

**DEFINITION OF THE TASKS FOR THE EU-PHARE DANUBE
REGIONAL PESTICIDE STUDY PROJECT 1995-1997**

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Abstract. The present chapter provides a description of the objectives of the Danube Regional Pesticide Study Project, initiated during 1995-1997 under the frame of the Danube Applied Research Programme, which is managed by the Danube Programme Coordination Unit in Vienna. The ultimate goal of the project was to achieve an agreement between the Danube countries on the list of pesticides that are allowed, conditions under which pesticides may be applied especially related to protection of ground and surface water, criteria for allowance of pesticide use with regard to ecotoxicological aspects. The tasks of the project were defined to cover: inventory of pesticide application, production, formulation and distribution, and emission sources; real and estimated concentrations in Danube river water; identification of the authorities responsible for pesticide regulation and criteria used; ecotoxicological and toxicological risk assessment of the identified agents; action plan to ensure the protection of the key functions of surface water in the Danube basin and proposal of documents for harmonization of the policy. This chapter is made with educational purposes to generally assist young scientific researchers, who intend to formulate future project applications in the field of environmental sciences.

Keywords: pesticides, ecotoxicology, economic reforms, risk prediction, management framework, risk assessment, aquatic life, drinking water, ecosystems, environmental contamination, adverse effects on environment and human health

1. Introduction

In the European Community Programme of Policy and Action in relation to the Environmentally Sustainable Development special attention is dedicated to agriculture. The objective is to decrease the input of chemicals to the point that none of the basic natural processes is affected.

In the Strategy action plan for the Danube river basin 1995-2005 agriculture is recognized as an important source of pollution of surface and ground water through agrochemicals.

The Danube Regional Pesticide Study Project as a part of the Strategy action plan for the Danube river basin was initiated during 1995-1997 with the aim to evaluate the risk of pesticides application for human and aquatic life in the region and to recommend a legal, policy and management framework, which would enable governments to develop risk reduction programmes. The economic reforms in most Danube countries have resulted in declined pesticide use patterns. On the other hand after decentralization the distribution and the use of pesticides have been dispersed among many units and farmers, which lead to the increase of the number of point pollution sources. The situation is believed to be temporary due to the expected changes in agricultural policy introducing of new technology, increase of economic stimulators for crop protection, etc. This imposes a careful evaluation of the present status, taking in account the past situation and the future perspectives.

The Danube Regional Pesticide Study Project was funded by the EU-PHARE under a Service Contract 95.0100, PHARE ZZ 9111/0106. The project was executed in three phases, eight month each, starting in May 1995. The Consortium included three countries: Bulgaria as a leading country, Hungary and the Slovak Republic, and consultants from the other eight Danube region countries, listed in alphabetic order: Austria, Croatia, Czech Republic, Germany, Moldova, Romania, Slovenia and Ukraine.

The members of the Consortium are from recognized nationally and internationally leading institutions in the field of environmental sciences, both in theoretical and applied research, as well as in elaboration of standards and regulation for toxic substances in the environment. Pesticide evaluation have been a part of their activities since decades. The members of the Consortium have qualified staff with relevant experience in this field.

The scope of a number of projects, conducted by the members of the Consortium, covered issues as toxicological and epidemiological studies and

proposals of standards, methods for multiresidue analysis, criteria for complex evaluation of pesticides in the registration procedure, guidelines for water protection zones, exposure tests, preparation of information and training materials, education and training of trainers in the field of safe use of pesticides.

2. Field of Applied Research

The lack of data and reliable studies makes it difficult to assess the problems of contamination of water bodies with pesticides and related environmental and health impact.

There are many general statements on these issues, but little verified information.

The main aim of the project was to evaluate the risks of pesticide application in the region for human and aquatic life and to recommend a legal, policy and management framework, which would lead to the reduction and elimination of this risk.

The work was performed in three phases, as it was mentioned above, with 14 tasks. The objectives in the first phase were related to the inventory of the existing situation in connection with the so called "life cycle" of pesticides from production to disposal and evaluation of the laws and practice of pesticide registration and regulation of their use. The second phase covers inventory of exposure data, modeling investigation for risk assessment of adverse effects on aquatic organisms and human health. The third phase uses the results of the first and second phases and the experience in the countries of EU and other countries to prepare action plan with recommendations and measures for reduction of the adverse impact of pesticide use in the Danube basin.

The expected overall output was formulated as a contribution to the improvement of the legislation, management and environmental protection in pesticide use in the Danube basin, which will reflect positively on human health and aquatic life.

3. Definition of Tasks

3.1. PHASE 1

3.1.1. *Task 1. Qualitative and Quantitative Inventory of Pesticide Application, Transport and Storage for all 11 Riparian Countries.*

Identification of the existing positive lists of pesticides and quantities used in each country, the variety of crops cultivated in the Danube basin, principal

pests, requiring treatment with pesticides, methods of application, storage and disposal, plant protection policy, the trend of pesticide application.

3.1.2. *Task 2. Inventories of Pesticide Production, Import, Export, Number of Producers, Formulation of Companies and Suppliers as well as Main Users.*

Lists of producers and produced and formulated pesticides in each riparian countries and export of pesticides between those countries. Lists of the imported pesticides. Practice of the pesticide trade and distribution. Packing and labeling. Special training requirements, licensing.

3.1.3. *Task 3. Identification of the responsible authorities for pesticide regulation and laws*

Identification of the principle organizations responsible for pesticide regulation and enforcement. Inventory of the role of the Ministry of Agriculture, Ministry of Health, Ministry of Environment and Ministry of Internal Affairs in pesticide regulation and laws. Interagencies collaborating activity. The role of non-governmental ecological organizations. Who is authorized to have a right for “veto” in decision-making. Implementation and control.

3.1.4. *Task 4. Economic Parameters Underlying the Usage Patterns of Pesticides*

Identification of the potential loss related to plant diseases, pests and weeds. Costs of the pesticides and their application. Cost/benefit analysis. Inventory of the crops cultivated and crop production loss from non-treated crops. Study on the existing experience in the countries.

3.1.5. *Task 5. Current Legislative Procedures and Criteria Related to Pesticide Registration*

Inventory of the current legislation in relation with pesticide registration. Agricultural, health and environmental authorities duties. Health and environmental classification and registration criteria. Enforcement procedure. Registration criteria and practice. Non-authorized usage. List of the documents. Usage categories in relation with the license requirement. Sanitary standards and safe use recommendation in the registration phase.

The results are used for the harmonization of the existing legislation and practice of pesticide registration in respect of health and protection in Danube region.

3.1.6. *Task 6. Overview of the most significant emission routes*

Inventory of the sources of pesticide water pollution. Information on the priority sources of pollution. The results were used for preparation of recommendation on the policy in pesticide use.

3.1.7. *Task 7. Classification of the active agents*

Classification of pesticide active ingredients in connection to water pollution and ecotoxicity hazard. Data on health hazard, ecotoxicity, solubility, transformation rate, extent of sorption, persistence in the environment, leaching in soil, etc. were summarized using international specialized databanks. Classification of pesticides in several categories based in EU and other classification schemes was performed.

3.2. PHASE 2

3.2.1. *Task 1. Risk Assessment for Humans and Aquatic Organisms*

Available data from existing monitoring systems, control laboratories, etc. was provided by Consortium members and consultants from the 11 Danube countries. Identification of analytical methodology was performed in order to assess the obtained information from different countries. Exposure models for determination of predicted environmental concentrations were used in case of lacking of exposure data. Available information from international specialized databanks concerning the dose-effect relationship for aquatic ecosystems (fish, crustaceans and algae) was summarized. Hazard assessment was performed.

3.2.2. *Task 2. Water Quality Standards*

Overview and comparative list of existing water quality standards – EU, WHO and the national standards of the Danube countries for drinking water and aquatic life was prepared.

The results may be used for harmonization of standards of riparian countries.

3.3. PHASE 3

3.3.1. *Task 1. Formulation of Common Procedures and Criteria for Admission of Active Agents in the Products for Sale*

Common criteria based on ecotoxicity, behavior and persistence in the environment, in order to protect aquatic ecosystems and drinking water. General approaches for common procedures for pesticide registration

3.3.2. *Task 2. Positive List for Active Ingredients*

Classification of pesticides in relation with established criteria and risk estimation. Recommended list of pesticides.

3.3.3. *Task 3. Measures for Reducing the Environmental Impact of Approved Active Substances*

Development of model legislation with special requirements for pesticide use in the Danube river basin. Recommendation of legal policy and management framework, required to improve the environmental situation in concern to the pesticide contamination in the Danube river basin. Preparation of a manual with recommended measures to be used by farmers.

3.3.4. *Task 4. Strategy for Pesticide Use in Danube River Basin*

Existing OECD/EU approaches were used and adapted to Danube situation with respect of elimination of all pesticide active ingredients, which pose a threat to the sustainability of key functions of surface water in the Danube river basin: drinking water, aquatic ecosystems and fisheries.

Inventory of the quantities of banned pesticides in stock was performed. Recommendations for the most effective, safe and inexpensive methods for disposal in rural conditions was prepared. Lists of banned or not registered pesticides were proposed.

3.3.5. *Task 5. Immediate and Long-term Action Plans*

Preparation of an action plan model for immediate and long-term actions in order to reduce the adverse effect of pesticide use in the region.

The prepared documents will be used for harmonization of the future steps in the riparian countries in environmental protection of the Danube river basin.

4. Methods/Methodologies

The Applied Research Programme is based mostly on inventory of the existing data in 11 riparian countries, concerning the pesticide regulations and use as well as the contamination of the water in the Danube river basin. Some of the countries are with changing agricultural economic structures, others have traditionally established organizations and practices. This situation has its advantages and disadvantages.

The disadvantages reflected on the preparation of the first phase report due to the diversity of data concerning existing practice and types and quantities of pesticide used.

Exposure data from existing monitoring systems and other analysis differ considerably in connection with the type of pesticides analyzed, methodology used and the way of data presentation, due to poor existing collaboration between these countries concerning pesticide environmental contamination.

The advantages reflected the development of guidelines on effective policy recommendations, management and decision tools and practices, required to improve the environmental situation in the Danube river basin.

European Union documents and approaches as well as those of the international organizations served as a basis for the evaluation and proposals.

4.1. DATA COLLECTION

The data collection processes are fundamental in this applied research. The two aspects have a priority importance:

- To obtain enough reliable data;
- To obtain as much as possible uniform information from the 11 countries, in order to facilitate evaluation and comparison of the data.

For this reason draft models of tables for each type of inventory were proposed and discussed. They included the studied parameters, possible sources of information and period to be covered. Several sources for each inventory were used in order to acquire reliable data.

4.2. MODELS FOR PREDICTION OF THE EXPOSURE LEVELS.

According to the Annex III of Directive 91/414/EEC (Directive 91/414, 1991) a great importance is given to the calculation of Predicted Environmental Concentrations ((PEC) as a basis of assessment of adverse effect of pesticide on non-target organisms. PEC calculations using a suitable model are required for all compartments, including the aquatic one. All types of surface water have to be considered – stream, river, lake, etc. The main relevant routes such as spray drift, run-off and drainage have also be considered.

The most commonly used scenario for risk assessment of pesticides in surface water in Europe is spray drift to a 30 cm deep stagnant pond. Assumptions include spray drift equal to 5% of the application rate, residues uniformly distributed through the water, no losses due to volatilization or adsorption to sediment or suspended particles, and residue levels from multiple applications are additive. In UK for instance, spray drift is included as a contamination of surface water in PEC calculations based on worst case with progress of overspray: the ditch itself is sprayed with the same amount of pesticide as the field.

The need for harmonization of approaches on community level led to the establishment jointly by the European commission and European Crop protection Association (ECPA) Forum for the coordination of pesticide fate models and their use (FOCUS) with three working groups – for leaching, for surface water and for soil. After inventory and assessment of existing models the Surface water working group concluded that:

- There is no model available describing all input routes and behavioral aspects of plant protection products in the European Union;
- Standard European standards are lacking.

Large number of exposure models exist in USA as well, but only a small number of the models are validated or certified in actual field studies. For the purpose of this study the following model systems and models have been used: USES – Uniform System for the Evaluation of Substances (Van der Poel, 1994), HESP - Human Exposure to Soil Pollutants (Poels et al, 1992) and Mackay (PED) Level I - Predicted Exposure Distribution (Mackay and Patterson, 1990).

The predicted quantity of pesticide use was taken into consideration for selection of pesticides for detailed evaluation and risk characterization: in the first phase for the selection of 100 pesticides using as one of the criteria the amount of pesticides in tons and in the third phase by number of countries using the particular pesticides.

5. Conclusions

This chapter is made with educational with general purpose to assist young scientific researchers, who intend to formulate future project applications in the field of environmental sciences.

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