



Medical Waste in Ukraine (Ukraine-MEDWASTE): A Pilot Project K-Z391-ST02

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1. Reason and purpose of the project MEDICAL WASTE UKRAINE

Name of the organization	Research and Transfer Centre „Sustainability and Climate Change Management“ (FTZ-NK) HAW
Name of the project	Medical Waste in Ukraine (Ukraine-MEDWASTE): A Pilot Project K-Z391-ST02
Responsible person	Prof. Dr. Walter Leal
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Medical waste is constantly generated in the context of health care. In times of war, they increase significantly. The variety is considerable and includes sharp objects, human tissue or body parts, and a wide range of infectious material. The current scale and scope of the problem in Ukraine is rather unclear at the moment, there are no specific statistics. Therefore, the main objective of the Ukraine- MEDWASTE project:

Analyse the amount and types of medical waste generated in a sample of hospitals in the city of Ivano-Frankivsk (approx. 230,000 inhabitants) as a pilot site and identify options for the specific handling, transport and disposal of this waste and for the recycling of plastic waste.

The specific objectives of the project are:

- i. Investigation of the amount of medical waste generated in the city's hospitals
- ii. Identify and describe obstacles and gaps in the safe handling and final disposal of waste generated in the selected healthcare facilities
- iii. Identify the health and safety risks associated with inadequate management of healthcare waste.
- iv. Propose measures to address the problem.

The project focuses on the city of Ivano-Frankivsk (approx. 230,000 inhabitants). The whole history of Ivano-Frankivsk (Stanislaviv) is strongly connected with Poland and also the city has a German minority (approx. 3% of the population).

2. Presentation of work stages and methods used

Table 1. Description of actions and results according to the project plan

Actions	Results	Duration, Months
WP1 (Tasks and Deliverables)		
T1.1 Establishing the Management and partners structure To complete this task, an online meeting was held with colleagues working at Ivano Frankivsk National Medical University.	The online meetings took place in February 2023. The project presentation was followed by a discussion on possible opportunities for cooperation. After the first meeting with the Ukrainian partners, online meetings were held every two weeks to discuss the next steps and results. As a result, two working groups were set up to conduct the study: 1) a coordination working group, 2) a working group for collecting and monitoring information in Ivano-Frankivsk. To achieve this, a working contract was signed with Ukrainian colleagues from Ivano Frankivsk National Medical University.	M 1, 2
T1.2. Internal monitoring of the progress of the project This task entails coordinating all procedures related to the conduction of the project, including planning tasks, collecting data, and analysing the results.	Work packages with tasks and responsible persons were created. All files related to the project were organized in a folder on Dropbox. Weekly group meetings were held for the "coordination working group".	
T1.3. External monitoring and reporting the progress of the project	An interim reports were prepared for the period from 13.02.2023 to 30.06.2023.	M 6, 12
T1.4. Final Report	We prepared the final report after finishing the project.	12
WP2 (Impact assessments according to different categories)		
T2.1. Literature review of a research methods and models in order to assess the environmental impacts of medical waste on ecosystems	The research was conducted using the VOSviewer software, and term matching was chosen as the method to examine the areas of research that researchers have discussed on the topic of environmental impacts of inadequate medical waste management.T2.1. After determining the inclusion and exclusion criteria, 1201 documents were selected for the study and subjected to expert review. The results were presented in the form of a publication. The study also considered case studies on this issue that were conducted in Ukraine.	M 1, 2
T2.2. Development, implementation and conducting of a survey among hospitals, with the aim of determining the amount and types of medical waste	To accomplish this task questionnaires were used. Questionnaires for hospital administrators were developed and uploaded to the Lime survey platform. The experts' answers were collected, translated, analyzed and presented in the table "Current situation in hospitals with medical waste".	M 1-3
T2.3. Identify health and safety risks associated with inappropriate medical waste management	Based on the bibliometric assessment of the literature, the need to develop a system of safe medical waste disposal that will allow to control of the risks to public health and the environment associated with medical waste was shown. Solving the problem of rational medical waste disposal is an interdisciplinary issue that affects various aspects of sustainable development, and also directly relates to 3, 12, and 17 of the UN SDGs and indirectly to 1, 2, 5, 6, 9, 11, 13, 14, 15. The results were presented in the table "The relationship between the Sustainable Development Goals and the need for a sustainable medical waste management strategy".	M 4-6
T2.4. Identify and describe obstacles and gaps in the	Obstacles and gaps in the final disposal of medical waste were identified.	M 7-9

final disposal of medical waste		
WP3 (recommendations for reconstruction and investment)		
T3.1. Literature reviewing and analysing of the best practices to resolve ecological damages caused by medical waste. In order to enrich the findings with interdisciplinary expert knowledge and adapt them to the Ukrainian context, a workshop was held at the Hamburg University of Applied Sciences (HAW-Hamburg) with Ukrainian colleagues and hospital directors.	Best practices in medical waste management were identified using the VOSviewer software. The results of the workshop with the participation of Ukrainian scientists and hospital directors, held on May 2, 2023, were presented in the table "Possible solutions and rational strategies for medical waste management". The literature review, case study and workshop results were used to develop recommendations.	M 1-2
T3.2. Preparation of recommendations that will help in the elimination of damage and restoration of the ecosystem	Recommendations that will help in the elimination of damage and restoration of the ecosystem were prepared.	M 9-11
T3.3. Development of an official document with recommendations on the plan of measures to eliminate the damage caused and the application of safe methods of disposal of medical waste according to safety categories	The road map with the plan of measures to eliminate the damage caused and the application of safe methods of disposal of medical waste according to safety categories was prepared.	M 11-12
WP4 (dissemination and upscaling activities)		
T4.1. Development of a reliable information and communication strategy to ensure the visibility of the project and its results in Germany and Ukraine	Communication strategy of the MEDICAL WASTE UKRAINE project, which describes not only media publications about the project, but also the interaction between partners, DBU project staff, stakeholders, decision-makers, and policy makers. According to the developed communication strategy, communication with internal and external stakeholders of the Medwaste-Ukraine project was based on regular teleconferences, e-mails, in-person meetings within the project, and seminars. The heads of hospitals in Ivano-Frankivsk were involved in cooperation through e-mails and personal meetings with colleagues from the medical university, with whom the project signed a cooperation agreement at the beginning of the project. Communication with other stakeholders (the general public) takes place through various communication channels, including social networks, media (online platforms) and the HAW website.	M 1-3
Task 4.2. Project logo and templates They are made in the colors of Ukraine and Germany at the same time, concisely indicating the main idea of the project - proper management of medical waste to preserve	A logo was developed, and the templates were used in numerous presentations, publications and official documents.	M 1, 2

<p>the health of the environment and the population of the whole planet.</p>		
<p>Task 4.3 Flyer for the web site and social media A project flyer in English and German, including detailed information on project objectives, methodology, etc., to be made available both electronically and in print.</p>	<p>A flyer of the MEDICAL WASTE UKRAINE project was prepared in English and German, which was used in numerous correspondences with potential partners, media and other stakeholders closely related to the project. It contains detailed information about the project's objectives, methodology and logo.</p>	<p>M 2</p>
<p>Task 4.4 Networking, Dissemination and Promotion events</p>	<p>According to the developed communication strategy, 3 posts were made on Linkendin. General information about the project was posted on the HAW website (https://www.haw-hamburg.de/en/research/research-projects/project/project/show/ukraine-medwaste/) in English and German. In addition, interview materials about the need for the MEDICAL WASTE UKRAINE project, project activities, and methods used were published in the online media REMONDIS Medison abfallmanager-medizin.de. A seminar to present the project results took place on 29th of November 2023 in Ivano-Frankivsk (Ukraine) and online.</p>	<p>M 4, 10</p>
<p>Task 4.5 Scientific publications With the purpose of dissemination of the results of the project, Scientific publications are planned to be delivered.</p>	<p>The scientific article "Review of medical waste management for achieving the UN SDGs: solutions for Ukraine's post-war recovery" was published. https://www.sciencedirect.com/science/article/pii/S2667010023000860</p>	<p>M 6</p>
<p>Task 4.6 Reports</p>	<p>The Intermediate report is was done. The final report is finished.</p>	<p>M 12</p>



3. Results

Presentation of the actual results achieved

Description of key results and achievements:

The internal monitoring of the project progress was carried out according to the developed structure, which includes four work packages (WPs). Each work package had different tasks and activities planned. All documents and deliverables were organised in a Dropbox folder.

In order to establish the partnership structure, an online workshop was held in early February 2023, which was also attended by Ukrainian scientists. This event was followed by numerous face-to-face meetings offline and online. As a result, two working groups were formed to conduct the research: a coordination working group and a working group to collect and analyse the current situation in Ivano-Frankivsk.

In accordance with the developed communication strategy, communication with internal and external stakeholders of the MEDICAL WASTE UKRAINE project was based on regular video conferences, e-mails, in-person meetings within the project and seminars.

The MEDICAL WASTE UKRAINE project communicated on four different levels:

- Specific communication activities aimed at DBU, e.g. email correspondence with the DBU project officer, regular reports, results, etc;
- Communication with stakeholders closely related to the project (scientific community working in Ukraine, participants of seminars) in the framework of open stakeholder meetings, seminars, conferences, as well as development of joint tasks.
- Communication with decision-makers and policy makers (Ukrainian state administration, politicians) through meetings, seminars, and report presentations.
- Communicating with other stakeholders (general public) through various communication channels, especially social media, mass media (newspapers, online platforms) and the HAW website.

The literature review of the sustainable management of medical waste to achieve the UN SDGs: solutions for Ukraine's post-war recovery was conducted using VOSviewer software [1], and the frequency of term recurrence illustrates the areas of research that researchers are discussing on the topic of medical waste in the context of achieving the Sustainable Development Goals. A total of 1201 peer-reviewed documents were considered. The results of this analysis are presented in the form of network graphs (Figs. 1, 2), the diameter of the sphere indicates the frequency of use of the term. The terms are grouped by colour, which indicates the frequency of their common use, thus forming clusters. The figures show three and four thematic clusters, respectively. The case studies were conducted taking into account the limitations of bibliometric analysis, analysing publications that are directly related to the objectives of this study.

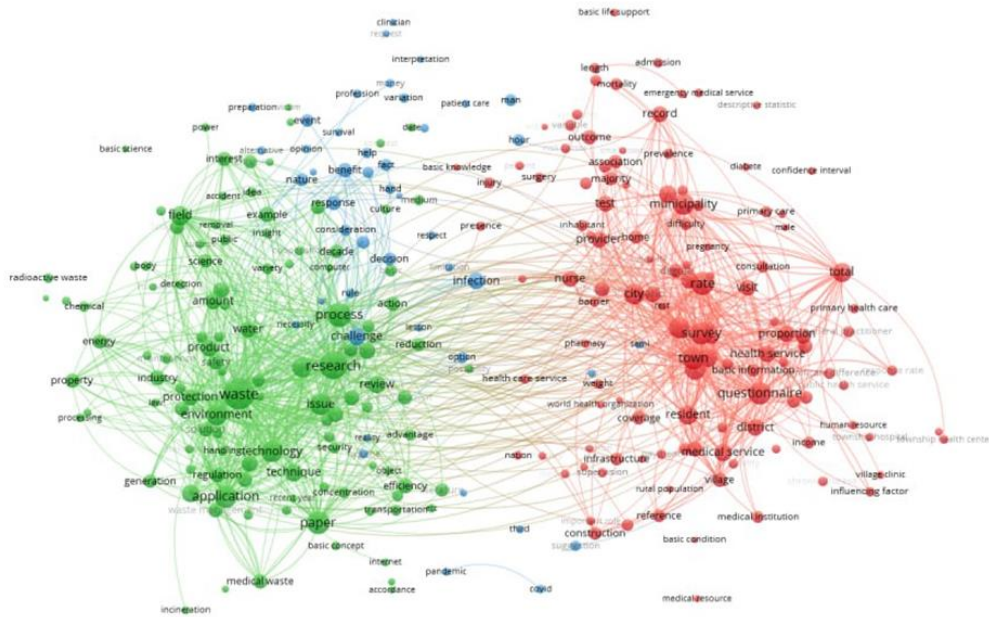


Figure. 1. Results obtained from the bibliometric analysis and clustering of studies on medical waste in the context of achieving the Sustainable Development Goals Part I.

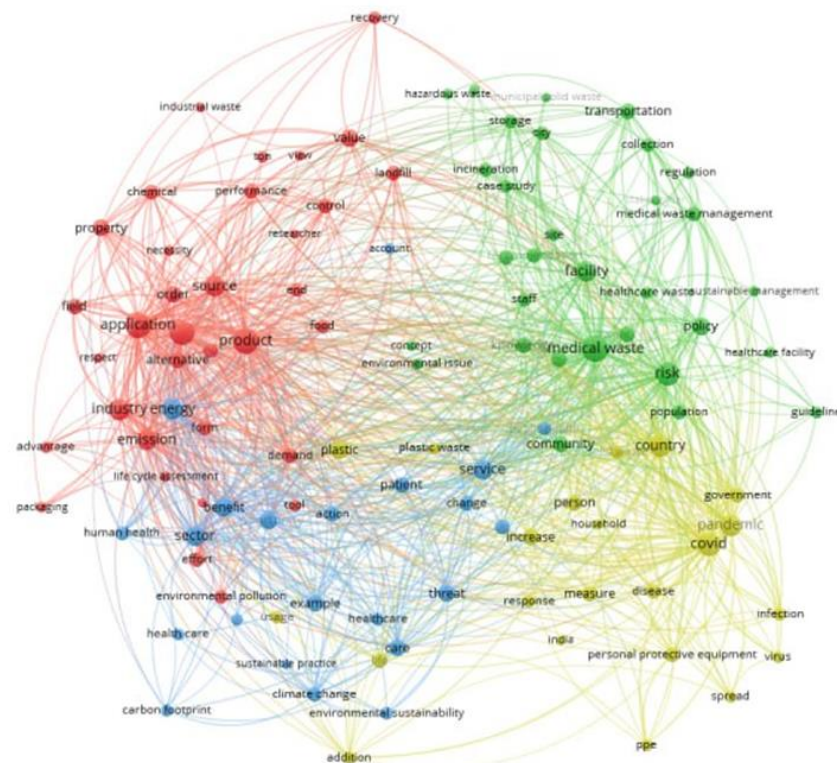


Figure. 2. Results obtained from the bibliometric analysis and clustering of studies on the topic of good medical waste management in the context of achieving the Sustainable Development Goals Part II.

Figures 1 and 2 illustrate the clear interconnection in research on medical waste with cleaner production and sustainability, climate change and environmental pollution. Also, during the Covid

19 pandemic, due to the use of a large number of disposable personal protective equipment, many studies have been conducted to prevent the generation of medical waste, in particular plastic medical waste. It has been established that during the pandemic, 0.5 kg/capita of hazardous waste was generated daily in developed countries, and 0.2 kg/capita of contaminated waste in developing countries [2].

In addition to health-related risks, improper management of medical waste can lead to adverse environmental impacts, not only soil and water contamination, but also the destruction of beneficial microorganisms in septic systems, as well as physical injuries due to the presence of sharp objects [3].

It has been established that the availability of a system for the safe disposal of medical waste is a key factor in controlling the risks to public health and the environment associated with medical waste. Medical waste management has great potential for the development and implementation of advanced solutions. Developing an effective medical waste management strategy and implementing it will accelerate progress towards achieving many of the UN SDGs.

Addressing the problem of rational medical waste management is a cross-cutting issue that affects various aspects of sustainable development, and directly addresses SDGs 3, 12 and 17, and indirectly 1, 2, 5, 6, 9, 11, 13, 14, 15.

Table 2: Relationship between the Sustainable Development Goals and the need for a sustainable medical waste management strategy

Sustainable development		Explanation
UN SDGs	Smaller goals that are directly linked to the UN SDG indicators*	
SDG 1	<p>1.3 Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable.</p> <p>1.4 Ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources and financial services, including microfinance.</p> <p>1.5 By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters.</p>	<p>Good health is the key to overcoming poverty. Medicine and the production of medical products contribute significantly to national economies and job creation. But poor medical waste management puts the poorest communities at the highest risk due to their occupation, living conditions, and limited access to clean food and water.</p>
SDG 2	<p>2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather,</p>	<p>This SDG aims to achieve food security and promote sustainable agriculture. Illegal dumping poses a significant threat to human health, causes pollution and land degradation, which has a direct impact on agriculture, food quality and safety.</p>

	drought, flooding and other disasters and that progressively improve land and soil quality.	
SDG 3	<p>3.3 By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases.</p> <p>3.4 By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being.</p> <p>3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination.</p>	<p>Ensuring a healthy lifestyle is directly linked to the efficient functioning of the healthcare system. The production of medical products and medicine in general help prevent millions of deaths every year. At the same time, we must ensure that reliable mechanisms are in place to dispose of medical waste in a manner that does not cause environmental pollution, contaminate water, soil and air, protect human health and prevent death and disease.</p>
SDG 5	<p>5.1 End all forms of discrimination against all women and girls everywhere.</p> <p>5.5 Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life.</p>	<p>Achieving gender equality and empowerment for all women and girls requires a clear legal framework, monitoring and regulation of the ratio of women's to men's wages, especially in hazardous working conditions associated with medical waste management.</p>
SDG 6	<p>6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.</p> <p>6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.</p> <p>6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.</p>	<p>Medical waste is dangerous because of its infectiousness, toxicity and ecotoxicity. The chemicals contained in medical waste can cause pollution that can seriously affect water quality. Developing an effective medical waste management strategy will help prevent the contamination of water sources and contribute to the protection and restoration of aquatic ecosystems.</p>
SDG 8	<p>8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship.</p>	<p>The issue of decent work and sustainable economic growth is directly related to medical waste management. Proper training and the provision of</p>

	<p>8.4 Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation.</p> <p>8.8 Protect labour rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment.</p>	<p>quality personal protective equipment for medical waste management personnel helps to ensure their rights to decent work and occupational safety. Decoupling economic growth from environmental degradation requires an effective medical waste management strategy.</p>
SDG 9	<p>9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities.</p> <p>9 a. Facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological and technical support.</p>	<p>Sound waste management, including medical waste, is an integral part of sustainable industrialisation. Sustainable industrialisation and medical waste management can stimulate innovation and create new job opportunities. An effective waste management strategy should include the introduction of clean and environmentally friendly technologies and industrial processes as early as the production of medical products.</p>
SDG 11	<p>11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.</p>	<p>Cities occupy only 3% of the earth's surface, but they are home to half of the world's population and use 75% of the earth's resources. At the same time, cities are the largest sources of pollution. Implementing a medical waste management strategy is essential for cities to become more sustainable through improved medical waste management practices and services.</p>
SDG 12	<p>12.2: By 2030, achieve the sustainable management and efficient use of natural resources.</p> <p>12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.</p> <p>12.5 By 2030, substantially reduce</p>	<p>Sustainable management and efficient use of natural resources cannot be achieved without good medical waste management practices. The principles of reuse and minimisation of waste generation and optimisation of resources through recycling should be the basis of a sound medical waste management strategy.</p>

	waste generation through prevention, reduction, recycling and reuse.	
SDG 13	13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.	Rational management of medical waste, in particular, is key to strengthening sustainability and combating climate change through resource recovery and recycling, waste-to-energy processes, optimising waste transport, using the latest techniques, etc.
SDG 14	14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution.	Wastewater and industrial effluent discharges pollute waterways, seas and oceans. Improving the management and disposal of medical waste is an important measure to protect the world's oceans, seas and marine resources.
SDG 15	15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements.	The production, use and disposal of medical waste can lead to serious environmental degradation, water and soil pollution and disruption of ecosystems if not managed properly. Improving the management and disposal of medical waste by preventing and minimising the release of waste into the environment helps to protect ecosystems and reduces the need for difficult and costly remediation.
SDG 17	17.7 Promote the development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries on favourable terms, including on concessional and preferential terms, as mutually agreed.	Proper medical waste management starts with environmentally friendly technologies, and the introduction of such existing technologies is possible through international cooperation. International partnership and dissemination of European experience is the key to developing rational management and disposal of medical waste for sustainable development of society.

* - <https://unstats.un.org/sdgs/metadata/> [4]

Waste legislation in Germany consists of several laws and regulations. The central component of it is the Closed Substance Cycle and Waste Management Act and Circular Economy Act which regulates the prevention, recycling, reuse, and disposition of waste through the German Waste Prevention Program since 2013 [5].

As the European Union (EU) member state Germany is responsible for enacting legislation that complies with and serves to implement European Commission (EC) directives on waste-related laws, directives, and standards. Therefore, hospitals in Germany categorize medical wastes in line with Chapter 18 of the European Waste Catalogue (EWC). The EWC was established on its own in the year 2000 by the European Commission Decision 2000/532/EC [7]

In addition, adherence to infection control and safety regulations is necessary to follow for medical waste (Infection Protection Act, Federal Law). Correct disposal of hazardous waste has to be proofed to authorities (Ordinance on the verification of the disposal of waste, Federal Law).

Transport of hazardous waste has to attend to the Dangerous Goods Regulation (Ordinance on the domestic and cross-border carriage of dangerous goods by road, rail, and inland waterways, Federal Law). Waste is classified according to the European Waste Catalogue and Hazardous Waste List. Incineration of waste has to respect the Federal Control of Pollution Act (Federal Immission Control Act).

In Germany, 75% to 95% of medical waste is not biohazardous and as a result, is comparable to domestic waste that is neither contaminated by body fluids nor by chemicals and has no sharp waste (Sousa et al. 2020). The use of waste landfills in Ukraine can be reduced by recycling used products in medical facilities such as plastics, batteries, paper, glass, metals, and silver used in photographic processing. Food and organic waste can be used for composting purposes.

According to the World Health Organization [5], there are several practical and scalable solutions for more environmentally sustainable management of healthcare waste personal protective equipment (PPE) (Figure 3.).



Figure 3. Several practical and scalable solutions for more environmentally sustainable management of healthcare waste personal protective equipment (PPE).

WHO report [5] also provides recommendations for sustainably strengthened healthcare waste management, at three levels: global, national, and facility.

1. Global

- Strengthen coordination among global health donors, logistics, infection prevention and control, healthcare waste and environment actors
- Promote and invest in more environmentally sustainable PPE and waste systems



- Support behavior change away from single-use and overuse of PPE, to appropriate use and reusables, when feasible

2. National

- Update, implement, and regulate sustainable healthcare waste standards and practices
- Invest in safe healthcare waste management and hand hygiene, as part of broader infection prevention and control, and WASH efforts
- Develop, implement, and finance a multimodal improvement strategy for hand hygiene to reduce unnecessary glove use
- Include waste management in health budgets and invest in the recycling market
- Regularly monitor and report on healthcare waste practice
- Encourage the most sustainable, safe options for PPE within and outside healthcare

3. Facility

- Improve training, mentoring, and investments for safe and sustainable waste management and waste workers
- Support hand hygiene and appropriate PPE use
- Incrementally improve the environmental sustainability of waste treatment technologies.

The study also adopted a questionnaire survey to collect quantitative and qualitative data about medical waste management in Ukraine during the war. A three-stage process was extensively used to collect data about the actual situation in Ukrainian hospitals.

In the first stage of our research, the development of the questionnaire was supported by the comprehensive literature review described above, which entailed some of the most recent literature publications and relevant works on the topic in the world. This was followed by a second stage, which was the design of a survey instrument, namely a questionnaire. This consisted of a set of closed questions, where respondents were asked to choose their answers from a fixed set of options. These types of questions were deployed because the obtained data cater to a reliable collection and analysis (reference). General open questions were also used at the end of the structured questionnaire in order to allow respondents to identify new issues not captured in the closed questions (reference). This type of question provided an increase in response rates (reference).

In the second stage of our research, an online survey was performed, with 25 questions divided into 5 groups based on the developed questionnaire. The invitation to participate in the study was sent to the hospital's head of management. The data were collected through the Lime Survey online survey tool (<https://www.limesurvey.org/>, accessed on 20 April 2023). This web tool is widely used for survey studies because it offers a wide variety of question types, and at the same time, it has a convenient interface [10] ([LimeSurvey — Free Online Survey Tool, 2023](#)). The online questionnaire was used to collect the actual data about the waste management situation with clear instructions.

The sample was composed of managers in the hospitals who work on the subject and are knowledgeable, thus providing well-informed answers. The authors did not engage in the analysis of errors or tests of the sample, such as correlation, regression, and structural equations, among others, as the work would have had to obtain a larger number of responses and thus reach other groups of respondents.

According to our survey results, 6 out of 8 hospitals have clearly defined guidelines for the disposal, reuse, or recycling of medical waste. Only one institution has agreements with manufacturers of medical products that bear financial and organisational responsibility for the stage of waste management of their products. With the beginning of Russia's full-scale invasion of Ukraine, the specialisation of 2 out of 8 hospitals changed, and the number of patients increased for 6 of them (between 10 % and 40 %).

This led to an increase of the amount of waste to be disposed as well as the amount of plastic waste; at the same time, the amount of waste that was reused after special treatment was also higher.

The survey results showed that the amount of plastic medical waste generated in the surveyed medical facilities on average per month is 50 % (of the total amount of medical waste), but in some facilities it can reach even 72 %.

Many of these plastic materials might be recycled or re-used with proper separation procedures, such as syringes, systems, elastomers, and pumps for infusions.

According to our survey results, the most popular method of sterilising instruments to re-use them is by autoclaves (Fig. 4). Among the other methods are chemical cleansing and ultraviolet and plasma sterilisation.

How are reusable materials being sterilized for re-use?

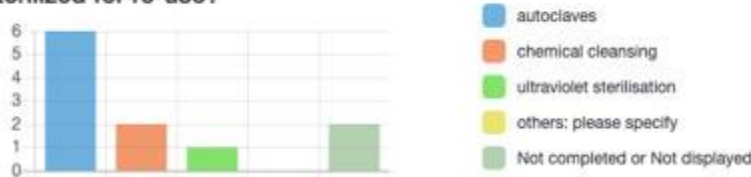


Figure 4. Methods of sterilising used by the researched medical institutions.

Challenges that hospitals currently experience with medical waste are mostly due to the lack of finance. This leads to a permanent need for containers and packages of different sizes for medical waste separation as well as autoclaves. There is a lack of money even to pay for outside companies and storage facilities reconstruction. There is no centralised disposal of medical waste in the west of Ukraine. There are only two certified companies that are able to utilise medical waste, and both are located more than 700 km away. Moreover, both facilities are endangered now due to constant shelling in Kyiv and Odesa.

In September 2023, we conducted a second interview with representatives of city and regional hospitals participating in the German-Ukrainian project MEDWASTE UKRAINE. There were 15 questions in the interview list connected with the results of participation in the project. Seven hospitals out of eight were interviewed: University Clinic, Ivano-Frankivsk Regional Clinical Cardiology Center, Ivano-Frankivsk Regional Children's Clinical Hospital, Prycarpathian Clinical Oncology Center, Ivano-Frankivsk Regional Clinical Palliative Care Center, Ivano-Frankivsk Regional Perinatal Center, City hospital #1. The results of the interviews are analyzed and presented in the given report. Almost all hospitals were represented by their directors during the interview except for City Hospital # 1 (the chief nurse), Prycarpathian Clinical Oncology Center (the storekeeper), Ivano-Frankivsk Regional Perinatal Center (the Head of the infection control department). Our hospitals have several sources of financing. The basic ones are presented in the following circular Figure 5.

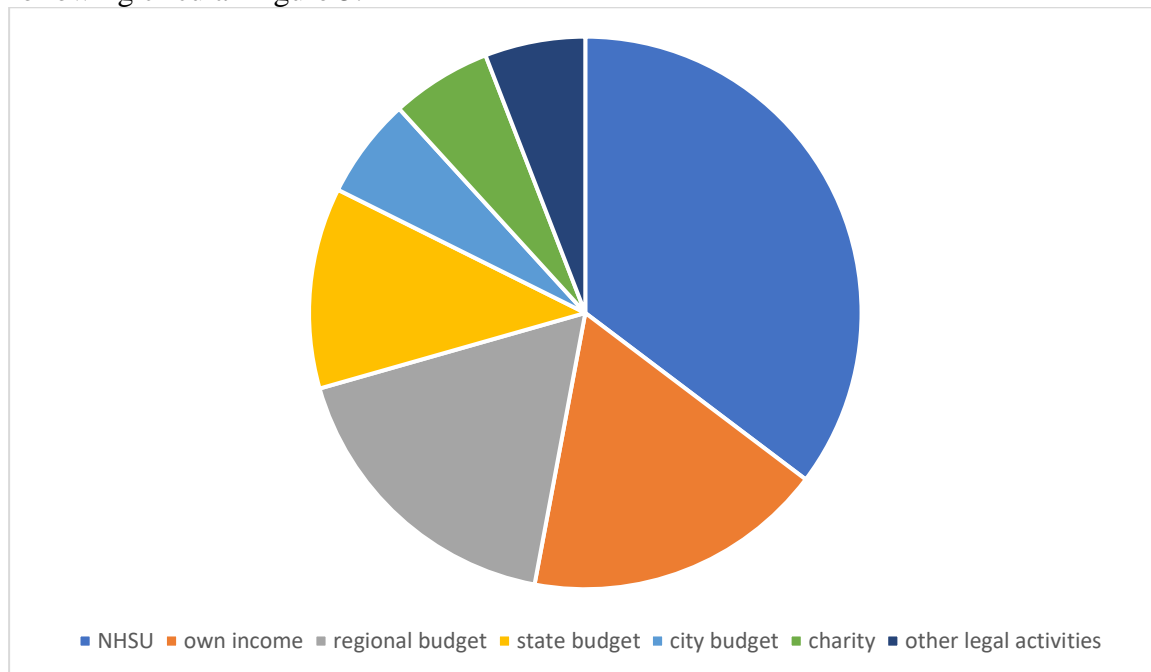


Figure 5. Sources of funding.

All hospitals are different in size, so the amount of financing differs. The level of financing can be seen in Figure 6.

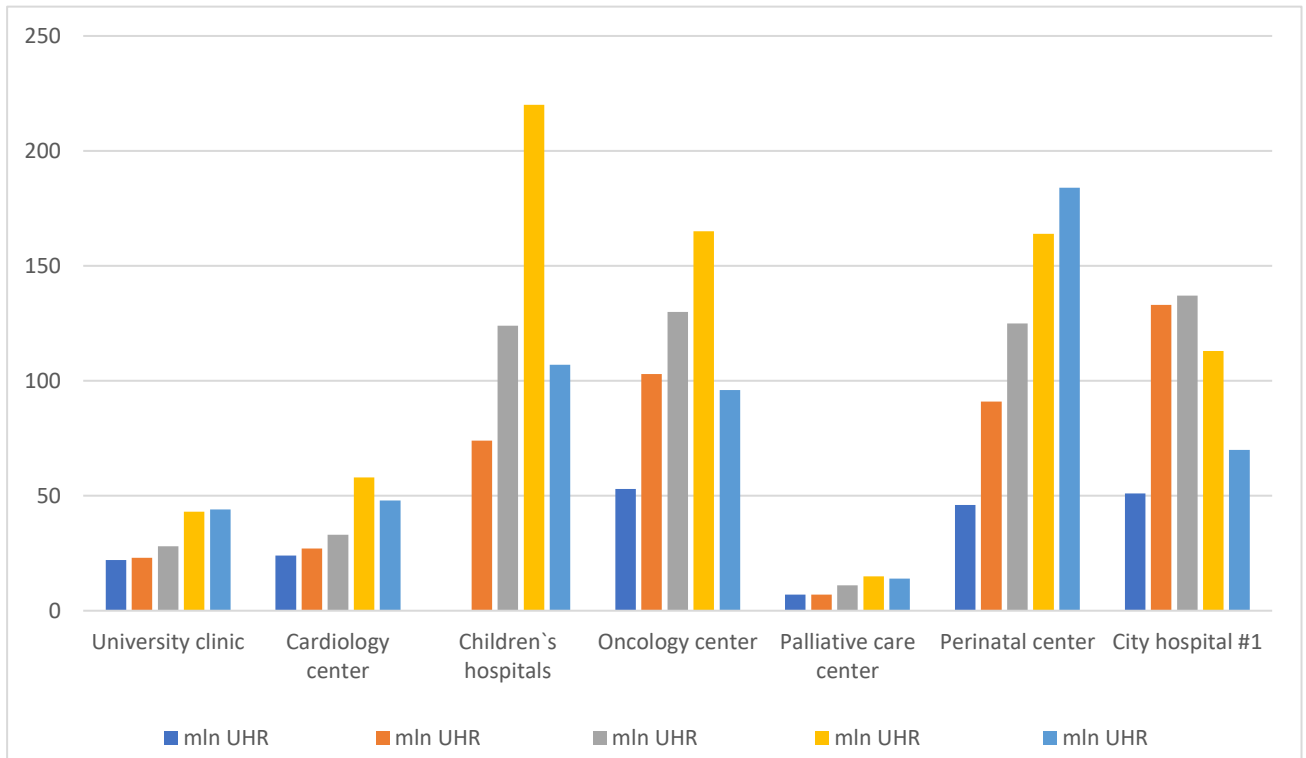


Figure 6. The hospital budget.

So, the hospital capacity is different. The number of beds is shown in Figure 7.

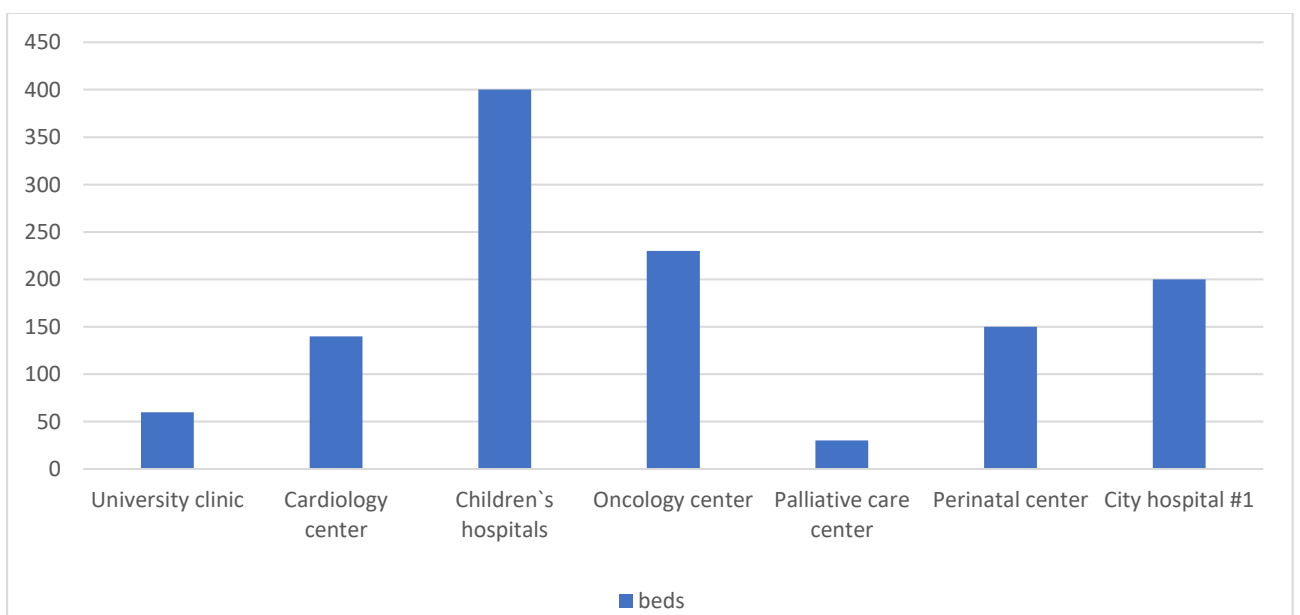


Figure 7. The hospital capacity

Yearly hospitals generate a certain amount of medical waste. Figure 8 illustrates how much waste is generated by each hospital on average per year.

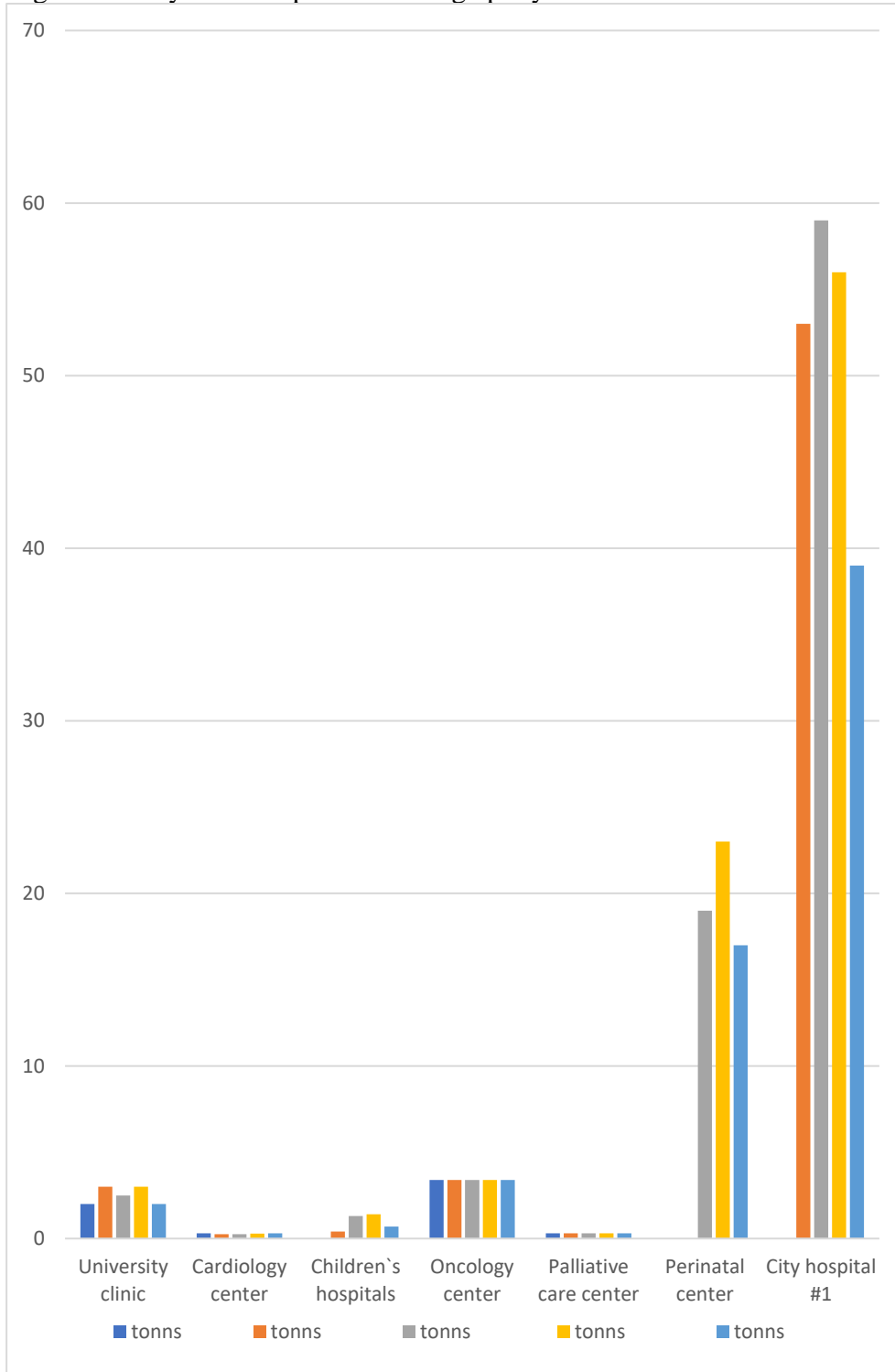


Figure 8. Amount of medical waste

Figure 9 shows the amount of medical waste generated annually by each hospital on average per bed.

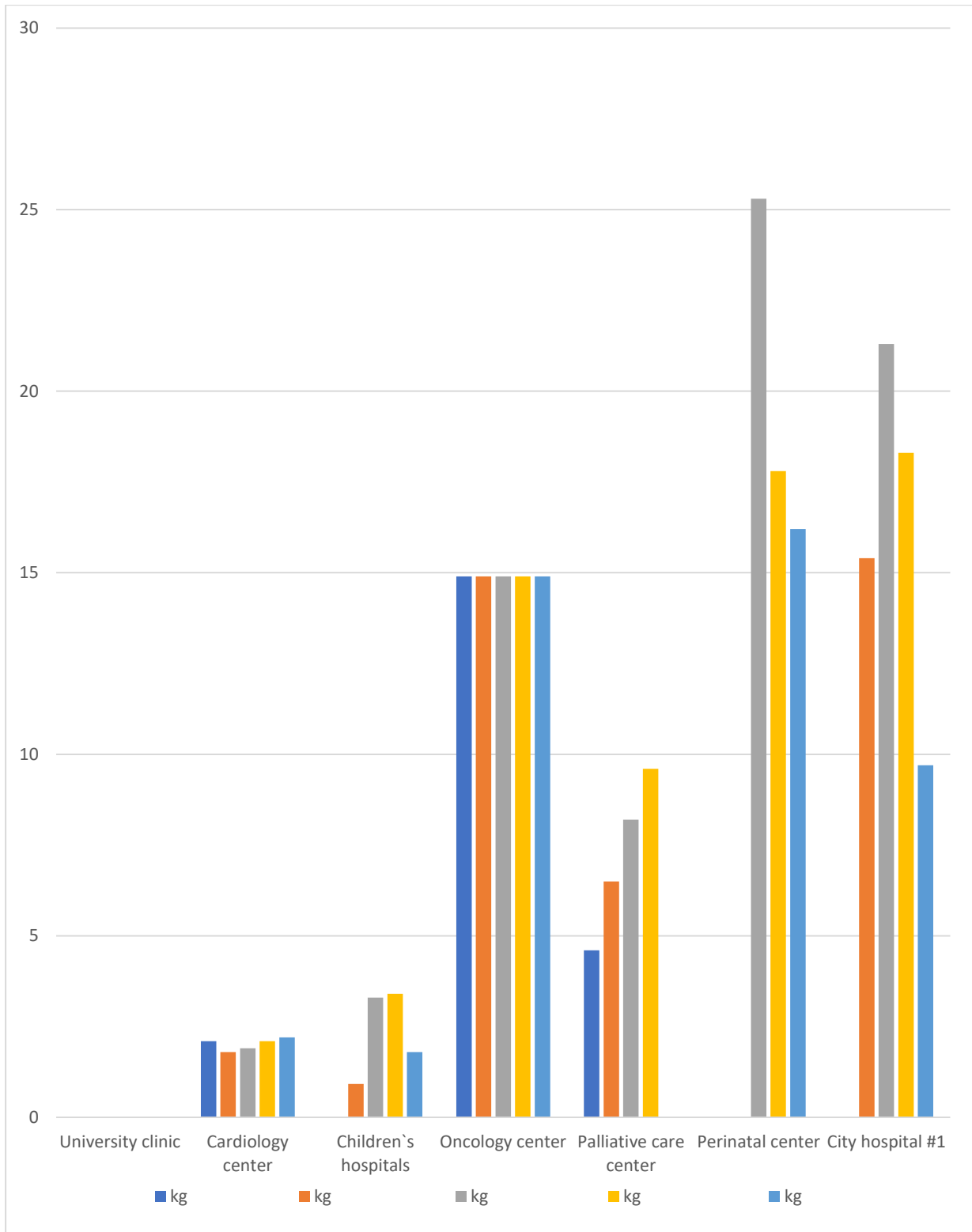


Figure 9. Amount of medical waste per bed.

Hospitals spend annually certain amount of money annually on medical waste management. Figure 10 illustrates these expenditures.

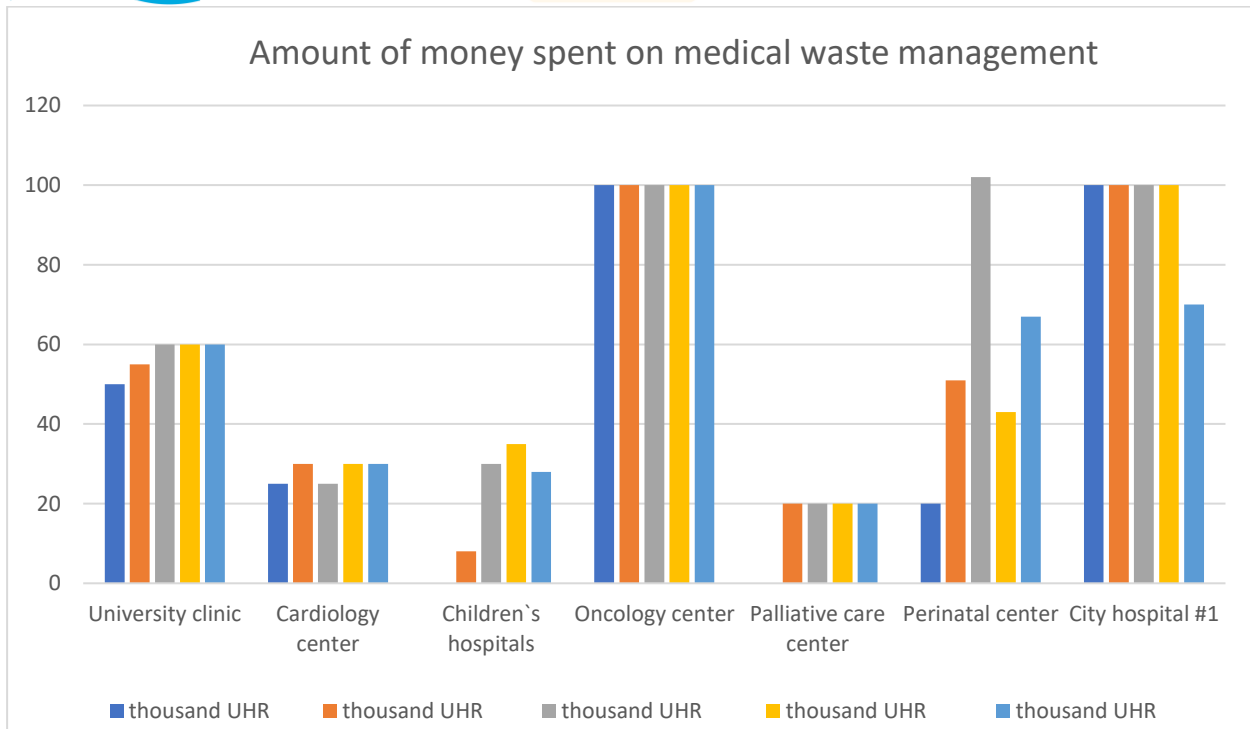


Figure 10. Amount of money spent on medical waste management

Thus, the first part of the interview showed that hospitals generate a lot of medical waste. And now after participation in the project hospital administration and employees realized the necessity of its proper management. That is why everybody is interested in changing the strategy of medical waste management, namely in professional training and proper facilities and logistics.

All hospitals underlined that participation in this project influenced positively their attitude toward medical waste separation and proper medical waste management.

All participants realized the danger of medical waste accumulation in hospitals, households, and landfills and its negative effect on humans. Some hospitals, namely those who went on an educational visit to Germany, have already taken certain steps to improve the current situation with medical waste. The University hospital bought boxes for medical waste separation for different rooms, arranged a special room for keeping and separating medical waste, started keeping a special register to control waste, and officially appointed the person responsible for medical waste management in our clinic. After getting acquainted with the experience of Hamburg hospitals, the Palliative care center arranged separate storage of medical waste (which includes diapers, dressings, and used syringes (we consider them infected)) and non-medical waste. In addition, they partially equipped the place for storing medical waste. Medical staff and patients of the Perinatal Center are being trained to separate medical waste. The administration of the hospital purchased some amount of containers, boxes, and bags for packaging. They encourage sponsors and entrepreneurs to buy the necessary inventory. Funds have been allocated to purchase a new autoclave for the bacteriology laboratory. City Hospital #1 also undertook several steps. Standard procedures for different categories of waste management have been developed in the hospital. A conference and training on hospital waste separation was held. A person responsible for waste management was appointed. Temporary medical waste storage is being repaired at the moment. Category A waste separation was initiated in all departments. The hospital separates medical waste into categories B and C. We have purchased dense bags for collecting medical devices contaminated with biological fluids and medicines (Category B). Containers for category C waste were purchased.



Still, all hospitals are planning to continue their activity to change the strategy of medical waste management, to equip a specialized room for the temporary storage of waste, to buy a sufficient number of containers for medical waste collection, to provide regular training for employees on waste management, to develop documentation to arrange a waste separation area, to obtain a license to handle medical waste, to install an autoclave to treat medical waste, to purchase a trolley to transport waste, etc.

All hospitals stated that they need support from the state government in terms of medical waste management. The main problem is the lack of financing. The Ministry of Health of Ukraine should invest more money in the development of medical waste management in general and in medical universities in particular. It is important to develop an integrated medical waste management system at the national and regional levels with clearly defined responsibilities, an official license register of waste management companies would be helpful. Hospitals expect logistical support. It is necessary to adopt strict legislative decisions on medical waste management that would comply with the EU Waste Directives, as required by the EU-Ukraine Agreement. It is important to move from declarative statements to clear control mechanisms at the state level, allocating money for medical waste management at the national level and in the budgets of healthcare institutions. It is required to increase the number of licensed medical waste management companies in Ukraine, to develop special educational programs on medical waste management, and to encourage suppliers of pharmaceutical products to develop clear disposal instructions. The National Health Service of Ukraine should separate the expenses on medical waste management and expenses on patient care services.

Hospitals also expect some support from the local authorities and the development of a special municipal program on how to deal with medical waste starting from collection and separation and finishing with its disposal. It would be great to have disposal companies in each region, to practice medical waste separation in all departments. They expect proper logistic and technical support for the disposal and recycling of all types of waste. It is necessary to increase funding to ensure proper medical waste management. Hospitals need support for projects launched to minimize bureaucracy and modernize the waste separation area. They expect our region to have its medical waste disposal plant one day. It will solve many problems with transportation, disposal, and recycling. They hope that our local authorities will solve the problem of disposal of medical devices containing mercury, arrange a closed area for the collection of household and medical waste following the requirements separately from residents, solve the problem of food waste disposal, find finances for containers to separate waste generated in the hospital. Almost all hospitals mentioned that they need autoclaves.

Plastic waste generated by hospitals accounts for a large part of all waste. However, it was calculated that it could be recycled to minimize disposal and negative effects on the environment. Though hospitals have no experience in doing so, they think that from 5% to 60% of A-category plastic waste could be recycled. Some hospitals even hope that 100% of it can be reused after special treatment.

Hospitals would be happy to get all kinds of support from Germany starting from the development of logistics, training materials, and workshops and ending with concrete material help and mutual participation in international projects.

It would be great to undergo professional online training with a test and certificate for clinic personnel to check their practical skills with specialists working in Hamburg hospitals. Visuals and reminders in the workplace are important to raise awareness of separate waste collection and safe waste management among hospital staff. Audio-visual aids in the form of bulletins, and memos on the formation of a culture of medical and household waste management will also be useful.



Table 3: Scheme of results obtained in healthcare facilities involved in the project

No	List of healthcare facilities in Ivano-Frankivsk involved in the Medical Waste of Ukraine project	Results obtained
1.	UNIVERSITY CLINIC Ivano-Frankivsk city Budget - 40-50 million hryvnias per year Capacity - 60 beds Medical waste management costs - UAH 50-60 thousand per year	Appointment of a responsible person, Continuous training of staff, Organisation of documentation, Allocation of a separate room for the temporary storage of medical waste, Arrangement of an external area for waste sorting, Sorting waste by category, placing containers for sorting in all rooms, Proper labeling of waste bags and containers.
2.	CITY CLINICAL HOSPITAL NO.1 Ivano-Frankivsk city Budget - UAH 101 million per year Capacity - 200 beds Medical waste management costs - UAH 100 thousand per year	Allocation of a separate room for temporary storage of medical waste, Arrangement of an external area for waste sorting, Sorting waste by category, and Proper labeling of waste bags and containers.
3.	REGIONAL CLINICAL CENTRE FOR PALLIATIVE CARE Budget - UAH 11 million per year Capacity - 30 beds Medical waste management costs - UAH 20 thousand per year	Continuous staff training, Streamlining of documentation, Arrangement of an external area for waste sorting, Sorting waste by category, and Proper labeling of waste bags and containers.
4.	REGIONAL PERINATAL CENTRE Budget - UAH 122 million per year Capacity - 150 beds Medical waste management costs - UAH 55 thousand per year	Appointment of a responsible person, Continuous training of staff, Organisation of documentation, Renegotiate contracts for waste disposal, Purchase of a powerful sterilizer, Purchase of containers for sorting and temporary storage of medical waste, Sorting waste into categories, placing sorting bins in all rooms, Proper labeling of waste bags and containers.
5.	IVANO-FRANKIVSK REGIONAL CHILDREN'S CLINICAL HOSPITAL No additional information provided	Organisation of training activities for medical staff, patients, and visitors on medical waste management in the facility and at home. Reconstruction of the old container site following the requirements (brick fence, roof, water supply, limited access).
6.	PRYCARPATHIAN CLINICAL ONCOLOGY CENTER IVANO-FRANKIVSK REGIONAL COUNCIL Budget – 261 UAH thousand No additional information provided	Containers for temporary storage of medical waste were purchased with funds allocated by the city authorities. Category B hazardous waste, including sharps, is transferred to a research and production company with which the company has concluded a contract for the provision of hazardous waste transportation and disposal services.
7.	Ivano-Frankivsk Regional Clinical Cardiology Center No additional information provided	Continue ongoing training of healthcare workers, patients, and visitors on the culture of medical waste management in the facility and at home. We are partially reconstructing and repairing the premises for temporary storage of medical waste (until it is sent for disposal).

All representatives of healthcare facilities noted that the main achievement of the project at the level of healthcare facilities was awareness of the problem of accumulation and hazard of medical waste, and dissemination of information and drawing attention to this problem. As a result, the responsible attitude of healthcare facility administrators, medical staff, and patients toward waste sorting was promoted. The last is active efforts to find alternative sources of funding for the purchase of waste sorting containers.

Possible solutions and sustainable strategies for medical waste management

Table 4. Types of waste and definition of medical waste categories*

Types of waste	Definition of medical waste categories
Category A household waste (non-hazardous waste);	<ol style="list-style-type: none"> 1) food waste; 2) waste that has not been in contact with biological fluids; 3) primary packaging of medicines that are defined as non-poisonous; 4) household waste (solid, bulky, repair); 5) bulky household waste.
Category B epidemically (infectiously) hazardous waste	<p>Contaminated (polluted) or potentially contaminated with infectious agents waste, regardless of the place of its generation:</p> <ol style="list-style-type: none"> 1) used dangerously sharp objects and medical devices (e.g. needles, syringes with a dressed needle, scalpels and their blades, broken glassware, intravenous catheters, blood collection lancets) contaminated with biological fluids; 2) immunobiological medicinal products with the primary packaging of the medicinal product that has not lost its integrity: <ul style="list-style-type: none"> with expired shelf life; stored in violation of the cold chain; with visual characteristics that have changed and are not specified in the manufacturer's instructions (e.g. presence of sediment and/or impurities, changes in colour and transparency); 3) medical devices and items contaminated with immunobiological drugs, blood and/or other biological fluids (e.g. oxygen masks, syringes without a needle, PPE); 4) organ waste and infected experimental animals (tissues, organs, body parts, placenta, embryos, etc.); 5) waste generated by medical laboratories (microbiological cultures and strains containing any live pathogens artificially grown in large quantities; live vaccines that are unusable, as well as laboratory cups and equipment for their transfer; residues of culture media, inoculation, mixing of microbiological cultures of infectious disease agents); 6) blood products and biological fluids (liquid biological waste), including liquid biological waste from vivariums obtained from patients with particularly dangerous or dangerous infectious diseases.
Category C toxicological hazardous waste	<ol style="list-style-type: none"> 1) waste contaminated with cytostatics and genotoxic medicinal and diagnostic products (pharmaceutical waste); 2) primary packaging of medicinal products defined in the List of Toxic Medicinal Products by international non-proprietary or common names, 3) dental amalgam; 4) batteries, mercury-containing devices and devices containing heavy metals.
Category D radiological hazardous waste	<p>Category D waste includes all materials generated as a result of the use of radioisotopes for medical and/or scientific purposes in any aggregate state that exceed the permissible levels established by radiation safety standards.</p> <p>The collection, storage, transportation and disposal of category D waste is carried out in accordance with the requirements of the Ukrainian legislation on radioactive waste management and radiation safety standards.</p>
Plastic waste	<p>The following plastic waste can be recycled:</p> <ul style="list-style-type: none"> - Polypropylene products - syringes, protective gowns, parts of medical masks, - polyvinyl chloride - intravenous infusion systems, oxygen masks, drainage tubes, catheters

(*The Law "On Waste Management," 2023)

GENERAL INSTRUCTIONS FOR AUTHORITIES:

- Regular and reliable **statistics** on the amount of medical waste and the publication of the results is important as a control tool at the national level. The data collected can later be used for reporting in accordance with European legislation. They can also serve as a basis for environmental policy decision-making. To begin with, the scope and type of environmental statistics that should be regularly collected in Ukraine at the national level should be determined.
- National strategies and **national programs for preventing medical waste generation** should be introduced at the national level, in the form of specific recommendations, tools, and measures. It is also necessary to identify opportunities for minimising and reusing waste, including reusable products in healthcare facilities after disinfection or sterilisation.
- Developing and promoting measures at the national level that show healthcare facilities, companies, associations, manufacturers, and other institutions how to avoid waste as a last resort, or **minimise** it.
- Establishment of a **comprehensive network of medical waste treatment facilities** at the national level, starting with the decontamination of infected waste by autoclaving, a network of temporary storage facilities for medical waste, and a network of facilities for the final high-temperature incineration of medical waste that cannot be decontaminated.
- Creation of a **unified database** of the types and amount of waste generated annually in healthcare facilities.
- Estimating the **costs at the national level** associated with good waste management practices.

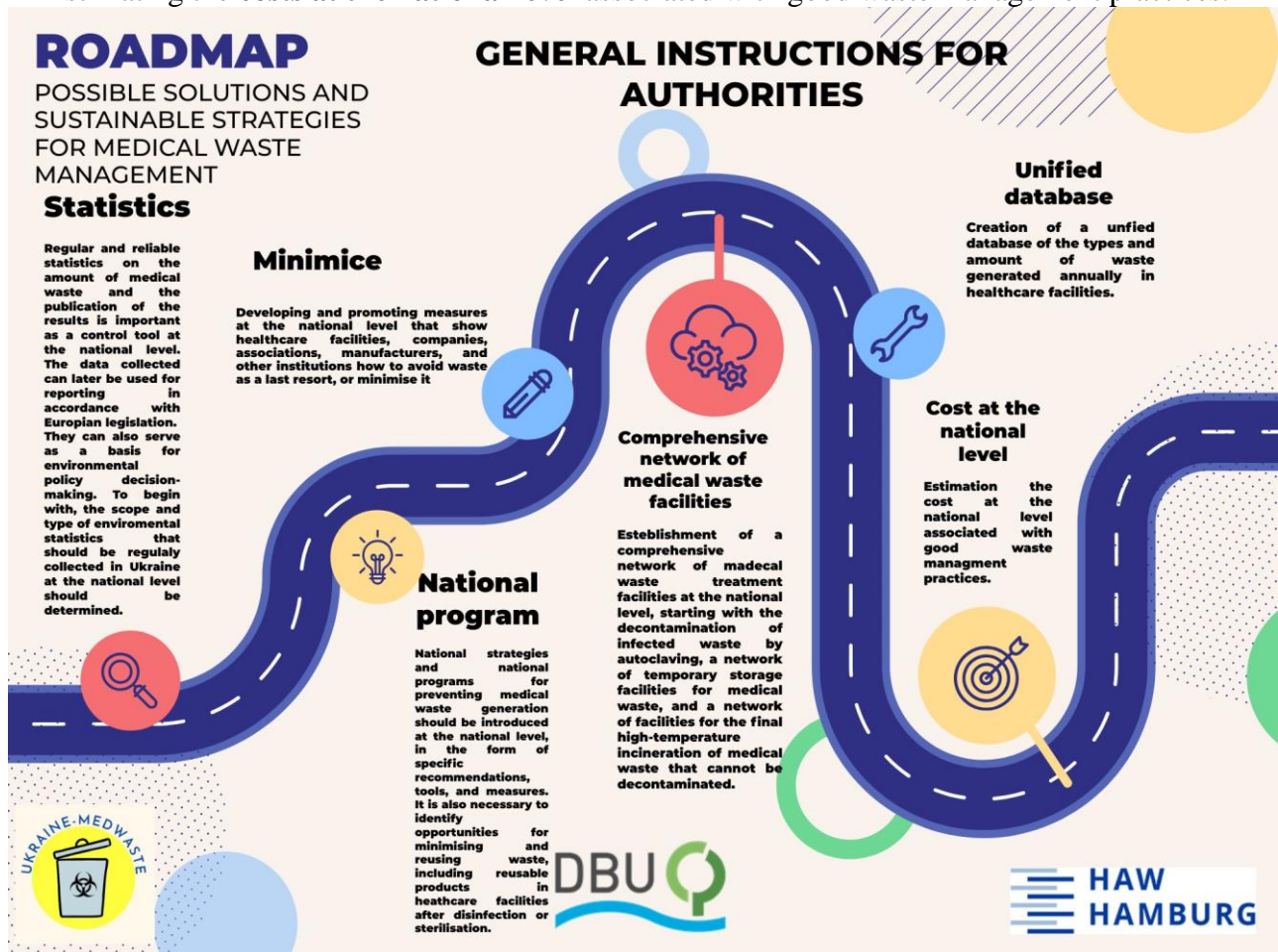


Figure. 11. General instructions for authorities.

RECOMMENDATIONS FOR MEDICAL FACILITIES:

- **Separate collection of different types of waste** from the outset, i.e. inwards, to maximise the material potential of the different waste streams. Separate collection of waste is essential to meet the quality requirements for the processing of materials related to individual waste streams.
- **Creation of a unified database of medicines** available in a healthcare facility or department, indicating the quantity and expiry date, regular audit of the available medicines, and ordering of medicines following the results and needs.
- **Gradual phasing out of mercury-containing thermometers** and lighting lamps and giving preference to more environmentally friendly materials.
- Appropriate **colour coding of medical waste** at all stages of collection, transportation and storage
- Regular **training of responsible personnel on medical waste management** in healthcare facilities.
- Development of a **clear algorithm of actions** in case of inappropriate medical waste management practices, injuries, or violation of procedures.
- Developing a **scheme for transporting medical waste** within the hospital with appropriate separation of routes for waste and staff, patients, and visitors
- Establishment of a **centralised medical waste storage facility** of category A and a separate centralised medical waste storage facility of category B within the healthcare facility in compliance with the relevant requirements.
- Introduce measures for **appropriate sorting of category A waste**, which is considered non-hazardous waste, into valuable components: plastic, glass, paper, and separate safe collection of sharps.
- Introducing **clear protocols for good practices in the disposal of Category A** food waste to prevent it from being discharged into the sewerage system.

Recommendations for medical facilities:



Figure 12. Recommendations for medical facilities.

Scheme of transport of category A waste within the healthcare facility:

- 1) Food waste; → Generation, → Composting, or transfer of sterilised food waste for livestock feed.
- 2) Waste that has not been in contact with biological fluids; → Collection once a day → centralised storage
- 3) Primary packaging of medicinal products that are defined as non-poisonous; → Collection once a day → Centralised storage facility.
- 4) Household waste; → Twice a day collection → Centralised storage facility
- 5) Bulky household waste; → Collection on an as-needed basis → Special container for bulky waste in a centralised storage facility.

The separate collection and clear categorisation and labeling on containers of **category B** waste: soft, sharp, liquid, pathological

- Develop clear procedures with timelines and identification of responsible persons in each department or centrally in the healthcare facility for the transport of medical waste within the facility and to the storage facility.
- Proper labeling of medical waste, including the name of the department, date of collection, category, and type of waste, decontamination marks, and the person responsible.

Scheme of transportation of category B waste within the healthcare facility:

Collection in the departments of the medical facility:

- Sharp waste, → Transportation every three days, → Centralised storage of category B waste in the medical facility
- Soft infectious waste → Transported three times a day → Centralised category B waste storage facility at the medical facility
- Pathological waste, → After generation, transport, → and Storage in a waste refrigerator
- Liquid infectious waste → After generation, disinfection → Discharge to the public network together with sewage.

Scheme of transportation of category C waste within the healthcare facility:

Collection in the departments of a medical facility:

- 1) Waste contaminated with cytostatics and genotoxic medicines and diagnostic products (pharmaceutical waste); transported as necessary, transferred to the hospital pharmacy for storage, and then centralised transfer to manufacturers for final processing or disposal.
- 2) primary packaging of medicinal products specified in the List of Toxic Medicinal Products by international non-proprietary or common names, if necessary, transported, transferred to the hospital pharmacy for storage, and then centralised transfer to manufacturers for final processing or disposal.
- 3) dental amalgam;
- 4) batteries, mercury-containing devices, and devices containing heavy metals transported as necessary and stored in a specially designated, locked room in the basement of the hospital.



Recommendations for manufacturers of medical products:

- The new Ukrainian legislation introduces the Product Responsibility Instrument, which defines responsibility throughout the life cycle of medical and pharmaceutical products and all that may later become medical waste. This creates incentives for the production of durable and low-waste products. Product responsibility should also be taken into account and ensure environmentally sound recycling and disposal after use.

Medical waste is suitable for recycling:

- polypropylene products —————> syringes, protective gowns, parts of medical masks,
- polyvinyl chloride —————> intravenous infusion systems, oxygen masks, drainage tubes, catheters
- glass vials and test tubes

Risks and challenges of the project MEDICAL WASTE UKRAINE

Despite the difficulties with electricity and internet connection in Ukraine, the responses of hospital representatives to the questionnaire were collected. They were translated, analysed and grouped into a table "Current situation with medical waste in Ivano-Frankivsk hospitals". It contains valuable information about the problems and gaps in the medical waste management system, risks to the environment, and whether there are consequences of improper medical waste disposal that are already affecting ecosystems or will affect them in the future.

Unfortunately, due to the active military operations in Ukraine, hospitals are experiencing a severe lack of funding and a shortage of qualified personnel, especially in the area of proper medical waste management. For this reason, and possibly for a number of other reasons, one hospital that was announced as a participant at the beginning of the project did not respond to the survey and did not provide information.

4. Public relations and communications

Table 5. The list of publication about the project MEDICAL WASTE UKRAINE

№	Title of the publication	Media	Link to the publication
1	We are waiting for the publication of an interview about the project of solid medical waste in Ukraine, which is posted daily on the Waste Manager Medicine portal of REMONDIS Medison GmbH	Waste Manager Medicine portal of REMONDIS Medison GmbH	The interview is being prepared for publication
2	General information about the DBU project Sustainable MEDICAL WASTE – UKRAINE, which is coordinated by FTZ-NK, briefly describes the prerequisites and the main goal of this project.	Linkedin	https://www.linkedin.com/posts/research-and-transfer-center-sustainable-development-and-climate-change-management_medwasteukraine-sustainability-circulareconomy-activity-7084118447579615232-MaKM?utm_source=share&utm_medium=member_desktop
3	Coverage of information regarding the educational visit held within the framework of the Sustainable Ukraine-MEDWASTE pilot project for heads of Ukrainian hospitals in the period from 30.04.2023 to 04.05.2023	Linkedin	https://www.linkedin.com/posts/research-and-transfer-center-sustainable-development-and-climate-change-management_dbu-sustainabledevelopment-researchprojects-activity-7063780930796015616-RYSE?utm_source=share&utm_medium=member_desktop
4	Coverage of the round table event Within the framework of the MEDWASTE Ukraine pilot project, after an introductory visit of heads of Ukrainian hospitals and trainings at Fachkraft für Arbeitssicherheit ASKLEPIOS and University Hospital Hamburg-Eppendorf, as well as a training seminar with a representative of REMONDIS on the topic: the specifics of German legislation on waste management. In order to spread knowledge and information among a wider circle of Ukrainian colleagues who took part in the survey, a round table was held with representatives of city and regional authorities regarding problems related to the proper practice of medical waste management.	Linkedin	https://www.linkedin.com/posts/research-and-transfer-center-sustainable-development-and-climate-change-management_sustainable-medical-waste-ukraine-the-way-activity-7084118654551781376-Lrb4?utm_source=share&utm_medium=member_desktop

5	MEDWASTE Ukraine project information on the HAW Hamburg page	HAW web page	https://www.haw-hamburg.de/en/research/research-projects/project/project/show/ukraine-medwaste/
6	The new article "Medical waste management and the UN Sustainable Development Goals in Ukraine: An assessment of solutions to support post-war recovery efforts" has just been published in the open access. This study was carried out within the framework of the project "Sustainable Medical Waste Ukraine", which was kindly funded by DBU. We would like to take this opportunity to express our sincere gratitude to DBU for their kind funding.	Linkedin	https://www.linkedin.com/posts/research-and-transfer-center-sustainable-development-and-climate-change-management_dbu-security-food-activity-7128824405501046784-eCZU?utm_source=share&utm_medium=member_desktop
7	Extend the invitation to the final event of MEDICAL WASTE UKRAINE, where we will look at international and local sustainable waste management strategies for a sustainable future! Pollution from improper medical waste management can have global implications, and during this event we will discuss how to tackle this problem at the city level.	Linkedin	https://www.linkedin.com/posts/research-and-transfer-center-sustainable-development-and-climate-change-management_dbu-medicalwaste-finalevent-activity-7135248140160372739-M1L9?utm_source=share&utm_medium=member_desktop
8	The FINAL EVENT in the Sustainable Medical Waste Management project took place online on the 29th of November 2023. We had an outstanding and productive meeting on "Sustainable Medical Waste Management in Ukraine", which attracted interest from scientists working in this field around the world, and together we had a fruitful discussion, shared our findings and conclusions.	Linkedin	https://www.linkedin.com/posts/research-and-transfer-center-sustainable-development-and-climate-change-management_dbu-medicalwaste-finalevent-activity-7137892527092695041-EiRH?utm_source=share&utm_medium=member_desktop
9	Training seminar on the topic - Requirements for Disposal in the Clinic - Avoiding Problems. On 4.12.2023, within the framework of the project „SUSTAINABLE MEDICAL WASTE UKRAINE“,	Linkedin	https://www.linkedin.com/posts/research-and-transfer-center-sustainable-development-and-climate-change-management_dbu-medicalwaste-uke-activity-7139912355559153664-I9QF?utm_source=share&utm_medium=member_desktop

	online training was organized for representatives of Ukrainian healthcare institutions on good practices in medical waste management in clinics.		
10	Interview article: Looking Beyond Ukraine. Medical waste management in the war zone. Published on 1 September 2023 on the medical portal. The article highlights the measures of sustainable medical waste management, describes the visit of the Medical Waste project group to Germany, and describes the problems arising from the limited disposal of medical waste.	Abfallmanager-medizin	https://www.abfallmanager-medizin.de/blick-ins-ausland/ukraine/
11	Scientific article: Medical waste management and the UN Sustainable Development Goals in Ukraine: An assessment of solutions to support post-war recovery efforts was published based on the results of the Medical Waste Ukraine project. Published in Environmental Challenges, Volume 13, December 2023.	Science Direct	https://doi.org/10.1016/j.envc.2023.100763
12	Call for Papers for a New Book: Medical waste management: circularity and sustainability. The book will be published as part of the fully indexed Climate Change Management series https://lnkd.in/dxeCWmz , published by Springer Nature.	Linkedin	



Conclusions

We exchanged best practice examples from the hospitals in Hamburg with our Ukrainian partners and hospitals and piloting the strategy's for hospitals in Ukraine via Ivano-Frankivsk. We identified the health and safety risks associated with inadequate disposal of healthcare waste and desined a road map. Furthermore, we proposed measures to address the problem. To achieve this, we were in close exchange with partners from Ukraine to address joint strategies that are feasible.

At the initial stage of the project, a survey of hospital representatives was conducted to identify the challenges faced by healthcare facilities in implementing good medical waste management practices. Based on the results, we prepared training materials and study tours to the hospitals of the University Hospital Hamburg-Eppendorf and Asklepios Clinic.

We prepared a report about visit of hospital representatives from Ukraine to Hamburg. We conducted workshops for them at the HAW Hamburg and visited a few hospitals in Hamburg to see medical waste management. Afterwards, the Ukrainian partners prepared in Ukraine a round table meeting with important stakeholder from the government from the city and region of Ivano-Frankivsk. The study tour at the Asklepios Clinic was conducted by Anne Friederike Den, Product Group Manager Environmental Health, Occupational Health Specialist, Chartered Engineer (FH), Centre for Occupational Safety, Environment and Health. The study tour at the University Hospital Hamburg was conducted by Heiko Schlüter, Waste Specialist, University Medical Centre Hamburg-Eppendorf, Safety and Compliance Department, Occupational Health and Safety Specialist.

We completed Surveys, presented the results on our final seminar in Ivano-Frankivsk and online (29 of November 2023) and published the results in [scientific journal](#).

An online training seminar was held for representatives of medical institutions responsible for medical waste management. The training seminar was conducted by Heiko Schlüter, Works Officer for waste, University Medical Centre Hamburg-Eppendorf, Safety & Compliance Division, Occupational Safety Specialist.

The training program was attended by more than 140 people, followed by a lively discussion, and all participants had the opportunity to ask questions and receive answers. Also, all participants received certificates of studying the experience of European healthcare institutions in waste management.

To sum up, practical medical waste management is the most important step in management and treatment activities for reducing the generation of medical waste in Ukraine. However, further research about the consumption hotspots of plastics in medical institutions in Ukraine is needed. At the same time, there is a lack of understanding of the environmental and financial trade-offs of switching from single-use consumables to reusable alternatives that require in-house or service sterilization, considering life cycle assessments for targeted products and alternatives. Before implementing any new changes in the waste management system, it is essential to analyse the possible challenges to be faced before, during, and after implementing the changes.

The biggest and most dangerous environmental and health threat is the lack of waste treatment facilities in Ukraine for biohazardous waste.

The project results are illustrated in Appendices 1 to 7



Resources

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UNIVERSITY CLINIC Ivano-Frankivsk city



UNIVERSITY CLINIC Ivano-Frankivsk city



Changes in the healthcare facility resulting from participation in the project:

Appointment of a responsible person, Continuous training of staff, Organisation of documentation, Allocation of a separate room for temporary storage of medical waste, Arrangement of an external area for waste sorting, Sorting waste by category, placing containers for sorting in all rooms, Proper labelling of waste bags and containers

CITY CLINICAL HOSPITAL NO.1 Ivano-Frankivsk city



CITY CLINICAL HOSPITAL NO.1 Ivano-Frankivsk city



Changes in the healthcare facility resulting from participation in the project:
Allocation of a separate room for temporary storage of medical waste, Arrangement of an external area for waste sorting, Waste sorting by category, Proper labelling of waste bags and containers.

REGIONAL CLINICAL CENTRE FOR PALLIATIVE CARE



REGIONAL CLINICAL CENTRE FOR PALLIATIVE CARE



Changes in the healthcare facility resulting from participation in the project:
Continuous training of staff, Streamlining of documentation, Arrangement of an external area for waste sorting, Waste sorting by category, Proper labelling of waste bags and containers

REGIONAL PERINATAL CENTRE



REGIONAL PERINATAL CENTRE



Changes in the healthcare facility resulting from participation in the project:

Appointment of a responsible person, Continuous training of staff, Organisation of documentation, Renegotiate contracts for waste disposal, Purchase of a powerful steriliser, Purchase of containers for sorting and temporary storage of medical waste, Sorting waste into categories, placing sorting bins in all rooms, Proper labelling of waste bags and containers.

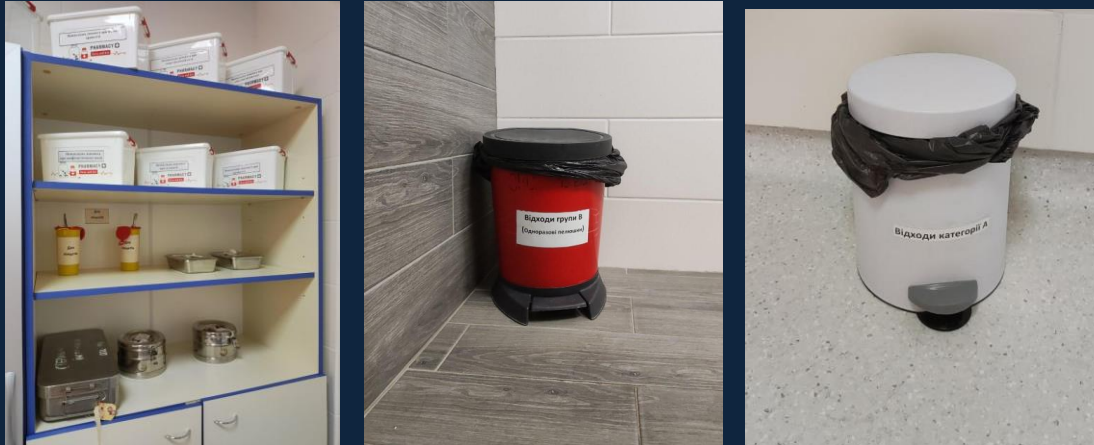
IVANO-FRANKIVSK REGIONAL CHILDREN'S CLINICAL HOSPITAL



Changes in the healthcare facility resulting from participation in the project:

Sorting waste into categories, placing sorting bins in all rooms, Proper labelling of waste bags and containers. Organisation of training activities for medical staff, patients, and visitors on medical waste management in the facility and at home. Reconstruction of the old container site following the requirements (brick fence, roof, water supply, limited access).

PRYCARPATHIAN CLINICAL ONCOLOGY CENTER IVANO- FRANKIVSK REGIONAL COUNCIL



Changes in the healthcare facility resulting from participation in the project:

Appointment of a responsible person, Continuous training of staff, Organisation of documentation. Containers for temporary storage of medical waste were purchased with funds allocated by the city authorities. Category B hazardous waste, including sharps, is transferred to a research and production company with which the company has concluded a contract for the provision of hazardous waste transportation and disposal services.

Ivano-Frankivsk Regional Clinical Cardiology Center



Changes in the healthcare facility resulting from participation in the project:

Continue ongoing training of healthcare workers, patients, and visitors on the culture of medical waste management in the facility and at home. We are partially reconstructing and repairing the premises for temporary storage of medical waste (until it is sent for disposal).