

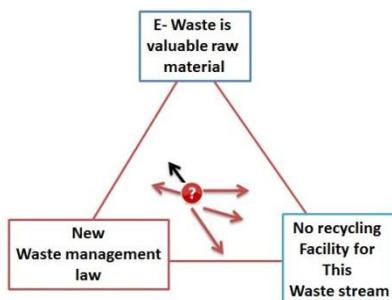


CAPACITY
BUILDING FOR
E-WASTE
MANAGEMENT
IN SERBIA
FINAL REPORT

Serbia is an upper middle income country, whose economic growth in 2001-2008 has fueled the rapid increase in the generation of e-waste, but the tools and infrastructure for the management of this waste stream in an environmentally sound manner has remained inadequate. The Government of Serbia is actively working on harmonization of the e-waste management procedures and legislation with the Acquis Communautaire of the European Union (EU). However, even if the legislation is swiftly harmonized, the country will lack the infrastructure to effectively implement its new legislation. The proposed project seeks to introduce practical, easy to use and sustainable solutions to manage the country's e-waste stream.

INTRODUCTION

Rapid technology development and replacement of equipment coupled with the migration from analogue to digital technologies have fueled the global e-waste market. Through the currently applied e-waste recycling processes of this complex waste stream valuable materials are lost in high percent. Inadequate recycling approaches in developing countries are causing additional environmental damages. WEEE is a non-homogeneous and complex waste mixture and it is essential to develop effective and ecologically sound systems, starting from recycling needs a holistic management and treatment strategy for a more efficient material recovery. According to 3Rs (Reduce, Reuse and Recycle) of waste management, the waste quantity should be reduced through smart procurement and good maintenance. Focus should be on the 3R potential analysis, the optimization of collection and pre-treatment as well as the development of recycling structures in the e-waste final treatment directions. The increasing amount of e-waste every year will provide a great opportunity to the e-waste management market. E-waste recycling has a short history in Serbia, so there is not yet a solid infrastructure in place. The goal is to describe and analyze trends in the contemporary e-waste recycling options and to apply them to the existing industrial facilities in Serbia.



The project had three basic standpoints. Group of valuable materials, including rare earth metals are essential for the production of electrical and electronic equipment. Currently the extraction of metals and valuable materials from raw materials and ores is energy intensive and involves high environmental risks. A promising alternative source for metals and valuable materials is waste from used electrical and electronic equipment (e-waste). So the e-waste is

valuable raw material not a waste.

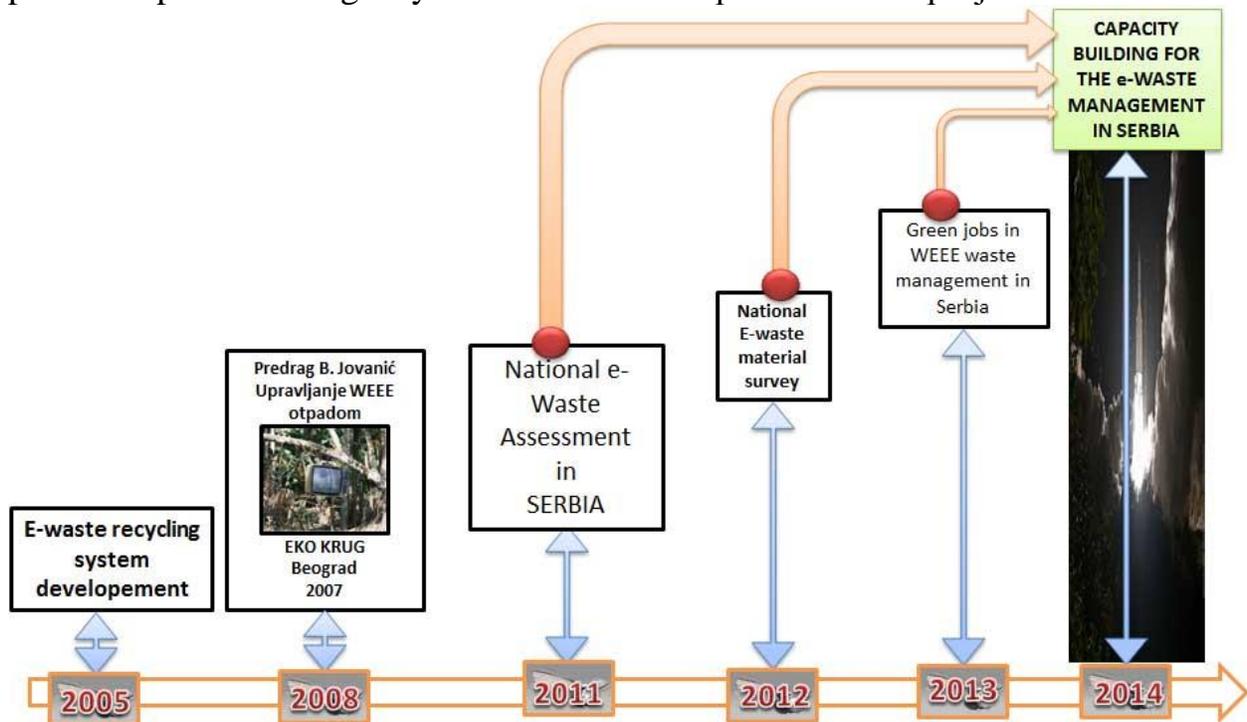
Waste management law is valid from 2009 and could not fulfill the nowadays trends in waste management, so it must be upgraded. Minimum two new approaches to the managements of waste should be included. One is "end of waste"

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principle and the other is waste to the resources, in order to make waste management in Serbia more efficient and sustainable.

Third reason was the fact that there are no “real” e-waste recycling facilities in Serbia. The so called "licensed recyclers" are regional collectors which export collected e-waste. On the other hand there are number of material extraction facilities in Serbia which has technology and capacity to extract valuable materials from collected and primary treated e-waste.

The project directions were results of the e-waste management research activities from 2005 till 2014 when this project starts. In 2005 the Ministry of science technology and technological development had accepted two year project "E-waste recycling system development", which resulted in in establishing "SET recycling" company. Following that project the e-waste collectors establish the "Eko-circle" (EKO-krug), cluster. Cluster issued first e-waste management guidance in 2008. In 2011 the pilot project "National e-waste assessment in Serbia", founded by Basel convection and UN PACE group. Following advices in realized project the "National e-waste material survey in Serbia" (first time ever done) was done in partnership with the Agency for chemicals as a part of POP's project in Serbia.



In 2013 in ILO's project Green jobs in e-waste management in Serbia, discuss about formal /informal collector relations in Serbia in the e-waste management.

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Results of all this projects make the base for proposal of the "Capacity building for e-waste management in Serbia" project which was accepted by the BC,Pace in 2013.

Small scale funding agreement (SSFA) and its annexes was made on 02nd December 2013, between The Secretariat of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (SBC), administered by the United Nations Environment Program (UNEP), an inter-governmental organization established by the General Assembly of the United Nations, and The Basel Convention Regional Centre for Training and Technology Transfer for Central Europe in Bratislava, a non-profit making organization.

Memorandum of understanding on the co-operation in the implementation of the project Capacity building for E-waste management in Serbia under the guidance of the Basel Convention Regional Centre (BCRC) at the Slovak Environment Agency, Bratislava was signed in 2014 between, Slovak Environment Agency, Basel Convention Regional Centre Bratislava, Slovak Republic, represented by director BCRC, Dana Lapešová, and Mr. Predrag Jovanic University of Belgrade, Institute for Multidisciplinary Research,1 Kneza Višeslava St. 11000 Belgrade Serbia.

UNEP/SBC agrees to co-operate with the Centre with respect to the project entitled "Capacity Building for E-Waste Management in Serbia", which will be implemented as a pilot project of the Partnership for Action on Computing Equipment (PACE) of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal.

The main objective of the Project is to seek to introduce practical, easy to use and sustainable solutions to manage the country's e-waste stream. The specific objectives are:

- To improve the existing legal framework pertaining to e-waste through specific legislative and regulatory measures, including procedures, geared towards managing and monitoring e-waste streams through the introduction of efficient monitoring and financial models.
- To establish a model for sustainable and profitable e-waste collection and recycling to be developed around existing official and licensed recycling centers and Small and Medium size Enterprises.
- To propose the establishment of a regional e-waste material treatment facility.
- To establish an independent mechanism for the monitoring and control of e-waste management.

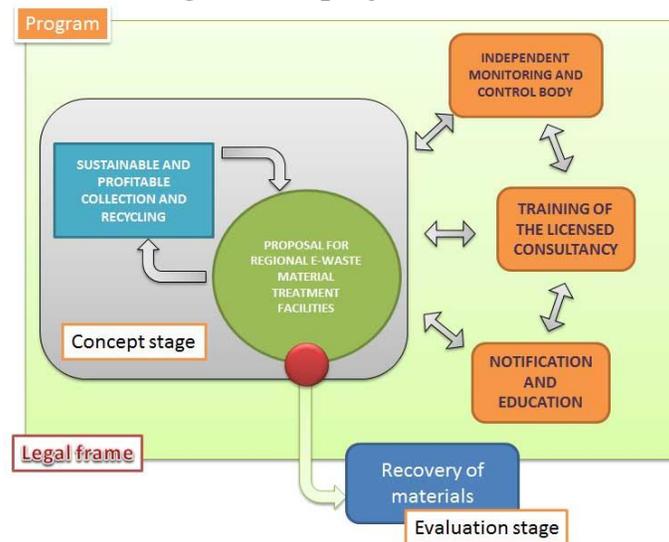
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- To educate and raise the awareness of the relevance of proper e-waste management for the environment and human health protection, as well as from the social and economic point of view.

Realizations of proposed project objectives were divided in five activities, starting from:

- **Activity 1:** legal component of the project
- **Activity 2-** Development of a Model for sustainable and Profitable collection and Recycling of e-waste
- **Activity 3-** Proposal to establish regional e-waste material treatment facilities
- **Activity 4** – Proposal to establish an independent monitoring and control body for e-waste management
- **Activity 5** – Public notification and education via Web site which will be developed under the University Networks
- **Activity 6** – Training of State administration

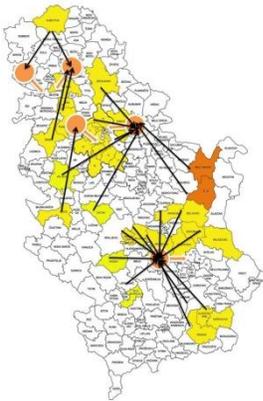
Each activity has its structure: starting from establishing workshops or training schools, obtaining the reports from activities and workshops and training schools. The program structure is presented on the next Figure, which has: Concept stage, Legal frame and evaluation stage of the project.



Idea of project was to propose the efficient profitable and sustainable e-waste collection and recycling system based on the existing Serbian industrial potential. Submission of the draft legislation and/or regulation, concerning in particular collection system and recycling requirements and setting out a financial system

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The first step in all these proposed activities was to improve the legalization procedures for waste managing. It was easier to say not to realize. The existing waste management law could not fulfil the new waste treatment approaches and changings in the world waste final treatment procedures. Starting from the fact that e-waste is categorized as hazardous waste and that Serbia don't have recycling facility; the only effective final e-waste treatment technology was export. Intention of this project was to clearly present Serbia's potential in e-waste recycling. The idea is to use this new law and to define the procedures for e-waste as the special waste stream. The new proposed Law defines the e-waste as the special stream and first time allow treatment of it, till now generally treatment of the hazardous waste was forbidden in Serbia. Using the definition of Nus product and End of waste in the new law we can propose better procedures for e-waste management, according to the planned activities on this project. The base is Pilot Serbian PACE project, Twinning project and the PACE guidelines. The new law will open the time gap for implementing e-waste procedures. After two years the "**DRAFT LAW ON AMENDMENTS TO THE LAW ON ENVIRONMENTAL PROTECTION**" was accepted in February 2016. During project realization the four reports were issued, besides the reports from workshops, concerning the legislation in e-waste management problems including the Environmetal protection financing model, Green Found base, new waste treatment financial model. All of them are listed in the "List of finished and delivered project documents", which is the annex of this report.



The second goal was more complex. It has to relay on the valid and applicable legal base. Second it had to put together the legal and informal (illegal) e-waste collectors. At the end it had to be efficient and profitable. We did have previously analyzed Serbian e-waste collectors' situation. On that base the models for e-waste collection and primary treatment wre simulated according to the presented amounts of collected e-waste. According to that six of possible efficient and profitable models were analyzed in 21 SME's over Serbia.

Two models were chosen according to the results and the pilot project was realized from May to October 2015 in order to test efficiency. The main activity in this part of the project was School (training) for primary e-waste treatment of collected waste. All realized activities were presented in two reports, listed in annex. Besides them there were published reports in Serbian, together with translation of PACE guidance, which were sent to the SME's involved in this project.

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This document presents the base for the final project document which intends to propose the model for real e-waste recycling system in Serbia. This is the one of the goals of the same Project together with model of sustainable e-waste collection network. This is based on the field analyses of the material process industry in Serbia which is probably working on the level of 10% of designed capacities, in order to introduce the principle "waste to resources" and incorporate the e-waste as the valuable raw material. The main focus should be pointed out on the establishing the network of a dismantling facilities, and their conceptualization. The base is new "**DRAFT LAW ON AMENDMENTS TO THE LAW ON ENVIRONMENTAL PROTECTION**" which was accepted in February 2016. During realization of the plans in this aspect of e-waste management three reports were issued together with reports from School and workshops.

During 2012, the national e-waste material content survey was done at the licensed e-waste recyclers in Serbia. Analysis of results and the experts in this field, suggests that most of this materials could be treated in the existing Bor hydrometallurgical complex. The pilot project for extracting Germanium (Ge), from the e-waste was realized on this facility. The aim of proposed activity is to analyze the possibilities of including this hydrometallurgical plant in e-waste management system.

RTB Bor Group is the only home producer of copper and precious metals, the most important link in the copper chain of Serbia and the company that is world famous for its high quality cathode copper. Another possibility which was not taken into account was the existing metal refinery complex in Bor.



Hence, the copper plant, with its potentials and abundant natural resources, is a strategically important company for the development of the entire Serbian economy, and as a great potential for economic prosperity is also seen by surrounding states. Electrolytic Refining Plant has active 1140 electro-refining cells. Precious Metals Plant This production unit, which started operation in 1969, utilizes the anodic slime from the refining process as a starting raw material for production of gold, silver, platinum, palladium and selenium, and is designed so that annually it processes 200 tons of wet anodic slime.

From this small introductory text could be seen there is existing facility for introducing the collected and primary treated e-waste as valuable raw material. It is interesting to note that according to Project two year material content surveys, e-waste contains more copper than ore.

Another possibility is the research in ongoing activities of Ministry of education, science and technological development. Some projects are dedicated to analyses of

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possibilities of e-waste treatment. According to this Project research survey three technologies could be applied in e-waste final treatment in Serbia: electrochemical treatment, hydrometallurgy and plasma.

To purpose of activity four was to propose and establish, (in cooperation with the BCRC-Slovakia), an independent institution for the monitoring and controlling of e-waste management in Serbia. The intention was to attempt to fulfill the existing gap between the current management and money back procedures. This was identified by a previous analysis performed by the Twinning and Bewel projects. This will incorporate the advanced monitoring system for the handling of computer equipment through its life cycle. In this context, independent institutions, licensed SME collectors and recycling centers, could become more relevant. This had two steps. First the establishing Green found base, which finally change the ECO tax model, which was canceled in 2012. The second direction was to introduce the independent control of e-waste stream, over associations, in this case the associations of Serbia recyclers was the stand point. Adequate reports were issued.

Activities directed to the public notification and education of the project activities results and proposal were planned to realize through web site and some of the public networks. The web site www.e-otpad.rs was founded in the October 2014 after the workshop on Public notification and education via Web site-(Activity V), of the Capacity Building for E-Waste Management in Serbia project. Web site was connected to the similar sites in Serbia in order to raise the awareness of the relevance of proper e-waste management for the environment and human health protection, as well as from the social and economic point of view. In the web site the "Identification of database of obliged persons" was only available to the registered users. The final upgrade of the web site will be done after the project acceptance. It will have all the reports and the results of the finalized project together with contacts of all participants in this project.

The last activity which was the part of previously was "Training of State administration", realized in January 2016. Project extension was allowed by the II Project amendment. The problem was question "who is state administration", due to fact that Ministry of environmental protection is not a standalone office. The second fact is that during project duration there were two state elections and lot of everyday changes in the responsible administrative workers. The scope of the meeting was: E-waste management procedures and Challenges and new solutions for industry. The training workshop had two parts in order to present the "Bill amending and modifying the Law on Environmental Protection, submitted by the Government" and the "Bill amending and modifying the Law on Waste Management, submitted by the Government". The other part was discussing the practical problems of new waste management structure in Serebia



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- Legal framework
- Institutional arrangements
- Strategies, policies, programmes and main projects
- Trends in waste management (generation, reuse, recycling, transportation and final disposal)
- Regulatory, economic, fiscal and information instruments

The output was meeting report.

This meeting closes the project activities and according to structure of PROJECT JUSTIFICATION in the proposal conclusion can be made that results of the project successfully open the opportunity in solving the problems in the rapid increase of computer market due to the government policy to enhance the development of the ICT in all segments. Problems like drop in computer prices and the market response to customers' needs through the import of second hand computers, was solved by the proved application of new collection and primary treatment e-waste models. New modifications of Waste management law fill the gap of absence of an adequate e-waste management system in the country, including the absence of direct specific by-laws to monitor e-waste. WE prove that Serbia can use and have potential in either private or public sector to apply the principles of waste minimization, recycling or reuse. This approach could solve still existing problems in unknown amounts of so called "historic e-waste" imported during the period of the 90`s. At the end web site (visited by 2356 users) give attention in education and present the relevance of proper e-waste management for the environment and human health protection, as well as from the social and economic point of view.

Project occupies 350 participants during realization. They were coming from public private e-waste management facilities, research institution (University or Institutes). Project had fully support from the licensed recyclers: B&S Recycling, JUGO-IMPEX, SET Recycling and EKO-NET who were the active members of the project. The Ministry of agriculture and environmental protection was the active participant during realization and local communities (21) who gives valuable help during pilot projects.

Besides this several real results must be pointed out. First is accepted modification the Law on Waste Management, which includes procedures for "end of waste", "nus product" and "waste to resource". Those procedures open the legal way to use the e-waste as the raw material and end the status of waste. Application of proposed collection and primary treatment models are adaptable to the specific condition in local communities in Serbia. Models simplify the administrative procedures and open the job opportunities and private initiative.

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According to the collected e-waste valuable material testing (survey), done by the project, potential the "real" recycling potential, extraction of valuable materials from e-waste in Serbia, was proved and set as the efficient and profitable industrial option. The existing facilities could be efficiently used. EKO-net will be the first facility in Serbia with plant for extraction of valuable metals from e-waste. According to the Project guidance, EKO-net develops herself from local SME's to the company with clear position on the market.

Combination of analyses and the results of pilot projects in Activities 2 and 3 propose efficient, profitable and sustainable solution for final treatment of e-waste, based on the existing infrastructure in this field and for this waste stream.

Independent control body realized through the Associations of recyclers for different waste streams is a good alternative to the existing one. It proposes involvements of all part: Government, companies, private or public, collectors, transporters and at the inspectors in efficient control of e-waste management. This way of monitoring and control is transparent.

The problems during project realization existed, without doubt. They were mainly due to non-efficient administrative procedures and delay in every field. Due to fact that project was finished in planned time frame there is no need to mention them here. We had help and advices from BCRC Slovakia, and there were no problems in cooperation.

This report has two Annexes. One is the list of published reports, and the other is CD with original reports and presentations done in this period in various workshops, schools and meetings

Belgrade

31.03.2016

dr Predrag Jovanic