

ROMANIAN – SWISS COOPERATIVE RESEARCH PROGRAMME “ENVIRONMENTAL SCIENCE AND TECHNOLOGY IN ROMANIA” (ESTROM)

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The Romanian Ministry for Education, Research and Youth (MECT), the Swiss Agency for Development and Co-operation (SDC) and the Swiss National Science Foundation had launched in 2004 the Romanian-Swiss research programme known as “Environmental Science and Technology in Romania” (ESTROM). ESTROM was established as a pilot programme of scientific co-operation between Swiss Research and Education Units with similar ones from Romania in the framework of SCOPES – a Swiss national programme for supporting the scientific collaboration with the Eastern Europe.

The strategy of the ESTROM Programme was to tackle as much as possible problems of a national dimension having socio-political background. The Programme tried to solve these problems by applying an inter- and trans-disciplinary approach and to transfer the results obtained into practice being implementation-oriented.

ESTROM promoted 9 joint Romanian-Swiss research projects in general environmental field, selected according to the principles of peer review and competition and having a maximal duration for the research of 30 months, starting on 1 April 2005. It was implemented under the authority of the Swiss National Science Foundation in close co-operation with Romanian research administration and was provided with a budget of CHF 1.5 million.

The Programme ESTROM focused on capacity building and providing the scientific and technical knowledge needed for developing solutions for environmental remediation emphasising chemical pollution of the aquatic environment including industrial and municipal wastewater, ambient waters such as rivers, lakes and groundwater

as well as drinking water. Priorities were given to environmental exposure assessment provided by chemical analysis and to the evaluation of human health aspects.

The selected projects carried out research and proposed urgent actions for remediation in different zones and environments in Romania. A short presentation of the selected projects is given below.

The effects of industrial activities in specific zones on human health and the environment were investigated by a number of projects. One of them was entitled “The estimation of the pollution degree of water and soil in the vicinity of the industrial area NEFERAL – Bucharest and the impact upon the health of people living in this area” (acronym *Nepoll*). The NEFERAL area includes two plants for recovering heavy metals such as lead, copper and zinc from solid wastes using relatively old technologies. The project has assessed the water and soil pollution by heavy metals in the studied area, gave a characterisation of the waste water and of the air contamination in the same area, studied the impact that the pollution of water, soil and air have upon human health and elaborated proposals for a better monitoring and limitations of environmental pollution.

The environmental impacts of past and present mining activities have been studied by a project entitled “An integrated assessment of environmental impacts of mining activities in two selected catchments (upper Crisul Alb and Certej) in the Apuseni Mountains, Romania, and trans-boundary river pollution” (acronym *Eimar*). The project carried out an entire catchment assessment of mining-related river pollution, by measuring concentrations of heavy metal contaminants in river water, river sediments

and floodplain soils. It has determined the degree from where the pollution poses a risk to ecosystems, and proposed practical measures to minimize or to eliminate mining waste inputs. The data have been integrated into a GIS database. The socio-economic part of the project have identified and evaluated the externalities of mining, especially the side effects which are not reflected in the costs and prices of extractive industry.

The qualities of water and of sediments in the tributaries of the Danube River were studied by several projects. One of them "Environmental assessment of the Olt River reservoirs in the region of Valcea: focus on suspended matter and sediments" (acronym *Orsed*) carried out a state-of-the-art environmental assessment of the most contaminated section of the River Olt and its barrage reservoirs. The region of Râmnicul Valcea was selected as target area because of numerous industrial companies in the region. The *Orsed* project studied the fate of past and present contaminants focusing on pollutants associated with suspended matter and sediments. Of particular concern were mercury and some other toxic metals and a large spectrum of persistent organic contaminants. Chemical, sedimentological and ecotoxicological methods have been combined in order to evaluate the contaminant mobility and bioavailability. The results of the work have been transferred to the local authorities in carrying cost-effective and goal oriented monitoring and in proposing mitigation and/or remediation measures.

Another project dealing with the river pollution was *Popiași* ("Chemical, biological and ecotoxicological assessment of the Bahlui River, in North-Eastern Romania. Case study: pesticides and persistent organic pollutants (POPs)"). The project investigated the use of POPs and pesticides in the basin of the Bahlui River, which is the main and the most polluted tributary of the Prut River (in north-eastern Romania) and determined the state of contamination in this river. The project tried to develop currently available approaches as well as new methodologies, which allow sustainable, environmental-friendly socio-economic development.

Environmental exposure of pharmaceuticals in the rivers has been tackled by the project called *Pharmasomăș*. It studied the major entry routes of pharmaceuticals and personal care products (PPCPs) leading to exposure of the aquatic environment and subsequent fate in wastewater treatment and in river water, on the example of the Somes Watershed, Romania. The occurrence and fate of selected PPCPs have been monitored in wastewater treatment plants and in the Somes river water. The project provided, for the first time in Romania, a dataset on the occurrence and fate of PPCPs in the aquatic environment and proposed adequate measures for improving the situation.

The assessment of drinking water quality with regard to disinfection and disinfection/oxidation by-products is tackled by a project focused on "Formation of trihalomethanes and bromate during disinfection of drinking water in water treatment plants and distribution systems" (*Waqua*). The *Waqua* project gives an overview for Transilvania as an indicator for the general situation in Romania. The results of this study contributed to a better understanding of the current drinking water treatment practice in Romania and lead to an optimization of the processes of improving the drinking water quality and human health in general. The project facilitates the transfer of know-how in the field of drinking water quality and chemical reaction mechanisms and kinetics related to the water treatment.

The development of integrated water quality management system has been tackled by the project with the acronym *Inwag*. The project has developed and implemented the informational instruments required by an integrated water quality management system for using these tools to identify an adequate water quality management strategy at the river basin scale. The project focused on the Ialomița river basin. The main questions addressed by the project were: identification of the relevant thematic fields to be considered and development appropriate analysis tools to propose a coherent short-, mid- and long term strategy for water quality improvement. The way in which the needed data have been collected and organized according to a well designed conceptual data model within the GIS played a central role in defining these strategies.

The anthropogenic impacts on the Black Sea coastal zone lagoons and lakes and their ecosystems rehabilitation have been studied by the project focused on Tașaul Lake near Constanța (acronym *Tașaul*). The Tașaul Lake environmental regime was changed from saline into freshwater system and threatened by various pollutants and over-fishing. The project established an input-output nutrient mass balance of the lake and implemented a long-term chemical and biological monitoring programme. The project tried to identify the measures for environmental protection and ecological recovery. In particular, the relationship between N/P-ratios, the water turbulence and algal blooming have been studied. The results were transferred to the end-users and various scenarios for a sustainable Integrated Management Plan have been proposed.

The water and sediment dynamics affecting nutrient cycles and greenhouse gas emissions in the Danube Delta have been studied by the project called *Wasedy*. The project addressed questions related to the production and emission of the greenhouse gases CO₂, CH₄ and N₂O in Danube Delta lakes and the relationship between nutrient inputs (N, P, Si) and CO₂, CH₄ and N₂O emissions in the delta. The project investigated the hydrological regime of

two interdistributary depressions, identified the sedimentation rate and the quality and stratigraphy of sediments, determined the turnover and retention of nutrients by specifically observing processes at the sediment-water interface and measured the greenhouse gas concentrations in lake waters and the gas fluxes at water/atmosphere interface. The project has formulated concepts and options for a sustainable management strategy of the Danube Delta Biosphere Reserve.

In conclusion, the ESTROM Programme sustained by the Swiss Agency for Development and Co-operation (SDC), the Swiss National Science Foundation and the Romanian Ministry for Education, Research and Youth (MECT), had outstanding results and fostered an excellent scientific co-operation between Swiss and Romanian scientists. The present volume of GeoEcoMarina represents the Proceedings of this international programme.
