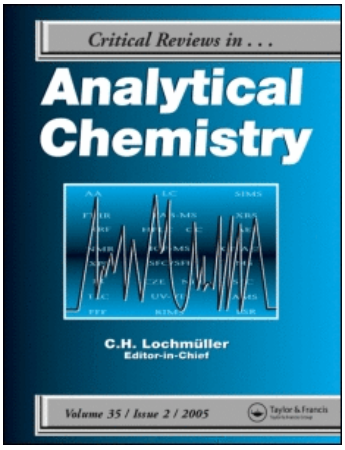

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University Support for Establishing a Strategy for Industrial and Special Waste Management in Sarajevo Canton

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1. BACKGROUND

Waste management policy is one of the key sectors identified by the Fifth and Sixth Environment Action Programme, whose primary goal is the achievement of sustainable development. The Community strategy for waste management establishes guidelines for the Community waste policy, priority for prevention, promotion of recovery, minimization of final disposal, and regulation of waste shipment.The implementation of this hierarchy should be guided by considering the best environmental solution, taking into account economic and social costs.

In developed countries, industrial and all other types of wastes and their management, as a segment of a global environmental protection task, constitute a major contemporary challenge to science and society.

Industrial (particularly hazardous) waste management is of paramount importance for proper health environmental protection and natural resource management for sustainable development. There are direct and indirect costs to society and to individual citizens, due to considerable loss of material, energy, and pollution. It is, therefore, crucial to enhance knowledge on the economics of prevention and management of industrial waste.

Waste minimization and pollution prevention policy is not anymore the green dream only, it is a rather technological possibility. It should be the social and economic imperative of any country with no respect to its general level of development. Bosnia & Herzegovina is not an exemption. In B&H, like elsewhere, the community is gradually becoming aware of the consequences of environmental unfriendly technologies and of the unscrupulous exploitation of non-renewable natural resources, which are both causing the degradation of ecosystems with subsequent loss of biodiversity.

With no respect to the enormous number of acute, environmentally related, or non environmentally related problems, which B&H is facing today, which are the consequences of aggression and mindless types of unselected military actions carried out by aggressors without any military logic that can be illustrated, apart from massacres of civilians and mass killings in general, with ruined homes, schools and hospital buildings, destroyed water supply and sewage lines and facilities, destroyed fuel-oil tanks, chemical plants and storage installations, devastated industrial and mining plants, destroyed bridges and railway lines and facilities, dispersed many millions of non-exploded mines, unusual accumulation of pharmaceutical waste, composed mainly out of dated drugs with expired dates, non-treated

uncontrolled accumulation of industrial wastes although of a less quantity than in the years prior the war, destroyed communal waste landfills and industrial waste treatment and storage facilities, dispersed enormous quantity of TNT, and other unindentified explosive related substances, B&H Government is ready, without hesitation, to start with the transformation of the UN sponsored sustainable development related declarations into the national action plans at all levels (United Nations Conference on environment and Development, UNCED, Rio de Janeiro 1992, UN Conference on Human Settlements Habitat II, 1996).

Nowdays, B&H has international expert support in introducing environmetal legislation and its harmonization with EU standards and recommendations. It is the EU PHARE project, Preparation of environmental legislation for B&H, and it is still in progress. Between the others, there is a Waste Management Law. Also, the National Environmental Action Plan is in progress.

2. WASTE MANAGEMENT STRATEGY

At the very beginning of the Project, waste management strategy and its development objectives were discussed together with governmental institutions, health care institutions, and pharmaceutical industry. The strategy had to enable B&H to adopt waste management standards and practices that would approximate to those practiced within existing EU member states. From common meetings, it was apparent that the production and nature of generated waste needed to be better understood. In the short term, substantial environmental improvements can be achieved using low-cost improvements to current practices for waste collection and disposal. In the longer term, mechanisms must be put in place to eliminate wastes at source, minimize the volumes of any wastes that are produced, and recover and recycle as much of the generated waste as possible, where such practices could be shown to be cost-effective. The entire integrated system must be carried out in a manner to:

- strengthen the national capability in order to ensure the preparation and implementation of sound development programs in a rational and consistent manner, which are taking into account the requirements of waste minimization and prevention of pollution, as the social and economic imperatives;
- maintain permanent community awareness of the consequences of the environmentally unfriendly technologies usually based on the rapid utilisation of the national non-renewable resources, and wich consequences are, inter-alia, the degradation of ecosystems and gradual loss of biodiversity;
- establish monitoring and control over industrial waste generation through registration, classification and mechanisms for collection, treatment and disposal in conformity with the international agreements, regulations and standards regulating the transport and processing of wastes, and international agreements regulating the importation and export of secondary raw materials;
- create an effective legal and institutional framework at all levels of government administration for further streamlining of the above three explained development objectives in a form of efficient environmental protection and waste management legislation, institutionalisation, and corresponding training and education;
- establish of an appropriate institutional framework (i.e., bureaux and agencies) which will implement and enforce the legislation;
- attract cooperation of the independent institutions (e.g., university laboratories) and their certification.

Cooperation of several segments of society is obvious for any effective system of environmental incentives and environmental policy instruments. No system will be truly effective without the support of the general public and a willing cooperation of industry. The implementation of this strategy involves a step-by-step approach, fully recognizing the limited short-to-medium term availability of different resources depending on the complexity of problems to be resolved, on bulk of works to be done, and the path of the likely funds intake as well. Planning and phasing down of project implementation activities are the framework for decisions on investment, as well as environmental protection. Economic instruments have to operate to stimulate potential polluters to determine the most efficient and cost-effective means for achieving environmental targets.

3. PROJECT OF INDUSTRIAL AND SPECIAL WASTE MANAGEMENT IN SARAJEVO CANTON

The government of Sarajevo Canton understood well the waste problem and decided to financially support the Project within a two years

duration. This is done with the aim to create an awareness of industrial waste problems and to establish an effective control over industrial waste accumulation and generation, through waste system classification and registration. It is decided that the Project Management would be composed out of the Analitical Chemistry Department staff of the faculty of Science and MEDA engineering company, while the Steering Comittee for Project implementation and on-going monitoring would be established by the representatives of the Faculty of Science and MEDA and financier, Ministry of Physical Planning and Protection of the Environment of Sarajevo Canton. The Project was subject to periodic reviews in accordance with the policies and procedures established by financier for the monitoring of the project implementation. Project progress reports were submitted at quaterly intervals by the Project Management in accordance with the format approved by the Steering Committee.

This project should be seen as a first step of Industrial and Special Waste Managemen Strategy on the state level.

Objectives of the project are defined by the project team and approved by the Project Steering Commitee as follows:

- Defining of waste types and establishing *System of waste classification* on the basis of industrial branches, processes, sub-processes, locations of waste generation and waste category, and signing hazardous waste. Background documents were Basel Convention, EU Green List, EU Red List, EU Amber List, and UN Class of Hazard;
- Creation and establishment of the questonnaire;
- Training and mobilising of persons who collected data of waste generators;
- Collecting waste generators data;
- Auditing and evaluating of collected data of waste generators and waste category;
- Creation of Software and building of the information system, testing, updating and applying;
- Creation of technical instructions of packaging, labeling, storage, safety instructions and possible treatment of special waste.

3.1. System of Waste Classification

Industrial and special waste were classified into categories according to the composition and degree of hazard, and the *System of waste classification* (SWC) was based on three lists:

- Waste list that was based on industrial waste generators (Code "1" signed by two figures, totaling 20 industrial branches);

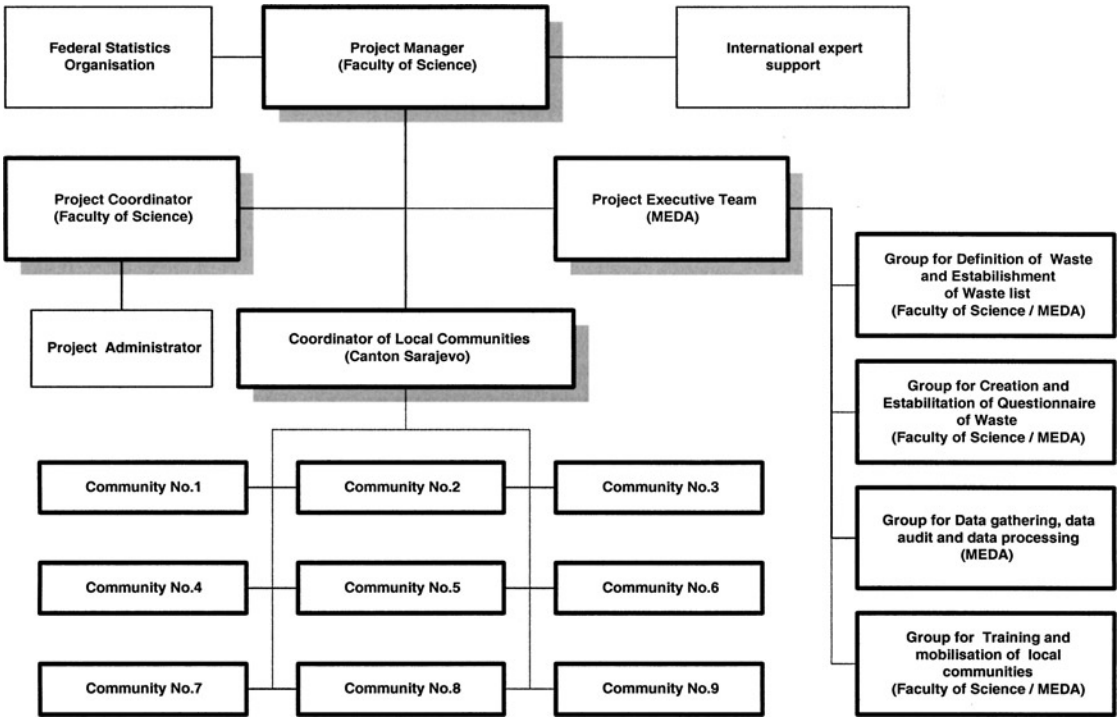

FIGURE 1. Project organization chart.

- Waste list that was based on process, sub-process or waste generator location (Code "1 + 2" signed by four figures, totaling 114 locations);
- Waste list that was based on waste category (Code "1 + 2 + 3" signed by six figures, totaling 700 waste categories). The building of this list was based on industrial waste categorisation into non-hazardous and hazardous in accordance to Basel Convention and UN Class of Hazard (totaling 295 hazardous waste categories).

3.2. Register of Waste/ Questionnaire

This document helped with the collection and data for waste generators, type of waste, waste location, waste collector gathering and disposing company.

There were two sheets in the questionnaire. The first sheet contained data on the company generating the waste (companies are identified by the company code). The second sheet contained data on the waste type reported (from the System of waste classification). A separate sheet had to be filled out for each type of waste. Wastes generated were described by waste code, waste name, quantity of waste generated in the current year, stocks from previous years, data on consistency and packaging, data on waste collector, transportation, waste processor, and methods of treatment.

3.3. Data Collection, Audit and Evaluation

Organized action for waste registration in the area of Sarajevo Canton was the next task. This action of data collection, auditing, and evaluation was completely realized by the team of the Faculty of Science. These activities are fully completed and made by team of 8 qualified and skilled researchers from Faculty of Science. This organized action has shown what generates the toxic waste, in what quantities per time, how and where it is transported, what is proceessing it, and what is taking care of final disposal. Audit and evaluation of collected data were done and stored in the waste database.

3.4. Building of Waste Database

The large amount and the changing nature of industrial waste have required efficient computer support (the PC is chosen). For practical reason and, on the Government of Sarajevo Canton's request, the existing System of the National Department of Statistics was upgraded by Waste Database. In designing Waste Database, background documents were Waste Questionnaire and System of waste classification. FOXPRO database management system was used.

The system of waste classification is linked with other sources of information (National standard

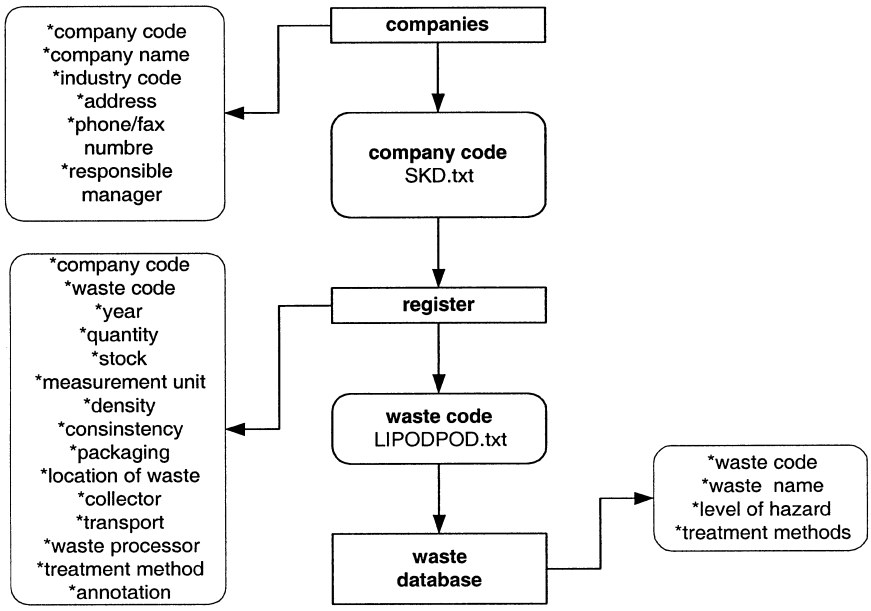

FIGURE 2. Relational diagram of Waste Database.

classification of economic activities), and it can essentially contribute to the evaluation of the reliability of data on hazardous waste registered. The system enables quick identification of waste types, quantities and locations, which serves as a warning mechanism and helps in planing waste collection, disposal, treatment or recycling and material and energy recovery. A direct link was therefore established with the National Department of Statistics, Chamber of Commerce and Ministry of Physical Planning and Protection of the Environment of database searching. The data were structured into a system which offered good guidance in waste database searching. The information system could be tested, updated and applied for different purposes in Sarajevo Canton.

3.5. Technical Documents

Next task of the Project was to prepare and/or coordinate the preparation of technical documents for packaging, labeling, storage, safety instructions and possibility of different treatments of hazardous waste with proposals for incentives and penalties and to prepare and/or coordinate the preparation for the creation of network of Environmental Protection Inspectorate at municipal and cantonal level.

3.6. Lessons Learned

In order to accomplish the objectives and secure the outputs of the Project, financier and other interested parties were involved from outset to the end of the Project. The outputs of the Project coincide well with the"culture of living" giving a considerable contribution to the strategy for sustainable human development. The methodology applied as well as the topic mentioned above, may serve as a case study for waste policy development in the whole B&H. Specifically, the Project produced the following:

- Improved operational efficiency of Analytical Chemistry Department, Faculty of Science with relation to the environmental protection and waste management research, development, educational and advisory functions.
- Computerised national environmental waste management database with permanent updating will be used by the Ministry of Physical Planning and Protection of the Environment and its partners. Database implementation will facilitate to Cantonal Government to plan and support projects that would be devoloped on its basis.
- Established nucleus of National Waste registry covering industrial, special and communal related waste in the area of Sarajevo Canton with possibility to extend it to the whole B&H.
- Initiated second annual conference,Solid Waste Management Strategy for B&H.
- Organised expert discussion of the Project on the state level.
- Involved students to cooperate in data collection and take part in discussions relating.
- Field activities.
- Full time involved postgraduates in the Project activities and contributed to the Project results.

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