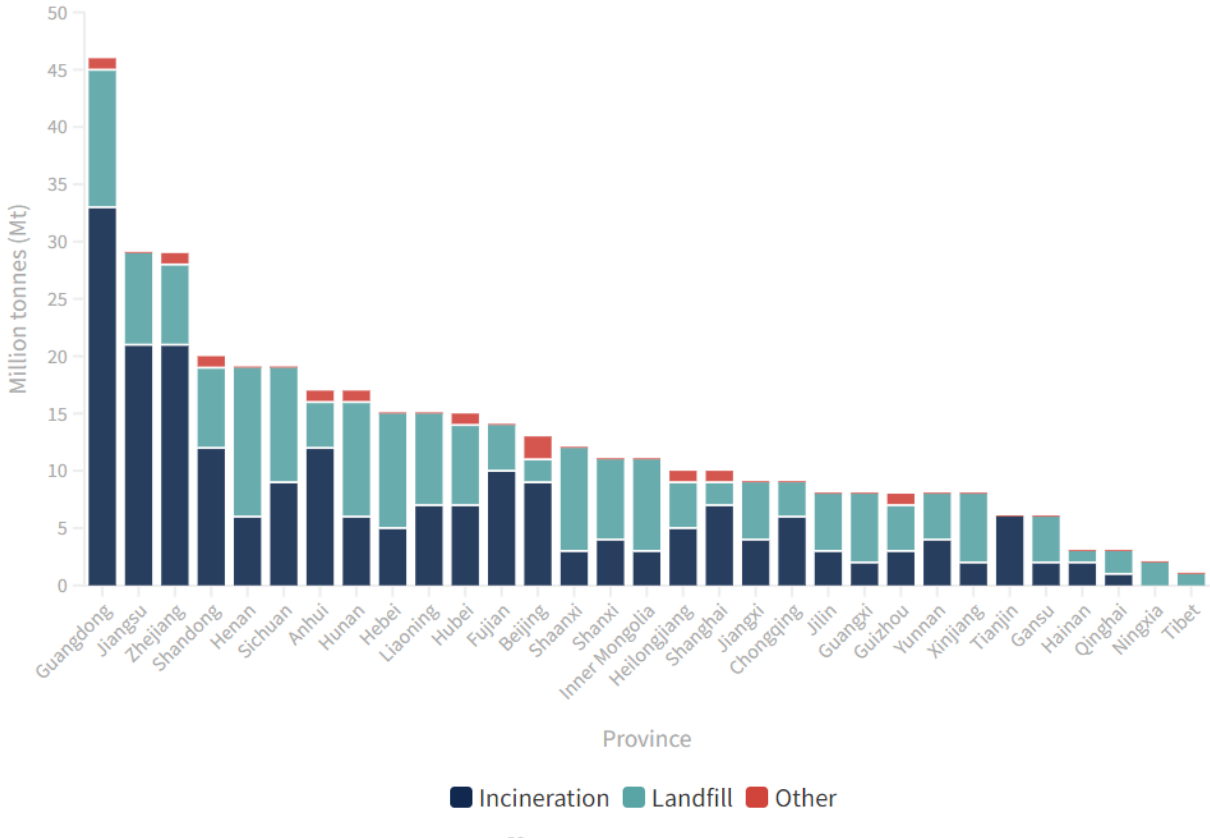
Methods of solid municipal waste management in selected cities and agglomerations of the world, 2019

DOI 10.46320/2077-7639-2022-3-112-15-24 "Зелёная экономика и энергетическая безопасность России" Гацалаева А.Х., Гулиев И.

Table

Waste Management Method	Countries			
	Germany	Switzerland	France	Russia
Recycling of waste into secondary raw materialsand composting of organic fraction	68,0	52,0	40,0	5,0
Waste-to-Energy (Energy Utilization)	31,0	48,0	36,0	2,0
Waste disposal	1,0	00,0	24,0	93,0
Disposal costs of 1 ton of MSW, Euro	218	224	157	33

Hierarchy of solid municipal waste management methods and disposal costs of 1 ton of waste in some countries



China's planned capacity for treating mixed municipal solid waste in 2020

DOI 10.46320/2077-7639-2022-3-112-15-24 "Зелёная экономика и энергетическая безопасность России" Гацалаева А.Х., Гулиев И.

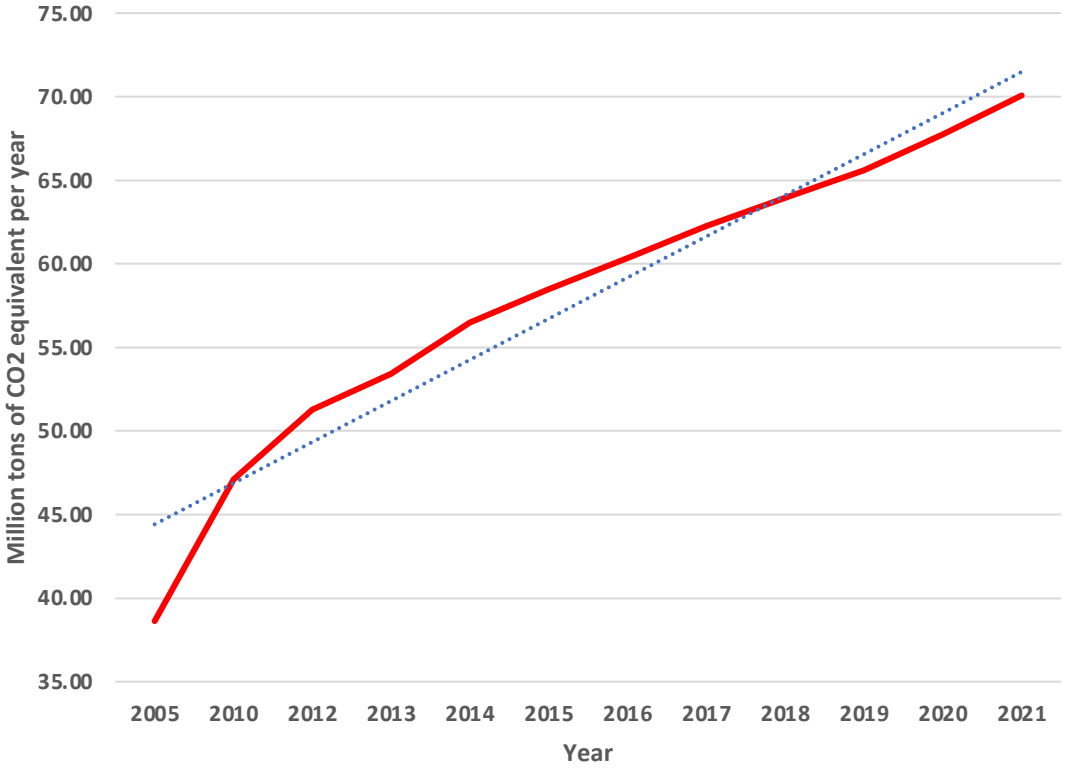
Waste processing industry

- There are **243** complexes for the disposal of MSW
- **53** complexes for sorting waste
- about **10** incinerators in the country

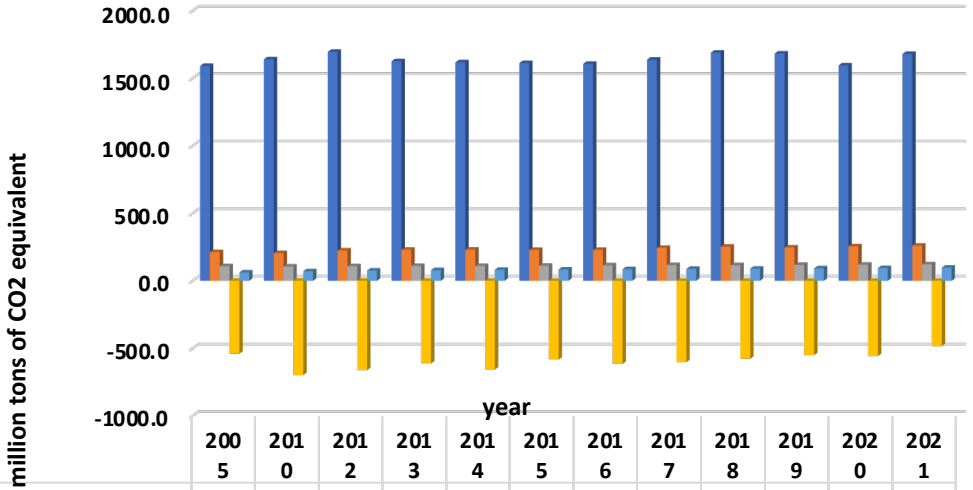
Advantages

Processing of 1 ton of MSW to produce energy using the grate combustion technology allows to reduce 1.01 tons of CO2, including a reduction of 0.5 tons of CO2 due to fossil fuel savings. At the same time , the burial of 1 ton of MSW without collecting landfill gas leads to the formation of 1.61 tons of CO2 . If we take into account the average market estimate of carbon quotas for greenhouse gas emissions in the amount of 30 euros per 1 ton and the reduction of such emissions in the amount of 1.01 CO2 equivalent for the energy utilization of such waste, the effect of the construction of this plant may amount to more than 1.7 billion rubles per year

GREENHOUSE GAS EMISSIONS FROM SOLID WASTE DISPOSAL



GREENHOUSE GAS EMISSIONS BY SECTOR



	2005	2010	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Energy	1590.2	1639.3	1694.5	1625.2	1617.1	1611.3	1606.1	1637.0	1688.7	1682.3	1594.1	1679.1
Industrial processes and use of industrial products	212.4	204.4	223.9	229.2	230.0	228.0	228.2	243.0	252.3	246.3	254.4	259.5
Agricultural industry	106.8	105.4	107.1	109.6	109.4	110.5	114.3	115.2	114.8	116.4	118.8	121.3
Land use and forestry	-539.7	-698.1	-661.5	-612.6	-657.4	-583.3	-615.3	-602.9	-577.3	-550.5	-557.6	-484.8
Waste	61.2	70.3	75.4	77.8	81.1	83.4	85.5	87.5	89.5	91.4	94.1	96.7

compiled by the author according to Rosstat, 2023

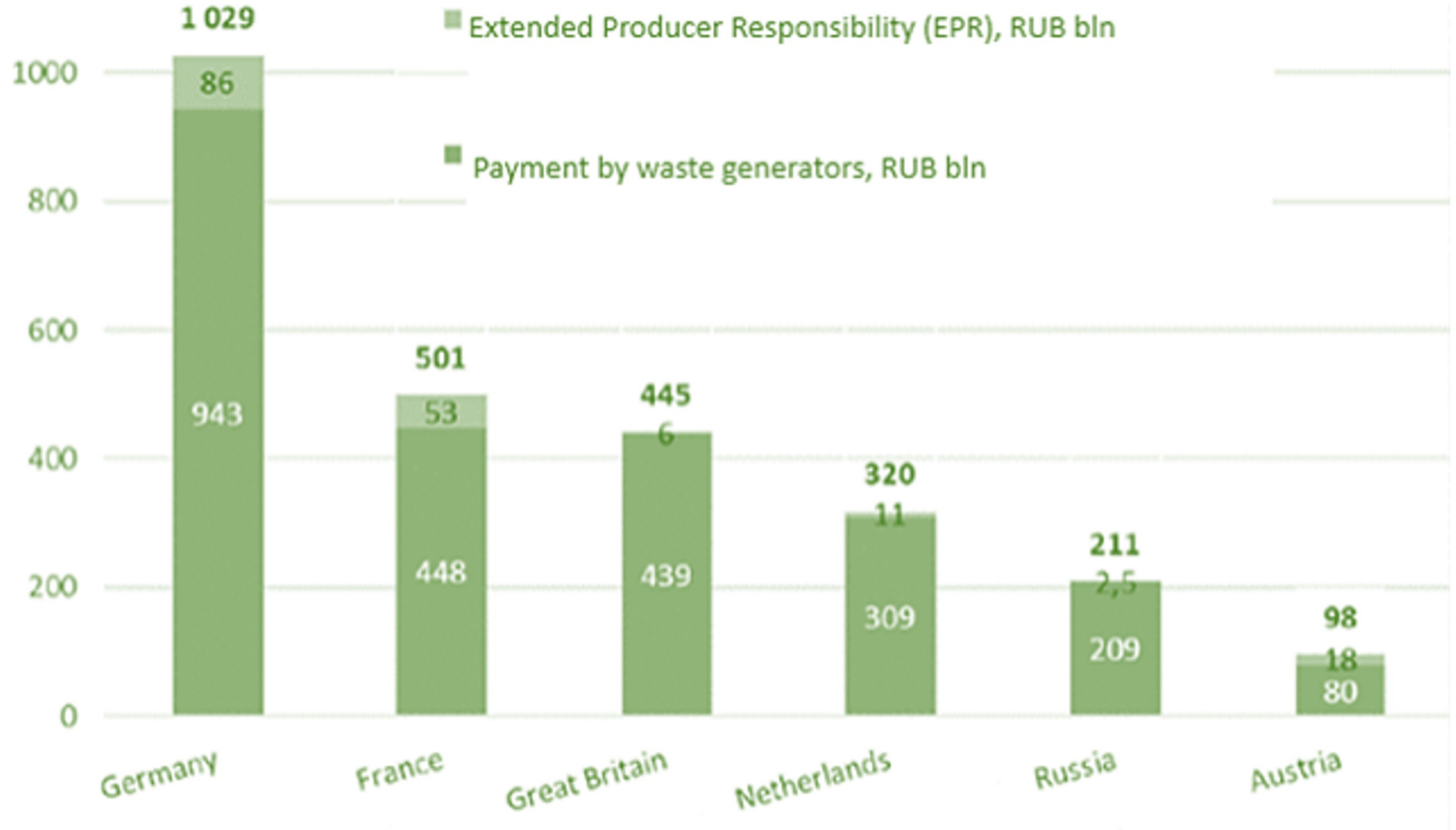
Plans

Sochi

Incinerator plant in Barcelona

"Green" tariff

MSW is recognized as a renewable energy source and in most countries, there is a "green" tariff for MSW-to-energy processing facilities, which is about 2 times higher than the market price for electricity



The size of the waste management market in some European countries and in Russia, bln RUB, 2020.)

compiled by the author according to Rosstat, 2023

Project financing

Other incentive measures include

- temporary exemption from income tax,
- provision of a site and external infrastructure for the construction of factories by local governments,
- VAT refund from the sale of electricity.

The main part of the plant's revenue (70-80%) for energy waste disposal is accounted for by the sale of electricity.

3 main conclusions

1. Energy recycling solves the problem of waste disposal
2. By burning waste, we reduce greenhouse gas emissions - leading to a low-carbon economy
3. The need to introduce green tariffs for energy from waste

Article

Using Multi-Criteria Decision Analysis to Select Waste to Energy Technology for a Mega City: The Case of Moscow

by Anna Kurbatova and Hani Ahmed Abu-Qdais

1. Department of Ecological Monitoring and Forecasting, Faculty of Ecology, Peoples' Friendship University of Russia (RUDN University), 6, Miklukho-Maklaya Street, 117198 Moscow, Russia

2. Civil Engineering Department, Jordan University of Science and Technology, P.O. Box 3030, Irbid 22110, Jordan

*Author to whom correspondence should be addressed.

Information

Thank you for your attention!

RUDN University

Kurbatova Anna I.

Assoc. Professor of the Institute of Environmental Engineering, RUDN University
PhD , Environmental Science
Expert of the GHG Validation and Verification Body, Institute of Environmental Engineering, RUDN University

+7 985 3608803

kurbatova-ai@rudn.ru