Workshop "Energy from waste: solutions at the municipal level"

## Prospects for obtaining biogas from organic waste in Kazakhstan





Yuliya Dushkina,

Director of the Department of Waste and Chemical Safety Projects

The Center «Cooperation for Sustainable Development»



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## **About the Center**

programme

	Center established	2008
The Center «Cooperation for Sustainable Development» - an independent non- profit organization whose mission is to assist and support activities aimed at the transition to sustainable development.	Analysis of the waste management system of electronic and electrical	2011- 2012
The main area of activity is the implementation of projects with the support of regional, international organizations, government agencies, industry and other stakeholders.	equipment Participation in the development of	
The Center operates on the territory of the Republic of Kazakhstan, CIS countries and Central Asia.	national standards in the field of waste management	From 2011 to 2022
Our partners	A research on the possibilities of reducing methane in the wastewater treatment sector	2018
SCO for a toxics-free future FOUNDATION THE FOUNDATION	Project for the development of the biogas industry in Kazakhstan	2019

## Current situation in the field of organic waste management in Kazakhstan



- Estimated production volume: 1.8 million tons annually\*
- Sorted in 2020: 18 thousand tons (~10%\*\*)
- Recycled to obtain feed additives

Waste of the agro-industrial complex



 Estimated amount of available waste (crops,manure, poultry wasteand others): 6.71 million tons\*\*\* Wastesewer treatment facilities



- No data on education volumes
  - Usually placed on silt sites (landfills)

\* from own calculations

\*\* https://stat.gov.kz/

## The concept for the transition to a "green economy" on the recycling of organic waste

The concept of transition to a "green economy" Development of organic waste recycling with biogas production

Construction of biogas installation at sewage treatment facilities and poultry farms





### **New Environmental Code RK**

On January 01, 2021, a ban on the landfill disposal of food and construction waste came into force

- Local executive bodies organize measures to stimulate the reduction of the disposal of biodegradable waste, including measures for their recycling, in particular by composting and recycling, including for the production of biogas and (or) energy.
- Composting of biodegradable waste is carried out in compliance with environmental and sanitary requirements.

## Recycling of organic waste from the wastewater treatment sector Initiative "Water-Waste-Energy»

- WATER Increasing the share of wastewater disposal and the level of wastewater treatment
- **WASTE** Recycling of sludge to produce biogas
- ENERGY Production of electricity from biogas

The initiative was supported by:

Организация бъединенных Наций по вопросам образования, науки и культуры











- Proposed by the Center CSD in 2017.
- Respond
  - Concepts of "green economy" (RES, sewerage, waste)
  - Concepts for the development of the gas sector of the Republic of Kazakhstan until 2020
  - legislation of the Republic of Kazakhstan
- Presented at international conferences Ecotech 2017, "Green Energy & Waste Recycling Forum– 2017-2018", "Ecology" (RF), etc.

## Research "Methane Reduction Opportunities in the Wastewater Sector in Kazakhstan" (2018)





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- Research Components
  - collection and analysis of data on the state of wastewater treatment
  - analysis of the regulatory framework in the wastewater and alternative energy sector
  - collection and analysis of data on existing and planned STPs
  - analysis of opportunities in the wastewater sector
  - development of recommendations and next steps to reduce methane in the wastewater treatment sector
- Results:
  - initial assessment of methane reduction opportunities in the wastewater treatment sectorwaters
  - further steps have been developed to promote biogas in RK
  - attracted the attention of stakeholders in solving the problems of wastewater treatment and sludge disposal

### Sewage treatment facilities (STP) in Kazakhstan

- Number of STP: 188, of which 17 largest (volume of waste water>250 l/s)
- Productivity: from 376 (Karkaralinsk) to 400,000 (Almaty) m<sup>3</sup>/day
- Putting into operation : from 1958 to 2017
- Main sources of wastewater: household, municipal, industrial wastewater
- Cleaning technologies mechanical and biological





## **Almaty STP**

Year of construction: 1970

Actual productivity: 400 000 m<sup>3</sup>/day

Types of cleaning: mechanical, biological

Handling of silt sludge: the sludge is pumped to the silt pads. Dried silt (on average, 1 time per year) can then be used for the construction of dams

## **Shymkent STP**

- Start of the biogas production installation: 2017
- Productivity: 100 000 m<sup>3</sup>/day
- Installation capacity 500 kW of electricity and 840 kW of thermal energy (for own needs)
- Handling of silt sludge:
  - the sludge after wastewater treatment is sent to the digesters, where biogas is produced
  - the residue after biogas production can be used as an organic fertilizer and in the production of building materials





### Potential for generating electricity from sewage sludge and GHG reductions

N⁰	STP Location	Actual power, m³/year	CH₄ emissions from silt deposits, T CH₄/year	Power generation potential, kW.h/year	Potential GHG emission reductions, T-eq CO <sub>2</sub>
1	Almaty	146,000,000	2389	17 955 000	53 530
2	Nur-Sultan	92 710 000	1 379	10 368 000	30 910
3	Shymkent	54 750 000	1 336	10 042 000	29 940
4	Karaganda	61 685 000	669	5,032,000	15,000
5	Taraz	24 017 000	477	3,590,000	10 710
6-17			5 339 CH4/year	21 485 400	64 050
	Total		9 111t CH₄/year 218 664 t-eq CO₂	68 472 400	204 140

## The results of pre-feasibility study for construction biogas installation on STP Nur-Sultan





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Reach	1 078 400 people
Productivity	254 million liters per day
Current situation	<ul> <li>Primary cleaning, secondary biological cleaning, tertiary cleaning by filtration through a sand filter and ultraviolet disinfection</li> <li>Sludge is placed on silt platform</li> <li>Digesters are installed but they do not work</li> </ul>
Conclusions	<ul> <li>Production and use of biogas is technically and economically feasible</li> <li>Composting will reduce GHG emissions, but it will be less cost-effective than just fermentation and the use of biogas (effective when generating income from quotas or other support tools)</li> <li>Fermentation will reduce transport costs</li> <li>The use of biogas on site will significantly save the energy consumption of the enterprise, compensating for the need for additional energy</li> </ul>

## The results of pre-feasibility study for the construction of biogas installation on STP Taldykorgan

	Reach	145 400 people
Global	Productivity	18 million liters per day
	Current situation	<ul> <li>Primary and secondary treatment with disinfection using sodium hypochlorite and discharge into the Karatal River</li> <li>The sludge is not recycled, it is sent to sludge sites after drying, it is used as fertilizer</li> <li>Digesters not installed</li> </ul>
center	Conclusions	Using only residues after cleaning is inefficient. Requires co-fermentation with agricultural waste and organic fraction MSW

### Auction for construction biopower installation

- In 2019, the first auctions for the construction of a bioelectric power station were held.
- Based on the results of the auction, the following companies were determined as winners:

- "Waste Energy Kazakhstan" LLP installed capacity of the project 4 MW auction price 32.13 tg/kWh

- "ZOR-Biogas" LLP installed capacity of the project 2.4 MW auction price 32.14 tg/kWh

- "GorKomTrans" LLP of Karaganda city installed capacity of the project 4 MW auction price 32.15 tg/ kWh

#### Standards in the field of organic waste recycling

- ST RK 3542-2020 "Organic fertilizers based on sewage sludge. Specifications"
- ST RK 3543-202 "Organic fertilizers.Vermicomposts. Specifications»
- ST RK project "Organic fertilizers. Sampling Methods»
- ST RK GOST R 53042-2010 "Organic fertilizers. Terms and Definitions»



# Necessary measures for increasing energy production from organic waste



- Reconstruction of existing STP with mandatory construction biogas installations
- Facilitating access to investments for the construction of biogas installations (green bonds)
- Creation preferences for STP, as well as other enterprises producing and using biogas to generate energy for their own needs
- Increasing fixed tariffs for the purchase of EE for biogas installations
- Subsidies for organic fertilizers
- Improvement inter departmental coordination
- Development of regional cooperation

## **Contacts:**



Kazakhstan, Almaty, Seifullin Ave.597, office 414



+7727255 87 23, +7 777 255 84 21



training@csd-center.kz



www.csd-center.kz



Yulia Dushkina Director of the Department of Waste and Chemical Safety Projects <u>csd.yuliya@gmail.com</u>



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