



MUNICIPAL SOLID WASTE SORTING TECHNOLOGY FOR THE RECYCLING OF SECONDARY RAW MATERIALS AS AN ALTERNATIVE TO ITS DISPOSAL

TECHNOLOGY DESCRIPTION

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The sorting of valuable municipal solid waste (MSW) components generates marketable and useful material with the subsequent treatment of waste residual by other technologies. This technology can be considered as an integral part of an efficient MSW management system in general, in addition to other technologies such as biological treatment or incineration. The MSW sorting technology can be divided into the following components, which mutually increase the efficiency of MSW sorting:

- sorting at MSW generation point (containers, temporary storage areas, etc.);
- transportation of bulky or separately collected MSW (infrastructure and transportation vehicles);
- waste reception/collection centres;
- waste sorting lines.

The efficiency of MSW sorting at the stage of its generation mostly depends on the conscientiousness of citizens and their motivation to contribute to the quality of sorting, as well as the availability of separate collection infrastructure. Efficiency of other components of MSW sorting technology depends on the success of cooperation between local authorities and business, market conditions, introduction of modern technologies etc. The central, but not independent, component of a MSW sorting technology is a sorting line. There are two main types – “clean” and “dirty”.

Clean Sorting Lines typically receive mixed ‘dry’ recyclables from the MSW separate collection such as paper, cardboard, plastic, metals and glass. Depending on the level of awareness, the efficiency achieved in such lines can be high (up to 80%) and the captured materials tend to be ‘clean’ and readily marketable.

Dirty Sorting Lines typically receive mixed ‘wet’ MSW with recyclables and other wastes. Efficiency achieved in such plants is typically low (at the level of 10% of waste input). Most of the sorting facilities in Ukraine can be considered as *Dirty Sorting lines*.

CURRENT TECHNOLOGY READINESS LEVEL OR COMMERCIAL READINESS INDEX

In 2020 MSW collection system of Ukraine included 35 sorting lines and approximately 4,000 specially equipped vehicles with 17,500 involved employees. A MSW separate collection system was developed in 53 settlements in 2010, and 1707 settlements in 2020. These sorting capacities and infrastructure have contributed to only 4.6 % of recycling share from the total amount of collected MSW.

According to the acting law of Ukraine “On Waste”, effective from 1st January 2018, it’s prohibited to dispose non-treated (unprocessed) MSW for which appropriate processing technology is available. Thus, separate collection of MSW components should be a mandatory element of a MSW management system of Ukraine. However, the development of the present separate collection system does not result in the desired effect yet. Thus, technology readiness level for the MSW sorting technologies in Ukraine is considered as system complete and qualified, commercial readiness as multiply commercial application.



CLIMATE RATIONALE OF THE TECHNOLOGY

Solid waste disposal at Ukraine landfills leads to annual GHG emissions equal to 8.0 Mt CO₂-eq. Paper and cardboards are responsible for 20-40 % of the GHG emissions from MSW disposal at landfills and waste dumps. Thus, if 75% of generated paper and cardboards is recycled, the GHG emission reduction will achieve 1.2-1.4 Mt CO₂-eq. Disposal of food and yard MSW fraction leads to 15-30 % of methane emissions from solid waste disposal sites in Ukraine. These emissions could be significantly decreased by composting activity, if the corresponding fractions were separated at the stage of their generation. GHG emissions reduction could also be achieved by other recyclable secondary uses (ferrous and non-ferrous metals, glass, textile, and plastic).

According to the Updated Nationally Determined Contribution of Ukraine¹ to the Paris Agreement (NDC2), MSW sorting is one of the key measures to be introduced to achieve the target on GHG emissions reduction in the Waste Sector by 2030.

AMBITION OF THE TECHNOLOGY

SCALE FOR IMPLEMENTATION AND TIME-LINE

The level of MSW sorting technology diffusion should ensure 10 % of MSW recycling in 2030; 34 % – in 2040; and 40 % – by 2050. Such a level of ambition for recycling corresponds to the implementation of the Waste Sector Target Scenario to achieve a sectoral goal stated in the NDC2 as well as to the implementation of the National Waste Management Strategy of Ukraine with ten-year postponement. The countrywide scale for implementation and time-line for MSW sorting technologies, which corresponds to the above stated target for waste management sector, is presented in the table below.

Component of MSW sorting technology	Number of units in operation				
	2020	2022-2030	2031-2040	2041-2050	Cumulative, 2022-2050
Sorting lines	35	91	214	61	366
Collection/reception stations	-	271	-	-	271
Thousand containers	No data	116	42	12	170
Collection vehicles	3862	930	275	79	1284

EXPECTED IMPACTS OF THE TECHNOLOGY

The expected impact of introducing a MSW sorting technology can be roughly estimated as 10 % of direct GHG emissions reduction in the Waste sector by 2030, through prevention of MSW disposal. A significant effect on indirect GHG emissions reduction could also be achieved in non-Waste sectors, such as Industrial Processes and Product Use, Energy and Agriculture, through using MSW secondary raw material which would be either a raw material an alternative fuel, or a fertilizer with a lower carbon footprint. Potentially, the waste sector could reach the status of being a carbon-neutral sector in Ukraine by 2050 if indirect effects of GHG emissions reductions are considered.

MSW Sorting projects creates jobs associated with the design, construction and operation of sorting lines and sorting infrastructure. Sorting projects involve engineers, construction firms, and equipment vendors.

POLICY ACTIONS FOR TECHNOLOGY IMPLEMENTATION

¹ Published in 2021, available at: <https://bit.ly/3ik1wMQ>



EXISTING POLICIES IN RELATION TO THE TECHNOLOGY

The acting waste management legislation is out-of-date. Presently, it is still based on the Law “For Waste”, which is earmarked for replacement. The draft law “For Waste management” is in line with the EU requirements for waste treatment system, which involve the implementation of waste hierarchy principles, extended producer’s responsibility, an electronic licensing system, and also imply changes in waste classification and accounting system. However, this is still at the approval procedures² stage.

In order to facilitate transformation processes on the basis of EU principles and practices, the National Waste Management Strategy up to 2030 was approved by the Cabinet of Ministers of Ukraine in 2017 and the National Waste Management Plan up to 2030 in 2019. However, it is possible that the National Waste Management Strategy up to 2030 will not be fully implemented by 2030 in terms of MSW sorting technologies development.

PROPOSED POLICIES/MEASURES TO ENHANCE TECHNOLOGY IMPLEMENTATION

In order to achieve the GHG emission target in the Waste Sector, which was set up in the NDC2, the following main policies and measures are proposed to be implemented for further waste sorting technologies dissemination in Ukraine:

1. Creation of necessary infrastructure:

- 1.1. To optimize the area of administrative units by means of division of oblasts into “coverage areas” / clusters and their approval within the framework of regional waste management plans (2022-2023).
- 1.2. To strengthen the cooperation in MSW management research by means of the establishment of an interdepartmental coordination council for research about the reuse of natural resources and processing (2022-2023).
- 1.3. To monitor introduction of modern MSW sorting assets and their conditions by means of creation of waste management registers and adoption of the decree of their maintenance (2022-2023).

2. Enabling framework for creation of market conditions:

- 2.1. To unify the classification of MSW components with the EU standards by means of development of national waste classifier based on EU legislation (2022-2023).
- 2.2. To stimulate investors’ initiatives to introduce MSW sorting technologies by means of the introduction of economic incentives for the environmentally friendly production technologies and expansion of processing (2022-2023).
- 2.3. To approve an act about the procedure for calculating the actual targets for MSW processing and recovery (2022-2023) to clearly define how to evaluate the achievement of targets for MSW sorting technologies.

3. Raising motivation of population to ensure efficient:

- 3.1. To promote awareness of population in sustainable MSW management at the level of households by means of development and dissemination of information materials dedicated to waste management issues and sustainable consumption (2022-2030).
- 3.2. To promote an exchange of best waste sorting practice experience in between relevant stakeholders by means of organizing of conferences and workshops dedicated to waste management issues (2022-2030).
- 3.3. To promote popularization of MSW separate collection practice in the media by means of supporting target awareness programmes (2022-2030).

COSTS RELATED TO THE IMPLEMENTATION OF POLICIES

² Status of October, 2021



In order to achieve the proposed level of ambition for sorting technology dissemination in Ukraine, 1.24 bln euros of capital investment is needed by 2050, i.e.: for sorting lines – 1.04 bln euros; for collection/reception stations – 0.04 bln euros; for containers and collection vehicles – 0.16 bln euros. The cost assessment for the dissemination of waste sorting technologies in Ukraine is presented in the table below for the period 2022-2050.

Component of MSW sorting technology	2022-2030	2031-2040	2041-2050	Cumulative, 2021-2050
	million euros			
Sorting lines	255.00	612.50	175.00	1042.50
Collection/reception stations	40.65	-	-	40.65
Containers and collection vehicles	117.60	33.92	9.69	161.21
Total	413.25	646.42	184.69	1244.36

Capital costs should be covered by international and domestic investors as well as by municipalities. International financial and technology support is expected to play a significant role in implementing and/or facilitating the implementation of the proposed level for the dissemination of MSW sorting technology.

USEFUL INFORMATION

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LINKS TO TNA REPORTS

Reports prepared within the TNA Project:

- Technology Needs Assessment
- Barriers Analysis and Enabling Frameworks
- Technology Action Plan

Full texts of the TNA reports are available at: <https://tech-action.unepdtu.org/country/ukraine/>

TNA Project page at the web-site of the Ministry of Environment and Natural Resources of Ukraine:

<https://menr.gov.ua/news/33450.html>