

*Andriy Pavliv*

## ECOLOGICAL CHALLENGES IN URBAN DEVELOPMENT OF LVIV NOWADAYS

*Lviv Polytechnic National University, 12, S. Bandery str., Lviv, 79013, Ukraine,  
apavelli1116@gmail.com, AndriyPavliv*

*Received: September 17, 2016 / Revised: January 27, 2017 / Accepted: March 9, 2017*

© Pavliv A., 2016

**Abstract.** In this article we look at the problems of hazardous waste in Lviv, as well as the global experience in solving such problems. We review the main steps and measures Lviv authorities have been taking to tackle the issue of household waste, recycling of electrical and electronic equipment. We analyse the results of these steps and measures.

**Key words:** household waste of electrical and electronic equipment, hazardous waste management, creation of municipal waste management system, integrated municipal programme, Lviv.

### 1. Introduction

Green areas make an integral and essential part of a comfortable city. They not only ensure the existence of city ecosystems, but also please the eye. Forming and maintaining the aesthetics of green spaces of parks, central boulevards, avenues and squares of Lviv, the so-called landscape architecture, was mainly done in the last century (1888–1913 years) by Carol Arnold Rering – the inspector of municipal plantations. Today, most of the exterior of green spaces is not that pompous as that of the late nineteenth century, but the loss of its aesthetic appearance is not the biggest problem in our time. There is a threat of their total destruction due to high levels of pollution with hazardous waste, including household waste of electrical and electronic equipment.

In European countries, environmental protection is an issue of great public and governmental attention, while in Ukraine it is quite far from being among the top problems to be tackled. Some measures in this sphere have been taken in Lviv.

For Lviv, the problem of solid waste is one of the most pressing issues. There is no waste recycling plant in the city, the Hrybovychi landfill site is overloaded, there are littered spots in some remote areas of the outskirts, no implemented garbage separation and just an initial sorting of all types of waste.

### 2. Basic Theory Part

In this article we will look at the problem of environmental pollution with household waste of electrical and electronic equipment in Lviv and measures to address it.

By household waste of electrical and electronic equipment (hereinafter – WEEE) we mean: energy saving and fluorescent lamps, batteries, computers, refrigerators and other small and large devices that are outdated and not used for their purposes or are out of order; electronic devices used for data processing and telecommunications in private households [1, p. 8].

These waste products which contain heavy metals (lead, cadmium, mercury and others), contaminate the soil, surface and groundwater. Hazardous substances which are emitted into the atmosphere when these waste products burn, contaminate the air. Energy saving, fluorescent lamps fall into the category of extremely hazardous waste and are graded as 1 class of toxicity.

**Problems of household waste of electrical and electronic equipment in Lviv.** Lviv is an important business, cultural and tourist center of western Ukraine, home for a significant number of research institutes, educational institutions, hotels, restaurant management facilities, industrial plants. *Major producers of WEEE in Lviv* are:

- *household users of electrical and electronic equipment:*

a) local residents. In one year 150 000 families in Lviv (758.351 pers.) dispose of 75 tons of waste batteries of low power. Consequently, the landfill, according to rough estimates, gets in 5 to 15 kg of mercury annually;

b) tourists. In 2015 due to numerous scientific conferences, festivals, art events and just with touristic purposes, Lviv was attended by about 2 million people. Numerous international roads, rail and air routes go across the city. Streams of tourists, whose number is increasing every year, produce significant amounts of waste, including WEEE;

- *public and educational institutions, industrial enterprises.*

Similarly to global trends, volumes of WEEE in Lviv are growing every year.

To establish an efficient system of proper WEEE management in Ukraine, on the whole, and in Lviv, in particular, we need to overcome and find solutions to *the following problems*:

– ***Imperfect legislation and regulatory framework.*** Today in Ukraine there are such laws, regulations and other documents in the field of solid waste:

- *Laws of Ukraine* “On Waste” (No. 187/98-VR of 05.03.1998), “On Chemical Power Sources” (No. 3503-IV of 23.02.2006); “On environmental protection” (No. 1264-XII of 25.06.1991) “On ensuring sanitary and epidemiological welfare” (No. 4004-XII of 24.02.1994), “On the Fundamentals (strategy) of the State Environmental Policy of Ukraine until 2020”, “On local government in Ukraine” (No. 280 / 97-VR of 21.05.1997), “On licensing certain types of activities” (No. 1775-III of 01.06.2000);

- “*National Action Plan on Environmental Protection for 2011–2015*” approved by the Cabinet of Ministers of Ukraine No. 577-r of 25.05.2011;

- “*Regulations on the Control of Transboundary Movements of Hazardous Waste and its disposal / utilization and the Yellow and Green lists of waste*” approved by the Cabinet of Ministers of Ukraine No. 1120 of 13.07.2000;

- *program and the concept of the program*: “The program of solid waste management” approved by the Cabinet of Ministers of Ukraine No. 265 of 4.03.2004; “The regional program of solid waste management for the period of 2007–2015”, approved by the Lviv Regional Council No. 310 of 12.06.07; “The concept of a national waste management program for the years 2013–2020”, approved by the Cabinet of Ministers of Ukraine, No. 22-r of 03.01.2013;

- *guidelines and procedures*: “Guidelines for the preparation of local programs of solid waste management”, approved by the Ministry of Construction, Architecture and Housing and Communal Services of Ukraine (hereinafter – MCAHCSU) No. 2 of 10.01.2006; “Guidelines for the formation of national awareness on ecologically- friendly household waste management”, approved by the Ministry of Housing and Communal Services of Ukraine of 16.02.2010 No. 38; and “separate collection of waste”, approved by MCAHCSU No. 133 of 01.08.2011; “Guidelines for collecting waste of electrical and electronic equipment, which is the part of household waste”, approved by MCAHCSU No. 15 of 22/01/2013;

- “*License conditions for economic activity with operations in hazardous waste management*”, approved by the Ministry of Ecology and Natural Resources of Ukraine No. 433 of 04.11.2011.

Some of these documents contain some inconsistencies. Thus, the use of the provisions of the Cabinet of Ministers of Ukraine № 1120 of 13.07.2000, within the legal framework of the Law of Ukraine “On Waste” or relevant regulations is quite incorrect [2].

There are also some inconsistencies in management of waste batteries and other chemical electric sources of small capacity, including those which are generated in households. According to the Law “On Chemical Power Sources” waste batteries, accumulators and so on, which are generated in households, do not have the legal status of waste, including household waste. ... The vast majority of batteries and accumulators used in households are much lower capacity than it is specified in Article 17 of the Law “On Chemical Power Sources” and, accordingly, does not fall under the mandatory deposit requirement for disposal [3].

The “Guidelines for the formation of national awareness on ecologically-friendly waste management” do not contain any provisions on dealing with waste of electrical and electronic equipment, only batteries are mentioned in terms of their separation before combustion [2].

– **The lack of reliable statistics on the number of produced, imported or sold EEE**, which does not allow the control of volume of hazardous waste and minimum amount of its utilization or processing;

– **Lack of ecological education**, thus very low public interest in ways to reduce the impact of waste on the environment;

– **Lack of awareness about the harm of WEEE and its proper management.** The survey, conducted among Lviv residents and the analysis of collected data showed that only 27 % of respondents are aware of the dangers of spent energy saving lamps and batteries, 50.3 % are partially aware, 22.7 % are not aware at all (Fig. 1).

Only 13.5 % of surveyed households keep these waste products at home or take them to the collection points, 86.5 % throw batteries and lamps in the trash (the largest proportion of respondents aged 18–25).

The respondents aged between 46–60 are prepared to the responsible management of spent energy saving lamps and batteries, of which 94.9 % are set to carry the waste to organized collection points [1, p. 10];

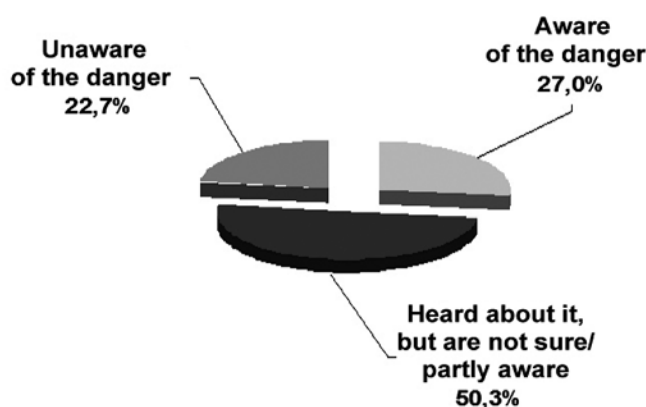


Fig. 1. Awareness of the dangers of waste energy saving lamps and batteries

– **reluctance of electrical and electronic equipment producers to report the presence of harmful substances in their products and the lack of required markings;**

– **lack of companies that recycle or dispose of hazardous waste.** In Lviv, SE “Argentum” works in this sphere, in the Lviv region, recycling of mercury-containing devices is done by the Scientific and Production Private Enterprise “Ecocenter”. Note that all companies do not have enough of necessary raw materials;

– **lack of experience in implementing similar projects in Ukraine.**

#### **Global experience in electrical and electronic equipment waste management.**

One of regulations for WEEE in the European Union is the EU Directive 2002/96 / EC of 27 January 2003 (updated 2008) on used electrical and electronic equipment (WEEE – Waste Electrical and Electronic Equipment), according to which:

- equipment must be suitable for disassembly and recycling;
- electronic devices manufacturers are obliged to accept spent or not suitable for use EEE free of charge, carry responsibility for its disposal, including financial;
- specialized processing (recycling) of WEEE must be insured. The priority is to re-use parts;
- citizens should be aware of:
  - possible impact of WEEE on the environment and human health due to the presence of these hazardous substances;
  - contribution of population in reduction of the impact on the environment;
  - necessity of separate collection of waste, points of WEEE collection;
  - importance of marking;
- the state should create a register of producers and collect information, including annual estimates of the number and categories of electrical and electronic equipment available on the market and collected, already

reused, recycled and recovered within the EU Member States and information on weight and the amount of collected waste which was exported;

- set technical requirements for WEEE storage (including temporary), places and equipment for its processing [4, p. 63].

Global practice shows using the following techniques in WEEE management :

- disposal of solid household waste in landfills;
- high-temperature incineration at waste incineration plants;
- export to the countries of the “third world”, mainly as humanitarian assistance;
- processing at specialized plants for recycling electrical and electronic equipment [1, p. 15].

Directive 2012/19 / EU of the European Parliament and Council of 4 July 2012 on waste of electrical and electronic equipment, which came into force on 13 August 2012 provides that Member States shall ensure that in 2016 45 % of electronic equipment sold in each country is processed, and by 2019 this figure should rise to 65 % (or 85 % of electronic waste collected separately) [4, p. 66].

The responsibility for the collection and disposal of WEEE in most EU countries lies with the municipalities and suppliers. Only in Belgium the collection of electronic waste is organized and monitored by the government.

**The project “Creation of municipal waste management system of household electrical and electronic equipment in Lviv based on the experience of Lublin”. “Integrated Municipal Programme of household waste management of electrical and electronic equipment in Lviv in 2013–2017”.**

The need to address problems of pollution in Lviv, including issues of hazardous waste, prompted the Department of City Development of Lviv City Council (applicant and lead partner of the project) together with the Lublin municipality (Poland) and the NGO “Environmental Initiatives” within the framework of cross-border cooperation Poland-Belarus-Ukraine 2007–2013, which is co-funded by the European Neighbourhood and Partnership Instrument (ENPI), (priority 2.1 – “protection of the environment in the border areas”) to implement the project “On creation of a municipal system of household waste management of electrical and electronic equipment in Lviv using the experience of Lublin” ; the timeframe was set for the period of February 2013– November 2015.

The project, submitted in September 2011 to the second set of competition of Transboundary Cooperation Programme Poland-Belarus-Ukraine 2007–2013, was selected from 130 projects and received additional financing from the funds of the European Union.

**The project included:**

- development and approval of “Integrated Municipal Programme of WEEE management in Lviv”;
- implementation of this programme.

“Integrated Municipal Programme of WEEE management in Lviv in 2013–2017”, was approved by the City Council, order No. 3066 of 20/03/2014, a first initiative of such a kind in Ukraine. The city obtained a quality and long-term tool to implement system activities in the sphere of WEEE.

This municipal program aimed to address the following issues:

- *urban development*. The narrow streets of the central part of Lviv and lack of space for container collection sites for WEEE collection, prompted to provide the installation of mobile collection points of waste. For this purpose we purchased and equipped two minibuses;

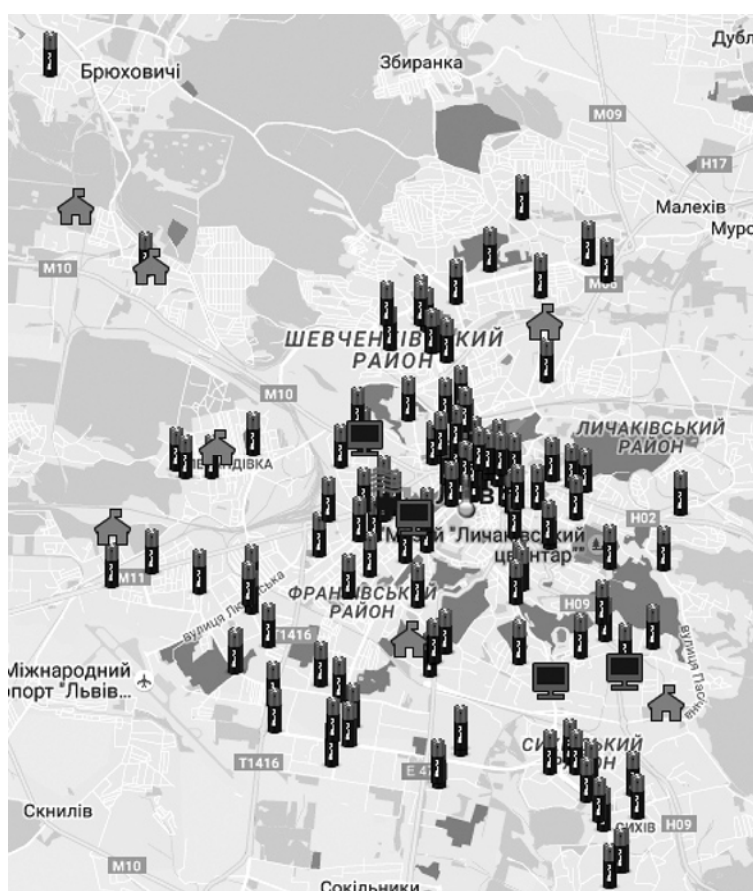
- *environmental*, including reducing the direct negative impact of WEEE on the environment as well as technological burden due to mining of raw materials for EEU; rational use of resources;

- *economic*. Products of WEEE processing make a valuable source of secondary raw materials. Purchased and installed special containers for separate collection and mobile collection points, will improve the performance of the companies that specialize in disposal and recycling of such waste products;

- *social*. Industry of processing of waste electronic equipment creates jobs. For example, according to the estimates of Electronics TakeBack Coalition, processing of 10,000 tons of WEEE annually creates about 300 jobs [4, p. 82]. Educational activities in this area involve people to participate in various programs, educate responsible attitude in dealing with waste.

**The results of the “Integrated Municipal Programme of WEEE management in Lviv in 2013–2017” in terms of the project “Formation of a system of municipal waste management of household electrical and electronic equipment in Lviv using the experience of Lublin”:**

- we estimated the capacity, purchased and installed a line for disposal of used fluorescent lamps and other mercury-containing items of equipment;
- we designated the points for separate collection of waste batteries, purchased and placed there 80 special containers (Fig. 2, 3);
- we organized two specially equipped mobile units (minibuses) (Fig. 4) for the collection of waste batteries and fluorescent lamps, determined their routes and parking places;
- we conducted the information and education campaign on coverage of WEEE management aimed at raising awareness in this sphere;
- we hosted an international conference on dissemination of best international practices in the sphere of WEEE.



**Fig. 2.** Interactive map of Lviv marked with the points of separate collection of waste batteries, thermometers, mercury-containing light bulbs, electronic waste; made by the publishing house “Velyka Epoha”, November 2015 [5]



**Fig. 3.** Special containers for collection of waste batteries



**Fig. 4.** Specially equipped mobile collection point for waste batteries and luminescent light bulbs

Today the issue of WEEE management is particularly relevant not only for Lviv, but also for Ukraine on the whole, which seeks to implement EU standards in this sphere. Thus, the project Twinning “Implementation of management systems of waste of electrical and electronic equipment (WEEE) in Ukraine” started in 2016, its estimated duration is 21 months.

The aim of this project is to minimize the negative impact of household hazardous waste to preserve the quality of soil, water and air based on the principles stipulated by the EU Directive on waste.

Twinning project is implemented jointly by the Ministry of Regional Development, Construction, Housing and Communal Services of Ukraine with the Austrian Agency for the Environment (Umweltbundesamt

GmbH), French International bureau on Water (Office International de l'Eau), Spanish International and Ibero-American Foundation of Public Management and Public Policy (Fundación Internacional y para Iberoamérica de Administración y Políticas Públicas (FIIAPP) [6].

### 3. Result and Discussion

The problem of WEEE management in Lviv and in all Ukraine is extremely urgent. The project “Creation of a municipal system of WEEE management in Lviv using the experience of Lublin”, which was implemented during February 2013–November 2015 and developed “Integrated Municipal Programme of Waste Management of household electrical and electronic equipment in Lviv in 2013–2017” – is one of the steps to address this problem locally. Their implementation helped establish in Lviv the mechanism for collection and recycling of waste batteries and fluorescent lamps, raise national awareness in dealing with WEEE, encourage the population to take part in the fight for healthier and cleaner environment, part of which is precious green spaces.

### 4. Conclusions

The next step in dealing with ecology issues in Lviv is implementation of a registry system, collection and utilization of other kinds of hazardous waste.

Lviv’s experience in WEEE management may be used by other cities of Ukraine.

### References

- [1] Departament mistobuduvannya Lvivskoi miskoi rady, Lvivskiy natsionalnyi universytet imeni Ivana Franka. Kompleksna munitsypalna prohrama povodzhennia z vidkhodamy pobutovoho elektronnoho ta elektrychnoho ustatkuvannia u misti Lvovi na 2013–2017 rr. Lviv 2013.
- [2] Ukrainske zakonodavstvo u sferi povodzhennia iz vidkhodamy elektrychnoho ta elektronnoho ustatkuvannia. Chastyna 1. Zahalni polozhennia shchodo povodzhennia iz vidkhodamy (2015, September 5)[Online]. Available: <http://e-waste.lviv.ua/statti/8-zakonodavstvo-vidhody-1>.
- [3] Ukrainske zakonodavstvo u sferi povodzhennia iz vidkhodamy elektrychnoho ta elektronnoho ustatkuvannia. Chastyna 2. Zakonodavstvo u sferi khimichnykh dzherel strumu (2014, February 18) [Online]. Available: <http://e-waste.lviv.ua/statti/15-zakonodavstvo-vidhody-2>.
- [4] International Renaissance foundation, Vseukrainska ekolohichna hromadska orhanizatsiia “MAMA-86”. Suchasnyi stan polityky povodzhennia z elektronnyimi vidkhodamy v Ukraini ta Yevropeiskomu Soiuzi: kroky do zblyzhennia. VEHO “MAMA-86”, Kyiv 2013.
- [5] Kudy zdaty vidkhody u Lvovi [Online]. Available: <http://www.epochtimes.com.ua/maps/ recycle/lviv.php>.
- [6] Minrehion prodovzhuie spivpratsiu z YeS v sferi upravlinnia vidkhodamy elektrychnoho ta elektronnoho obladdannia (2016, June 15)[Online]. Available: <http://www.vidhody.org.ua/news/view/16-06-2016-minregion-prodovju-spivpratsyu-z-s-v-sferi-upravlinnya-vidhodami-elektrichnogo-ta-elektronnoho-obladdannya>.

Андрій Павлів

### СУЧАСНІ ЕКОЛОГІЧНІ ВИКЛИКИ В УРБАНІСТИЧНОМУ РОЗВИТКУ м. ЛЬВОВА

*Анотація.* У статті розглянуто проблеми у сфері поводження з небезпечними відходами у м. Львові, а також існуючий світовий досвід у вирішенні таких проблем. Висвітлено реалізовані заходи для вирішення проблем у сфері поводження з відходами побутового електронного та електричного устаткування у м. Львові. Проаналізовано результати впровадження цих заходів.

*Ключові слова:* відходи побутового електронного та електричного устаткування, поводження з небезпечними відходами, створення муніципальної системи поводження із відходами, комплексна муніципальна програма, Львів.