

Abstracts of the projects 2011

Branch of Hydraulics, Hydrology and Hydrogeology

Anthropogenic pressures on the status of soil, water resources and aquatic ecosystems in the Czech part of the international basin of the Elbe River

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Partners: Faculty of Civil Engineering of the Czech Technical University in Prague, Czech Geological Survey, Faculty of Fisheries and Protection of Waters, University of South Bohemia

International cooperation: Lancaster Environment Centre, Chemistry and Dynamics of the Geosphere, Research Centre Julich

Duration: 2007–2011

The project represents the fifth phase of the Czech national project Elbe, which is coordinated by the TGM WRI. It is focused mainly on basic research on transport of nutrients in the basin, uncertainties in flow simulation, the use of stable isotopes for examination of the hydrological regime in the basin including water quality, radionuclide monitoring in rivers, impacts of pollutant on fish species, fish behaviour in rivers and fish species natural reproduction.

Selected topics of the fundamental research in the fifth phase of the project were:

- Runoff formation in small catchments, phenomena causing probably the uncertainty of estimates were studied in the laboratory (studies of the effects of entrapped air using tracing and Magnetic Resonance Imaging)
- Uncertainty estimation for frequency of catastrophic floods; effects of polluted sediments transferred by a catastrophic flood
- Nitrate transport in the unsaturated zone and potential impact of climate change on nitrate load
- Mobilization of arsenic from acid deposition
- Analysis of contaminant transport into the Elbe River System; transport and dispersion of pollution in large rivers; the risk of chronic effects of surface water pollution
- Quantification of individual components of tritium balance in the Vltava and Elbe Rivers affected by the operation of Temelín Nuclear Power Plant
- Fish occurrence in the fishpass with respect to water temperature, water flow and fish size; telemetry studies on the activity of fish in rivers
- The effects of pharmaceuticals and synthetic musk fragrances on fish.

It is obvious that some of the topics are already near the stage of applied research. Our project can also inform decision making:

- Long term lowering the concentration of nutrients in streams did not bring about any obvious response in lowering the biomass of phytoplankton (other effects such as discharge, water temperature, intensity of light and complicated relations of phosphorus to soils and sediments have overwhelming importance on the variability of phytoplankton)
- Acidification in the Jizera Mountains is still a problem (rainfall often below pH=4.5; probably caused by nitrates in air pollution from transport)

- Nutrients in water might not be caused by current agricultural practices only, but also by communal pollution from recreation cottages, from houses not connected to sewerage, from leaking septic tanks and as heritage from previous times when much more fertiliser was used.

Accuracy improvement of previous estimates of the impacts of climate change in the sectors of water, agriculture and forestry, and the proposals of adaptation measures

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Duration: 2007–2011

The objectives of the project are to improve the accuracy and to refine climate change scenarios on the territory of the Czech Republic for the time horizons of 2011–2040, 2041–2070 and 2071–2100, to improve the accuracy of the expected impacts of climate change on sectors of water, agriculture and forestry, to develop appropriate adaptation measures and to support the implementation of the National programme on mitigation of the impacts of climate change in the Czech Republic.

In 2011, the project was focused mainly on the synthesis of the results and preparation of a monograph, which reviews the latest developments relating to the possible impacts of climate change on the hydrological regime in the Czech Republic and discusses possible adaptation measures aimed at reducing these impacts. The first part summarises the results of water balance simulation performed on hundreds of water basins in the Czech Republic by using current projections that have been derived from climate models. The results are consistent with previous knowledge that the decrease in summer precipitation and increase in winter precipitation and air temperature will be dominating factors influencing water regime in future. Consequently, summer runoff decreases with the decrease in precipitation, while winter runoff increases due to a time shift of a melting period and the increase in precipitation. The results of an analysis of simulations by climate models showed that the inaccuracy in the predicted winter flow and changes in annual flow patterns are substantially greater as compared to that associated with a decrease in the summer flows.

The second part deals with the assessment of the levels and effectiveness of selected types of potential adaptation measures. Discussed are the basic measures, i.e. measures in the landscape, those focused to the flows in floodplain and urban areas, and considered are also the construction or reconstruction of water reservoirs, optimisation of the use of water resources, reduction of water consumption and legislative measures. Measures are classified according to their purposes, limits and effectiveness.

Patterns of interaction of water-rock-landscape system and their use in the protection of the groundwaters in the Czech Republic

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Duration: 2007–2011

The activities in the part of the project carried out by TGM WRI included: a proposal for the methodology for groundwater thresholds determination in its interaction with surface water, the proposal for a methodology for the determination of groundwater regimes for individual hydrogeological regions/bodies of groundwater in the Czech Republic and the development of internet applications with supporting documents for the river basin district plans. The first methodology will be used for assessing chemical status of groundwater bodies while the second methodology will be applied for water balance assessment.

In the last year of the project the final version of the methodology for determination of threshold values for groundwater in its interaction with surface water was completed. The methodology for the determination of groundwater regimes in individual hydrogeological regions/bodies of groundwater in the Czech Republic, which was developed in the past years, was modified in 2011 in accordance with the developments in European Union in the area of indicators of drought and water scarcity based on the results of groundwater regime analyses. In addition, a method for assessing the indicator of drought and water scarcity was developed and embodied into the method developed previously. The method can be used for validation of the results of water balance assessments as well as for decision making by water authorities in licensing of groundwater abstractions. The results can also be used in modifications of monitoring programmes and accuracy assessments of the observed data.

Draft strategy for managing emergency situations originating from the occurrence of drought and water scarcity on the territory of the CR

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Duration: 2010–2014

The objective of the project is to develop a methodology and procedures to manage emergency situations caused by drought, similarly to those which have been implemented and stipulated in Czech legislation for protection against floods. The solution lies in defining degrees of drought (similarly to those defined for floods), selected according to the thresholds of indicators of drought and the general consensus agreed by representatives of water authorities, state institutions and other stakeholders involved in availability of water resources and water demands, particularly in dry seasons. The strategy should define not only the degrees of drought but also powers of the authorities of public administration, involved in water management and water use priorities, particularly in drought periods.

In 2011, weekly time series of precipitation, flows, spring yields and groundwater levels in boreholes were tested for identification and quantification of indicators of meteorological drought and drought affecting surface water and groundwater. For the description of the evolution of rainfalls, indices SPI and its other characteristics – DMPI (severity of drought) and IBS (rainfall deficit) were selected, having regard to the standardised character and the known frequency of extremes. For the uniform description and range of the index, the characteristics derived from the SPI were also used for description of the development of surface water and groundwater. For these characteristics, appropriate theoretical distributions were tested and recommended. For the purposes of warning, BILAN model was adapted to the solutions in the weekly step and preliminary water balance assessment was made for the pilot catchments. The catchment area of the Rakovnický Brook was used for calibration of the SIMGRO model for its application in testing different mitigation measures. As a tool to cope with drought, basic structure of simulation games was developed.

To assess the severity of the agronomic drought, indices PDSI and Z-index were tested, as well as their simpler versions, P-E and P-T indices. The indices were compared with yields of agricultural crops. The closest relationship between index P-T and the subsequent revenues was detected in late April to early June. Furthermore, the programme PONS2train allowing ensemble simulation of hydrological and agronomic factors was developed.

Drought prediction options were tested on the basis of the precipitation probability field and by using the resampling method of the nearest neighbour for 1 to 3 months in advance. For a period longer than one month, better results were achieved by using the resampling. Influence of the decline in withdrawals to the flow in the Metuje River in dry seasons was simulated by MODFLOW model. A complete cessation of the withdrawals for several months in the area of Teplice nad Metují was reflected only in a partial increase in the flows. For the early instrumental period, which was not included in CHMI databases, data on water levels in pilot catchments were digitised and analysed in terms of the occurrence of drought.

Sustainable use of water resources in conditions of climate change
Protected territories of surface water and groundwater intended for human consumption – assessment of raw water and its use in practice

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Duration: 2011–2013

The project has several objectives. Since the beginning of the impacts of climate change, which are permanently increasing, variability is also increasing in the quantities of groundwater and surface water, which is reflected also in fluctuations in its quality. Raw water as a source of drinking water is irreplaceable. It is therefore very important to know its quality and its development in the whole territory of the Czech Republic. In order to ensure high-quality drinking water for water supply purposes in the Czech Republic, it will be necessary to determine the relationships between the water quality and various factors, such as river flow patterns in the individual periods. Water authorities will also need relevant information on the current quality of raw water for their decision-making. The data on water quality will be also needed for the implementation of Nitrate Directive (91/676/EEC) and relevant reporting, and for the fulfilment of the requirements of the Water Framework Directive (2000/60/EC).

The project was initiated by an extensive survey of data on raw water, both groundwater and surface water. The survey included the data flow, the state of the reported data and also geographical identification of the sampling points. Project managers were successful in obtaining the data reported from 2002 to 2010 by all regional authorities. The result is a very widespread material, which is partly in electronic form and partially in hard copies. At the beginning of the activities with the data on raw water, it was decided that the identification number in use in the balance assessments of groundwater and surface water in accordance with Decree No. 431/2001 Coll. and in the Information system for public management (ISVS-Water) will be applied as essential and unique identifier of each of the sampling sites. It was also assumed that withdrawals, for which these numbers are not allocated, will be identified. The project activities included also some local investigations. When checking the individual forms submitted by the operators of the water supply systems to regional authorities, some very serious deficiencies were identified and subsequently corrected in the individual data files. For this purpose, it was necessary to develop LIM application, which operates in MS Excel environment. This application is intended to be used in checking the standard forms. In the next phase of the project, the activities were focused on the development of a basic database of raw water withdrawals. Subsequently, the activities were also launched in the development of the methodology, which is the main output of the second stage of the project.

Development of apparatus and methodology for continuous determination of snow water equivalent

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Duration: 2011–2014

The objective of the project is to develop an apparatus for continuous determination of snow water equivalent, to test it in various terrain and vegetation conditions, and to develop a methodology or its installation and use. The data obtained will be used in the development of hydrological models. Simultaneously, the depth of the snow cover will be monitored in different locations with different vegetation cover, climate and topographic conditions.

In 2011, the activities were focused on a literature review, which was oriented on testing principles and methods for the determination of snow water equivalent and on their advantages and disadvantages. On that basis it was decided to develop few alternatives with the aim to reduce maximally their drawbacks. After some consultations with external experts, the decision was made to include testing of some new methods, which could potentially be suitable for the monitoring of the snow water equivalent.

During the year, prototypes of snow meters on the principle of capacitors were tested by measuring their capacities, which can be used for calculation of snow permittivity. Simultaneously, documentation of the first prototype of a weight which was entered into production was prepared in cooperation with RMT, Ltd. Company. In summer, Doppler radar was tested for its possible application. The tests included the alternatives of optical cable connected to a segment of a weight and measurements on the basis of signal of the resonance of atoms by using a magnetic field.

Several monitoring localities were selected with different snow conditions, availability for the calibration field measurements and possibilities for adjustments of the prototypes during the winter. It is assumed that the pilot monitoring would be launched in localities operationally easily available and subsequently the apparatus will be moved to more complicated conditions, mainly in terms of climate variability.

Programmes for the environmental protection technologies and efficient water management in small river basins

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Duration: 2011–2013

The objective of the research project of the consortium of the GIS Geoindustria company and TGM WRI, p.r.i., is to optimise the current technologies of environmental protection and to integrate the knowledge into tools for integrated management of water resources in small river basins. To meet this objective, detailed research of the processes in the infiltration of pre-treated waste water into rock media and monitoring of the impacts on surface water and groundwater will highly contribute.

The research project will address the issue of infiltration of pre-treated waste waters into rock media in four closely related blocks:

- Block A – methodology for the optimization and more efficient biological treatment of waste water from small sources of pollution, assessment of the effects on the quality of groundwater and surface water of subsequent infiltration of purified water (assessment of infiltrated water resources).
- Block B – the optimal technology of infiltration of pre-treated waste water, testing in the pilot locality, testing of infiltration technologies, the development of methodology (a study of the process of infiltration).
- Block C – use of tracer methods for defining the behaviour of infiltrated waters (study of the behaviour of water infiltrated into rock media), hydrogeological and hydrological assessment

of the influence of infiltrated water on water balance (assessment of the impact on available groundwater resources).

- Block D – integration of knowledge gained and outputs in new instruments for the integrated groundwater management, their use for the definition of new approaches to the optimization of resources.

During the year 2011 the first stage of the activities of the block A was successfully completed.

Transposition of Council Directive 2006/118/EC on the protection of groundwater against pollution and deterioration in the Czech Republic

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Duration: 2007–2012

Directive 2006/118/EC on the protection of groundwater against pollution and deterioration was adopted at the end of 2006. This directive, in harmony with paragraph 17 of the Water Framework Directive, defines the criteria of good chemical status of groundwater, the criteria for detection of changes in significant and long term increasing trends and for identification of the beginning of the changes in trends and also complements statements given in directive 2000/60/EC about the prevention or limitation of polluting substances entering into groundwater. Member states are obligated to adopt legal and administrative regulations which are necessary for achieving harmony with the directive by 16th January 2009 and to determine threshold limits according to the Directive by 22nd December 2008.

In 2011, the activities were focused on the analysis of the requirements for the monitoring of groundwater to be in accordance with European legislation, a comparison with the situation in the Czech Republic, a proposal of the economically efficient quality monitoring options for the 2nd half of 2011, and general recommendations for the monitoring of the quality of groundwater. The project included preparation of a review of the activities for working group C Groundwater for common implementation of the Water Framework Directive.

Revision of vulnerable zones for the Nitrate Directive including support for reporting

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Duration: permanent activity

To fulfil the requirements of the Nitrate Directive, those vulnerable zones in the sense of its stipulations were delineated, which drain water which is polluted or at risk of nitrate pollution from agricultural sources and in which measures for limiting concentrations of nitrates in the water will be adopted. The objective of the project is to update the borders of these vulnerable zones periodically to meet the requirements of the Nitrate Directive in regular four-year cycles. The first revision of these borders was elaborated in 2007 and the second revision took place in 2011. This project is a permanent activity, the TGM WRI, p.r.i., is the expert body authorised by Ministry of the Environment.

All activities in 2011 were aimed at implementation of the second revision of the vulnerable areas. The project consisted of two main parts. Firstly, it was the expert assistance on both national and international levels and participation in the Nitrate Committee meeting in Brussels. The expert assistance on international level included mainly preparation of documents for mandatory reporting activities for the Nitrate Directive in 2012. The representatives of the Czech Republic submitted several amendments, which were subsequently partly reflected in the documents of the Nitrate Committee. The objective of the next part of the task was to implement the second revision

of the vulnerable areas. The results included a proposal to increase the area of the vulnerable areas by 1.7%. An integral part of this phase was the settlement of the comments made by agricultural technical public. In 2012, the Czech Republic, as well as other EU countries, will have to prepare a report on the implementation of the Nitrate Directive.

Professional support for the Ministry of the Environment in the implementation of the Convention on the protection and use of transboundary rivers and international lakes and the Protocol on water and health to this Convention, in connection with the readiness of the parties to the climate change

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Duration: 2011

The task is focused on providing the technical support to the Czech central place for climate change applying in the framework of the Convention on the protection and use of transboundary rivers and international lakes and the Protocol on water and health to this Convention. The task includes the assistance in the elaboration of documents and recommendations of the Convention and the Protocol for the adaptation to climate change, participation in the workshop on this topic and presentation of the approach of the Czech Republic, professional preparation to this negotiation, the fulfilment of the tasks arising from the negotiations, processing the opinions on materials sent by the Secretariat of the Convention, the preparation of the documents required at the national level and the support of the implementation in the Czech Republic.

The main output of the task in 2011 was the contribution on Adaptation strategy for water resources in a pilot river basin in the Czech Republic submitted during the Second workshop on Water and Adaptation to Climate Change in transboundary basins: Challenges, progress and lessons learnt. The objective of the seminar was to arrange a meeting of people involved in the process of adaptation to the climate change in transboundary river basins and to allow the pooling of practical experience in this area. In the framework of the workshop problems related with the adaptation were identified and the best possible procedures for overcoming them were searched. The workshop used an experience from the first meeting that was held in the year 2010, which was focused on the preparation of adaptation strategies.

Research on adaptation measures to eliminate the impacts of climate change in regions of the Czech Republic

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Duration: 2008–2012

The project aims at designing and testing through pilot applications of procedures for draft effective adaptation measures for elimination of climate change impact on water resources in the CR. The focus of the project lies within simulation modelling of technical adaptation measures for reservoirs and water management systems. Methodology resulting from the simulations will be usable within the next cycle of river basin district planning according to the Water Framework Directive.

In 2011 the project focused on testing methods for generation of synthetic series of monthly flows and their usefulness for water management solutions. The generated series were further used for the preparation of the series of scenarios for three of the forecasted periods, which take into account the results of the climate models. The series of scenarios were prepared using the

incremental method, which takes into account the change in the means and variability in temperature and rainfalls, derived from the results of the simulations by the climate models. The methods have been tested in the pilot catchment area of the Chrudimka River. The resulting flow series formed the input data into the simulation model of Hamry, Seč and Křižanovice reservoirs. The results of the project in this year showed that despite of the expected decrease in the reservoir yields the Křižanovice reservoir is an important reserve water resource for the water system of Eastern Bohemia.

The project activities in 2011 included simulation modelling of adaptation measures identified in the catchment area of the Orlice River, as well as the assessment of hydraulic effect of Mělčany designed reservoir on the flow system of the Litá spring area and also the assessment of the possibilities for abstraction of groundwater in quaternary flood plain area of the Orlice River by applying the bank infiltration.

Possibilities for mitigation of current consequences of the climate change by improved accumulation capacity of the Rakovnický Brook catchment area (a pilot project)

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Duration: 2009–2011

The project assessed the significance of climate change impact on water resources with the focus on pilot application in the Rakovnický Brook catchment area, which is an area already very sensitive to climate change due to unfavourable combination of local conditions. Existing water shortage is a cause of problems for water management institutions. The purpose of this project was to design and assess the effectiveness of adaptation measures to mitigate the consequences of climate change. By adjustment of hydrological regime the water accumulation in the catchment area will be increased and so will the disposable amount of water in the region.

In 2011, the project was designed to refine the information on groundwater regime based on detailed observation of changes in the water level in the area of the catchment and also the relationships between groundwater and surface water. The processing of the input documentation for the proposed localities of storage reservoirs was completed and the potential for improving water balance by the transfer of water from the catchment area of the Ohře River was assessed. The study on flood regime, which is in the catchment area of the Rakovnický Brook highly extreme, was completed. For the catchment area of the Rakovnický Brook the resulting draft of the measures to ensure the necessary minimum flows was completed. The project was finalised by drawing up the general methodology for the promotion of the draft measures, aimed at improving the storage capacity of the catchment area, which suffers an unacceptable decline in the flows and the lack of water resources. The results of the task will be, in addition to the final report, published in the form of a book and reported by catchment adjustments illustrated in monothematic maps. During the project implementation the results were provided for the use of the City Office of Rakovník, the Vltava River Basin, state enterprise, and other users.

Evaluation of the risk of landslides and floods from glacial lakes, the Cordillera Blanca, Peru

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Duration: 2011–2014

In 2011, after many years of research activities (Institute of Rock Structure and Mechanics of the AS CR, p.r.i.) in the area of the Cordillera Blanca in Peru, which were focused particularly on the mapping of dangerous slips and the evaluation of the degree of the danger to the community, the project activities were extended by 1D mathematical modelling of flood hydrographs. Flood from the glacial lakes can be caused in particular by instability of slopes and land subsidence (rock or soil ranges or glacial blocks) into these lakes. Hydraulic models of flow hydrographs resulting from possible landslides into the lake are based on the field survey of the territory and of the results of calculations of stability of slopes.

In 2011, the input data, derived from geodetic measurements in special-interest locality, were used to build 1D mathematical model. This model was calibrated and applied for the first simulations of the flow of water from a particular event from April 2010, when the fall of an ice block to the lake caused a flood on the Chucchún River, which struck the city of Cuarhaz. For hydraulic calculations we used 1D mathematical model HEC-RAS (4.1.0, Hydrologic Engineering Centre, U. S. Army Corps of Engineers, River Analysis System), which is suitable for modelling of flow in open channels, their flood plain areas and flows through objects (bridges, culverts, etc.). It is a reliable model for simulation of steady and transient flow with which it is possible to calculate the so-called mixed flow, that is flow, in which there is a transition from the river regime to the swift creek regime and vice versa. Having regard to the large changes in the bottom slope, this alternative of the flow simulations was used. This technique was also applied for hydraulic modelling of the flow through objects, which included six bridges embodied into the model. The simulation included possible blocking of the bottom by rock subsidence during the flood.

The simulation produced interim results, however, in the next stage the mathematical model will be improved using the newly acquired data from the expedition to the study area. On the basis of the results it will be possible to determine the scope and course of the events, water levels in the individual cross sections, the mean flow velocities and boundaries of the flooded areas. The model will be also used for the modelling of possible future scenarios.

Mathematical simulation of the influence of the Vltava River cascade of reservoirs on floods on the Elbe River

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Duration: 2010–2012

The project evaluates the influence of the Vltava River cascade of reservoirs on the floods on the Elbe River, both on the Czech and the German section of the river. The purpose of the project is to assess the effects of flood transformation in the Vltava River cascade of reservoirs for several types of floods and to evaluate its influence on peak flows in selected cross sections in the Czech Republic and the Federal Republic of Germany. The project is implemented on the basis of the contract between TGM WRI, p.r.i., and Federal Hydrological Institute based in Koblenz.

In 2011 the calculations for each flood event and final Czech-German report were completed. For the simulation of the operation of the Vltava River cascade of reservoirs during the floods Aqualog multifunction modelling tool was selected. This tool is currently used as a forecasting model based on rainfall-runoff simulation in the catchment area of the Elbe River. For the calculations outside of the Vltava River cascade of reservoirs HEC-RAS hydrodynamic model was used. This model is in the conditions of the Czech Republic commonly applied. Four control cross sections (Prague-Chuchle, Ústí nad Labem, Dresden and Barby), which were selected, will be used for presentation of the results. Ústí nad Labem cross section is the most downstream river site simulated using the HEC-RAS model by TGM WRI, p.r.i., in close cooperation with the Aqualog, Ltd company. Downstream section of the Elbe River is simulated by German party using SOBEK simulation model. The simulation also includes Nechanice Reservoir, which plays an important role in the

transformation of the floods on the Ohře River. The simulation is performed for regimes affected and not affected by the cascade of the reservoirs and for the two types of floods, which are represented by the summer flood in 2002 and the winter flood in 2006. Each cross section is simulated for floods with return periods of 10, 50, 100, 200 and 500 years.

Evaluation of water resources for Moršín (Ukraine), Mirgorod (Ukraine), Borjomi (Georgia), the Sacred Springs (Russia), Truskavets (Ukraine), Edelweis (Russia)

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Duration: 2011

The objective of the project was to perform the environmental audit on six foreign localities in use for withdrawals of mineral waters.

Commercial contract, which was in 2011 implemented by a consortium of companies IMEC (Belgium), Armoric (France), TGM WRI, p.r.i., and Envigeo for IDS Borjomi Group multinational company, focused on a Due Diligence Study performed for six localities of mineral waters in Ukraine (bottling plants and spas Truskavets, Moršín and Mirgorod), in Russia (bottling plants and spas Lipezk and Kostroma) and in Georgia (bottling plants and spa Borjomi). For each locality the assessment involved environmental, water management, hydrogeological, technological and legislative aspects. Parameters under consideration were derived from methods for evaluation of the available resources of mineral waters and prospects for their further development, stability of water chemistry, the method of qualitative and quantitative monitoring, the method for protection of resources of mineral waters and an assessment of the harmony between the local and European legislation.

Rebalance of groundwater storage

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Duration: 12/2011–6/2014

TGM WRI, p.r.i., is the coordinator of activities 2, 4 and 6 of the project, which is coordinated by the Czech Geological Survey. In the framework of the activity 2 on Evaluation of the resources for the assessment of the quantitative status of groundwater, a simplified determination of natural groundwater resources will be developed for 55 hydrogeological regions. The activity 4 on Hydrological measurements including the construction of water gauging stations on the selected rivers is to select sites (about 80) and to design and construct the water gauging stations. This activity includes also monitoring, hydrometric measurements and the data evaluation. The objective of the activity 6 on Calibration of hydrological models based on existing and newly observed data will be to prepare the models of hydrological balance for 56 hydrogeological regions for the determination of the time course of groundwater recharge.

In 2011, the activity 2 was focused on the preparation of the data. In the activity 4, the existing data from observation networks were analysed and used for preparation of a proposal of potential new localities suitable for construction of water gauging stations and additional data were gained during field works. Works in the activity 6 were focused on the analysis of the extent of the input data and their specification.

Reconstruction of the hydraulic model of the Elbe River section downstream from Děčín navigation weir

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Duration: November 2010–May 2011

The objective of the project was to reconstruct the existing hydraulic model in scale 1 : 70, which is situated in the open area in the TGM WRI, p.r.i., locality, and to use it for modelling a section of the Elbe River between river km 737.50 (navigation km 98.50) and river km 730.10 (navigation km 105.90) and its objects involving the weir. The reconstructed model will be used for subsequent simulation of the fairway for 1b alternative of the Děčín navigation weir.

The proposed design of the Děčín navigation weir (alternative 1b) assumes regulation through a combination of bank concentration shoots and bottom dredging in the section between river km 733.61 (navigation km 102.45) and river km 730.42 (navigation km 105.40) and in the downstream stretch a partial extension of the fairway at the banks by dredging the bottom. The proposed solution, which was optimized by using 2D mathematical model and monitored in-situ testing on six built experimental shoots, requires verification of its hydraulic function by using a physical hydraulic model. The verification should be focused mainly on conditions for navigation, management of flood flows and stability of river bottom, banks and regulatory structures under consideration. For this purpose can the existing hydraulic model in scale 1 : 70 of the Elbe River section between river km 737.4 (navigation km 98.6) and river km 730.02 (navigation km 105.8) rationally be used, which was built in 2000 in the open area in the TGM WRI, p.r.i., locality. This model was used in the years 2000 to 2002 for research of planned modifications of river bottom and nautical conditions but it was highly devastated during the flood on the Vltava River in August 2002. Its reconstruction was made under a contract with the Directorate of Water Ways of the Czech Republic, including the navigation weir.

Research of the Děčín navigation weir – efficient transport of ice

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Duration: November 2010–June 2011

The objective of the project was to propose building, technological and organisational measures, which would ensure safe operation of the reservoir and minimize the duration of winter period when the navigation is impossible.

In the framework of the project the hydraulic model on a scale 1 : 70 was adjusted in accordance with the results of research of the biocorridor of the navigation weir made using a hydraulic model on a scale 1 : 20. The model was used for an analysis of ice phenomena in the vicinity of the Děčín weir. Subsequently, the hydraulic model (on a scale 1 : 70 built in the great hall of the hydraulic laboratory of TGM WRI, p.r.i.) was used for optimisation of the operation to ensure effective transport of ice from the upper reservoir into the river downstream. Considering the actual conditions during the winter on the lower Elbe River, particular attention was paid to operational rules, which would be optimal for prolonging the navigation period before the winter and for shortening its duration. In addition, options were considered for releasing the ice blocks at the beginning and end of the freezing period. The research resulted in a proposal of necessary measures to ensure trouble-free winter regime of the reservoir and minimizing the duration of time when navigation is impossible consequently to winter conditions.

Reference Laboratory of Environment Components and Wastes

New methodological approaches for monitoring and evaluation of bathing surface water

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Duration: 2011–2013

*The objective of the project is a verification of the microbiological indicators of the quality of bathing waters (*Escherichia coli* and intestinal enterococci, cyanobacteria), addressing the critical points in their determination and research of the correlation with pathogenic micro-organisms (thermotolerant *Campylobacter*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Listeria monocytogenes*, parasitic protozoa, etc.). The research results will be used in a technical recommendation for hydroanalytic laboratories and other entities interested in the area of quality and safety of bathing waters.*

In 2011, literature review was carried out relating to all of the above mentioned areas, and the current situation was mapped regarding to the methods used (questionnaire methods), including the advantages and disadvantages of the existing methods. All laboratories were interviewed, which supply the results of the bathing water quality to IS PiVo, on the specific use of the methodology, which may affect the results of the determination. 61% of them responded.

Furthermore, methods were tested and optimized for the determination of representative pathogenic micro-organisms in bathing waters and a pilot sampling was carried out at selected localities. For the sampling, localities were selected involving different types of river systems (Berounka at Černošice near Prague), a river originating at backwater area (Otava at Vojníkov), a pond (Šeberák) and a large water reservoir (Orlík at Radava) and at the same time they met the expectations for the occurrence of some organisms, in order to be able to assess the results. In 2012, the monitored localities will be complemented by a small water reservoir (Hostivař), which was discharged in 2011 for its sediment remediation.

Nine regular samplings were carried out (of which 8 during bathing season and 1 after the season), and one pilot sampling prior to the season. Some analyses were carried out in parallel with those conducted by the National Institute of Public Health and TGM WRI, p.r.i., for determining the reproducibility of the methods. Experiments were also carried out to determine the stability of the samples of bathing waters during their 24 hour storage and the influence of rainfalls on the water quality was monitored in the individual profiles. Causal factors responsible for increasing the concentration of cyanobacteria in the sampling localities were tested. In the next year, a special apparatus will be developed for this purpose. The efficiency ultrasonic homogenisator in disintegration of cyanobacteria was tested. Activities were launched on preparation of the study of health risks from exposure to cyanotoxins during water skiing (Stráž pod Ralskem locality).

Examination of possible impacts of the Temelín Nuclear Power Plant on hydrosphere

Project manager: Ing. Eduard Hanslík, CSc.
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Duration: 2003–2011

The objective of the project was to ensure an independent examination of possible impacts of the Temelín Nuclear Power Plant on hydrosphere and other components of the environment and the reference levels for the possible construction of new blocks of the plant.

Impacts of Temelín Nuclear Power Plant on hydrosphere were monitored for the needs of the Ministry of the Environment. From the results of the field monitoring, it was derived that in the receiving water of body (the Vltava River), there is no increase in concentrations of artificial radionuclides in comparison with the reference (not exposed) sites, with the exception of the activity of tritium. The increase in the tritium concentration is attributable to its discharges from the plant (according to the ČEZ, a. s., data). Thermal pollution leads to an increase in the temperature of the water in the Vltava River downstream from the outflow of waste waters and from the cooling towers. Pollution standards according to Government Regulation No. 61/2003 Coll., as amended, were not exceeded.

Ensuring of the activity of the permanent and emergency component of nationwide radiation monitoring network

Project managers: RNDr. Diana Marešová, Ph.D., Ing. Irena Pohlová
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Duration: permanent project

The objective of the project is to monitor the levels of radionuclides in hydrosphere in normal and, where appropriate, in the emergency conditions in cooperation with laboratories of the river basin state enterprises.

In the follow-up to Framework Agreement concluded on the activities of the components of the nationwide radiation monitoring network (RMS) between the Ministry of the Environment and the State Office for the Nuclear Safety the reference laboratory of TGM WRI, p.r.i., ensures the activities of the permanent and emergency component of nationwide radiation monitoring network in cooperation with water management laboratories of the river basin state enterprises. In the period of the monitoring in the normal radiological situation (in 2011), the development of the concentrations of radioactive substances in surface and drinking waters, sediments, water sludge and biomass of fish in the selected sites was monitored. Increased concentrations of tritium in comparison with the background was identified in the Vltava River at Prague-Podolí and in closing cross sections of the Elbe River and the Morava River as a result of discharges of waste water from the Temelín Nuclear Power Plant and Dukovany Nuclear Power Plant. The results of the monitoring are continuously transmitted to nationwide radiation monitoring network (RMS) in the scope of the information system of the State Office for the Nuclear Safety.

Monitoring and evaluation of the quality of surface water and groundwater and their changes consequently to the influence of the operation of the Temelín Nuclear Power Plant on its vicinity

Project manager: Ing. Eduard Hanslík, CSc.
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Duration: 2000–2011

The objective of the task is given by its name.

Monitoring and evaluation of the influence of the Temelín Nuclear Power Plant on the environment was carried out for the needs of ČEZ, a. s., in the follow-up to the conclusions of the examination of the effects of changes in buildings (EIA) on the environment.

Integrated monitoring of the changes in the concentration of radioactive substances in groundwater resources and in water after its treatment

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Duration: 2011

The objective of the project was to monitor and evaluate the concentrations of radioactive substances in the groundwater resources.

Monitored and evaluated were the concentrations of radioactive substances (including radon 222) in water resources and their changes consequently to the water treatment technologies aimed at reducing their content in packaged drinking water and natural mineral water (a project carried out for the needs of Eco-Aqua-Servis, s.r.o.).

Concentrations of radioactive substances in the Orlík reservoir and its tributaries after initiation of the operation of Temelín Nuclear Power Plant (period 2011)

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Duration: 2011

The objective of the project was to monitor and evaluate the concentrations of radioactive substances in Orlík reservoir and its tributaries for the needs of the river administrator.

Monitored was the development of concentrations of tritium in surface waters downstream from waste water discharge from Temelín Nuclear Power Plant, including the vertical distribution of tritium in Orlík reservoir, and further the reference (unaffected) localities. The monitoring was carried out for the needs of the Vltava River Basin, state enterprise.

Control measurements of the concentrations of radioactive substances in the Řež Nuclear Research Institute locality

Project managers: Ing. Eduard Hanslík, CSc., Michal Novák

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Duration: 2011

The objective of the project was to monitor and evaluate the impacts of the radioactive substances from the old burdens on the environment.

In the framework of the project, the effects of remediation of old ecological burdens in the Řež Nuclear Research Institute locality on the hydrosphere and other components of the environment were monitored as one of the bases for the assessment of the effectiveness of remedial measures taken in the framework of the Implementation project of the remediation works.

Studies in the field of raw water withdrawals and discharges of waste waters

Project manager: Ing. Eduard Hanslík, CSc.

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Duration: 2011

The objective of the project was to assess the impact of the new nuclear resource on groundwater and surface water in the locality of the Dukovany Nuclear Power Plant.

A study was performed in the area of sampling of the raw water and waste water discharges. It was a sub-contract to Study of integrated evaluation of the quality of the raw water and, in particular, of waste waters discharged from the locality of Dukovany Nuclear Power Plant.

Determination of the concentrations of radionuclides in water

Project managers: Ing. Eduard Hanslík, CSc., Ing. Barbora Sedlářová
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Duration: 2011

The objective of the project was to develop and test a method for rapid determination of the total beta activity.

A literature review was carried out and the activities were initiated in examining disturbing interferences in rapid determination during radiological emergency conditions for the needs of Radiological laboratories of river basin state enterprises.

Water quality in the Hamerský pond and its tributaries and proposals for measures

Project managers: RNDr. Blanka Desortová, CSc., RNDr. Ladislav Havel, CSc.
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Duration: April–November 2011

The objective of the commercial contract financed by the private company was to identify casual factors of the adverse conditions in water quality in Hamerský pond (Kamenice village, Prague-West).

As a result of the load by high concentrations of the total phosphorus and nitrogen compounds, this pond is highly affected by eutrophication. During the growing season, there is an excessive development of aquatic species represented by *Spirodela polyrhiza* macrovegetation which completely covers the water surface.

In order to identify the main sources of the nutrient load, the catchment area of the Hamerský pond was explored and changes tracked in the chemical and biological characteristics of water quality both in the pond and its tributaries. On the basis of the resulting data, the shares of the potential sources of pollution on the total contamination of the Hamerský pond were identified.

Branch of Water Protection and Informatics

Accuracy classification for existing delimitation of flood plain areas in the Czech Republic, and implementation of the results in delimitation methodology

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Duration: 2010–2014

The main objective of the project is to carry out a comparison study on the accuracy of delimitation of flood plain areas in selected reference locations (watercourse sections), which are specific in terms of various parameters – morphology of the area, the manner of its use (the nature of the surface of the landscape, vegetation, urban areas), hydrological and other parameters, affecting the accuracy of the results of hydrodynamic modelling and subsequent delimitation of the flood plain areas. The project will

compare the existing delimitation of these areas specified with the use of available vertical surveying technologies of varying accuracy (photogrammetry, geodetic surveys, vertical surveying ZABAGED[®]) with the results of a new hydrodynamic modelling (1D or 2D) and delimitation of flood plain areas using new elevation data for the territory of the Czech Republic acquired by aerial laser scanning, launched at the end of 2009. Conclusions from the results of the comparison for the reference sites will be used to develop a classification method for the flood plain areas delimitation accuracy, subsequently to be applied for the development of a methodology for delimitation of flood plain areas according to the requirements placed on inputs, hydraulic aspects of modelling and outputs.

In 2011 the project included processing of data from air laser scanning, derivation of appropriate formats and simplification of data for their import into numerical models. In the five selected locations (Lužnice at Soběslav, Nežárka, Doubrava, Šembera, Jizerka), flood modelling was carried out using 1D and/or 2D approach. The next steps were to evaluate the differences in the results when modelling on the basis of various inputs from vertical surveying and analysis of the inputs.

Special task was the preparation of the evaluation parameters for carrying out the intercomparison study (end of the third year). The list of parameters was developed, which may have an effect on the accuracy of the determination of flood plain areas. At the end of the year, the project team was focused on the initial stage of the selection of reference sites in the West and Centre areas – two sites for 2D modelling and four sites for 1D modelling, including the preparation of input data (processing of characteristics for potential reference sites).

Administration and development of the DIBAVOD tool

Project manager: Ing. Tomáš Fojtik
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Duration: 2008–2012 (long-term activity)

The objective of the task is mainly the administration and updating of the selected layers of the DIBAVOD database.

In 2011 the process of updating of the watercourse and watershed divides was continued. This activity was initiated by the request for collaboration and support to Czech Hydrometeorological Institute from April 30th, 2008 (No. 33869/ENV/08) in updating the watershed divides – supporting the development of the watershed divides in the 1 : 10 000 map scale. In the first half of the year, the updating was completed for the four remaining branches of the seven. The data for each area were linked to one data set and in the second half of the year the problematic situations both on the borders between the areas and inside them were solved. For each problematic area the error was resolved and subsequently all data affected by the correction were relevantly modified (both graphical and attribute data). The layer of watershed divides in the 1 : 10 000 map scale, completed in 2011 except for minor exceptions, will be agreed by CHMI and TGM WRI, p.r.i.

Operation of registers of Public Administration Information System-Water, and data support to the application of combined emission limit determination

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Duration: 2011

The objective of the project is particularly to fulfil the obligations of the TGM WRI, p.r.i., specified in the Decree No. 391/2004 Coll., the Government Decree No. 229/2007 Coll. and also in the Guideline to this decree issued by the Department of Water Protection of the Ministry of the Environment. The operation of the registers of the Public Administration Information System-Water and data support for combined

emission limit determination is fulfilled by means of the Hydrological and Environmental Information System of the TGM WRI, p.r.i. (HEIS VÚV), operated as the central information system for the information maintenance, processing and making available.

In 2011, the project team operated the information system, which provided the updated data from records and registers, and at the same time ensured the availability of the services provided in the framework of the management of registers of Public Administration Information System-Water at the web address <http://www.voda.gov.cz/portal/>.

The project team updated the records on hydrogeological regions, the watercourse registers, including highly modified and artificial water bodies, records on status of water bodies, records on the environmental potential of highly modified and artificial water bodies, records on flood plain areas, and records on protection zones of water resources (including the protection zones of water reservoirs).

During the year a register of protection areas in the range of data that are available for the HEIS portal was incorporated into the structure of Public Administration Information System-Water and since December 12th, 2011 it is maintained. Furthermore, in the framework of the application for the combined determination of emission limits, including the relevant information support, the updated application, data and the results of the calculation were available on the HEIS WRI portal since October 10th, 2011, as specified in the revised Government Regulation No. 61/2003 Coll. The evaluation of the fulfilment of the requirements on the quality of surface waters at a national scale for basic variants (i.e. for the status quo, provided compliance with the emission standards and under the conditions for the application of BAT at municipal WWTPs) was subsequently completed.

The necessary outputs included continuous information support to the users, including user applications, telephone consultations and seminars on the premises of TGM WRI, p.r.i.

In 2011 the project team ensured the compliance with the obligations by ensuring availability of the metadata, which was the TGM WRI, p.r.i., obligation stemming from Act No. 123/1998 Coll. The metadata were prepared in accordance with the standards CSN ISO 19115 on Geographic information – Metadata and CSN CEN ISO/TS 19139 on Geographic information – Metadata – XML implementation diagram. The data are available to the public from the portal on Public Administration Information System and at the address <http://geoportal.gov.cz/php/micka>.

Services provided by the system are available to the project managers of the projects commissioned by Ministry of the Environment in the framework of intranet of TGM WRI, p.r.i., at <http://prgheisv> (internal users only). System services available directly to the Ministry of the Environment, professional and general public are available at <http://heis.vuv.cz>.

Technical support in preparation of legislation amendments in the area of water protection

Project managers: Ing. Arnošt Kult, Ing. Pavel Balvín, Ing. Anna Hrabánková, Ing. Petr Tušil, Ph.D., MBA
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Duration: permanent activity

The objective of the project is to provide legal and expert support to the Ministry of the Environment in supplementing and developing the implementing regulations. Correct implementation of legal provisions in practice is frequently problematic. Finding a consensus in deliberating legal amendments and proposals for implementing regulations demands research and analyses often based on extensive volumes of specific information from both research and practice. A great attention should be paid to the studies of selected foreign literature.

In the framework of the project in 2011, the outputs were prepared as follows:

- a proposal for localization of monitoring sites in the updated water bodies in river category, including its map illustration with regard to the requirements of Water Protection Department of Ministry of the Environment,
- draft list of monitored parameters in the individual monitoring sites including the proposed frequency of the monitoring of individual groups of indicators and biological components for the assessment of the ecological status of the water bodies,
- technical document for the development of paragraph version of the Government Regulation on minimum ecological flows according to paragraph 36 of an amendment to Act No. 254/2001 Coll., and expert activities and participation in expert negotiations in accordance with the requirements of the contracting authority,
- supporting documents for the development of the paragraph version of an amendment to Government Regulation No. 103/2003 Coll., on the determination of vulnerable areas and on the use and storage of fertilizers and manure, crop rotation and the implementation measures against soil erosion in these areas, arising from the review of vulnerable areas, including expert activities and participation in expert negotiations in accordance with the requirements of the contracting authority.

The development and maintenance of data, data and map-based outputs for reporting, International commissions for the protection of the Elbe, Odra and Danube Rivers

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Duration: 2011

The objective of the project is to fulfil reporting obligations concerning areas posed to significant flood risk and to coordinate the delimitation of transboundary surface water bodies carried out together with neighbour countries.

In 2011 the project activities were focused on two main areas, which are reflected in the reporting activities and which will continue in 2012.

1. Development of a layer of areas posed to significant flood risk for all international commissions. The graphical interpretation of the data has been reconstructed, attribute added data have been inspected and after connecting the attribute data the resulting layer was verified by experts of the Ministry of the Environment.
2. Reconciliation of pass-through points and segments of transboundary water bodies was a long-term process, observation proceedings from the part of catchment area administrations and also of the Ministry of the Environment had several rounds and even editing performance and production of maps.

In the first phase, contact points (point layer) were defined at all borders of the liner layer of bodies of surface water. The definition of the segments of the cross-border bodies of water was made directly to the liner layer of bodies of surface water. On this basis, layer of segments of transboundary water bodies (liner layer) was developed. In cooperation with the international commissions, the attribute point and liner layers were subsequently gradually developed. On the basis of the attribute data, also Wasserblick data templates were prepared for the Elbe and Odra Commissions. For the overall orientation in the first phase not only maps of the transboundary areas but also the overall maps of the catchment areas were developed in harmony with those produced by river basin enterprises – in total of 229 map sheets. In the course of the observation proceedings 303 map sheets of transboundary areas were produced.

The operational requirements resulting from the activities of the international commissions in this area were continuously fulfilled.

Support to the activities of the Czech Republic in the International Commission for the Elbe River Protection (MKOL)

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Collaborating project manager: RNDr. Hana Prchalová

Duration: long-term activity

The objective of the project is to provide expert support to the International Commission for the Elbe River Protection in specific areas by preparing relevant documentation and participation of TGM WRI, p.r.i., staff in the activities of expert teams of the International Commission for the Elbe River Protection: Surface Waters (SW) and Groundwater (GW). TGM WRI, p.r.i., experts cooperate in these activities with those from other institutions (river basin administrators, Czech Hydrometeorological Institute, and others).

The key tasks of the expert teams in 2011 included the continuous monitoring of the fulfilment of the objectives of the international river basin management plan for the Elbe River basin, preparation of relevant documentation for ensuring public awareness and preparation of the upcoming planning cycle. Namely, the updating of the international Elbe River measurement programme was carried out, the methodology for the calculations of solid component outflows was refined and information was exchanged related to the methods for assessments of groundwater status.

Support to the participation of the Czech Republic in the activities of the Permanent Committee for Saxony and Permanent Committee for Bavaria of the Czech-German Commission for Transboundary Waters

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Collaborating project managers: Ing. Věra Kladivová, Mgr. Pavel Eckhard

Duration: long-term activity

The objective of the project is a long-term providing of expert documentation for the collaboration in transboundary waters and to support the activities of both Permanent Committees. Issues of transboundary waters are investigated by Czech-German expert teams or by direct collaboration between Czech and German experts. The outputs include expert documentation for the negotiations of expert teams and higher organisational units participating in this cooperation.

Expert documentation that is required has the nature of the proposals in various stages of development or approval. The problems to be resolved are numerous and different, from strategic and methodological documents for addressing specific problems of specific sites to the implementation of the Water Framework Directive on transboundary waters.

Activities under this assignment are carried out by experts from TGM WRI, p.r.i., as well as those from other institutions (river basin administrators, Czech Hydrometeorological Institute, and others) and an important aspect is in consensus to be made by national and international experts in resolving the problems.

In 2011, TGM WRI, p.r.i., staff participated directly in collaborations between Czech and German experts in investigating the issues of quality of surface water and groundwater, in the development of the documentation as well as in the meeting of the Permanent Committee for Saxony. The experts also participated in the long-term challenges aimed at protecting freshwater pearl mussel and thick-shelled river mussel, and in protecting and improving quality of transboundary waters involving those of the Dragon Lake (Drachensee in Federal Republic of Germany) in the catchment area of the Kouba (Chamb) against eutrophication, in finding solutions concerning mercury pollution in the Ohře and Reslava Rivers and Skalka reservoir by hydrargyrum coming from German territory. In 2011, TGM WRI, p.r.i., experts also participated in the preparation of the meeting of the Permanent Committee for Bavaria.

Bathing waters in the transitional period – reporting support in accordance with Directives 76/160/EEC and 2006/7/EC

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Duration: 2011

The objective of the project is to provide information and documentation necessary for meeting the reporting obligations stipulated in Directives 76/160/EEC and 2006/7/EC on the basis of a monitoring conducted in collaboration with Ministry of Health.

In 2011, the project activities included validation of the results of monitoring obtained from Ministry of Health for preparation of reporting in accordance with Directive 76/160/EEC and Directive 2006/7/EC. Performed was also validation of data processed by the European Commission as a part of quality evaluation of bathing waters in the Czech Republic. Simultaneously, expert discussions took place over the new reporting templates in the document on Reporting Sheets for the Bathing Water Directive 2006/7/EC.

A register of surface waters used for bathing in the Czech Republic is available to users from the public administration as well as the general public on the Internet at <http://heis.vuv.cz>.

Balance, verification and assessment in the field of protection of water quantity and quality

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Duration: permanent activity

The objective of the project is to develop a Summary Water Balance document for the main river basins in the Czech Republic as specified in Section 1, paragraph 2 of Ministry of Agriculture Decree No. 431/2001 Coll. on the contents of the water balance assessment, manner of its preparation and water balance data.

The following outputs were prepared as components of the analyses of water resources utilisation and water quantity and quality requirements for the year 2011:

- a register of data on water withdrawals and waste water discharges, submitted to the catchment area administrators in accordance with the Decree No. 431/2001 Coll. (updated files on the withdrawals and discharges in 2010, data transformed for the purposes of calculations in database files and plus other outputs),

- check balance calculations corresponding to the former summary water management balance assessment and/or the Ministry of Agriculture guideline on processing of water management balances for individual catchment areas,
- summary hydrological balance assessment, summary water management balance assessment – quantity and quality of surface water (the quality was evaluated only for those river basins, for which data were available for the objective assessment of the quality of water – Povodí Vltavy, s.e., and Povodí Ohře, s.e.) and the quantity of groundwater. These activities included preparation of 2010 Water resources journal.

Concise information on water in the Czech Republic

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Duration: permanent activity

The objective of the project is to collect, analyse and publish concise information on waters in the Czech Republic in various forms of outputs in accordance with the requirements of Ministry of the Environment on the basis of the results of the projects carried out in TGM WRI, p.r.i., and other data sources.

The outputs in 2011 included those as follows:

- At the beginning of the year 2011 a publication on Water resources journal 2009 was completed. The publication includes an assessment of natural conditions (carried out by using time series 1995, 2000, 2005, 2006, 2007, 2008 and 2009), water resources, water quality in watercourses, water abstractions and waste water discharges, data and information on public water supply systems and public sewerage systems, on waterways, the use of water power and the results of the summary water balance assessment,
- For a report on the Status of water management in the Czech Republic in 2010 (a part in responsibility of Ministry of the Environment), the project team prepared necessary supporting documents on water management and data on produced and discharged pollution from point sources, pollution from non-point sources, emergency pollution, quality of surface water and its development since 1990, structures aimed at water protection (an overview of the construction and reconstruction of municipal and industrial waste water treatment plants in 2010), and other necessary information,
- Input documentation for chapter on Water in the 2011 Statistical Yearbook of the Environment of the Czech Republic and other supporting documents required during the year by Ministry of the Environment.

Socio-economic analysis of climate change impacts on water management in the Czech Republic

Project managers: Ing. Šárka Blažková, DrSc., Ing. Lubomír Petružela, CSc., Ing. Jiří Dlabal, Ing. Arnošt Kult (TGM WRI, p.r.i.), prof. Ing. Jiřina Jílková, CSc., Ing. Lenka Slavíková, Ph.D., Mgr. Viktor Květoň, doc. Ing. Jan Pavel, Ph.D., Ing. Jan Slavík, Ph.D. (Institute for Economic and Environmental Policy of the Prague University of Economics)
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Duration: 2009–2011

The project is focused on the interdisciplinary research of social and economic impacts of the climate change in water management as well as on economic instruments developed to mitigate these impacts. Increasing variability and uncertainty of the impact (range, place, time) forms situations in which indirect but flexible tools of economic type are applicable whose principles are already in the basic

patterns of economic, but also social behaviour fixed or can be positively controlled. The outputs of the project include the input documentation for programs of measures intended as prevention and mitigation of climate change impacts on water and water management, including planning instruments, and application of draft guidelines and legislative modifications.

In the final year of the project (2011) the accent was laid to synthetic and implementation outputs of the project. The results include the specification and substantiation (on the basis of carried out analyses) of the framework principles in the development of adaptation measures to mitigate the negative consequences of climatic phenomena in water management and its functions, the case studies, which in conditions derived from the practice of analysing the individual aspects of the possible impacts and tools, and the proposals for specific economic and methodological tools, covering the area of management of the water supply of the population with drinking water and the remediation of relevant infrastructure.

From the view of sustainable use of water, it is evident that the impacts are combined – in the field of environmental, economic, social and financial terms – and targets in these areas interact. Elements of the market type of the use of water are being introduced but the development of traditional markets in the distribution of water is limited by the special nature of water. Market parameters (cost, price) have a significant impact on the supply side connection with demand. This raises the need for an interdisciplinary approach and the need for greater integration of economic elements and methods into the solution.

The emphasis on cost recovery of water services (including the cost of adaptation measures due to the impacts of climate change) and the financial return emphasizes the fiscal role of prices in the segments (subscriptions to groundwater and surface water and drinking water supplies), where economic parameters and price on the supply side, significantly affect the demand. The current instruments in the area of water management, including economic instruments, are aimed at searching for possibilities to provide resources, quality and continuity of supply of water, in particular, measures for the strengthening of the supply side. They virtually support costs, which by the tendency to higher (or complete) return are reflected in higher prices for water services. Then this leads to the only possible choice for consumers, which is reduction of the consumption. The demand squeeze is reflected in desirable and permanent rational savings but also the crackdown on the benefits from water and the problem of recovery of the costs of the installed equipments. Measures forced by the climate change and their financing this trend will deepen. We can wait for the situation, which can be found in an integrated view on the natural-technical and socio-economic access to be evaluated as the price drought. This shows the situation with a natural enough resources of water in the required quality, with enough potential of the technical infrastructure and capacities for the expert administration and operation on the supply side but without response on the optimal use of water on the side of the consumer. The innovation of rules that support higher importance of economic instruments and their diversification is the real strategic line and tactics in response to the increasing weight of market and financial factors in the use of water and the variability and uncertainty stemming from climate change.

Jointly used groundwater on the Czech-Saxony border (GRACE)

Project managers: Ing. Marie Kalinová, Mgr. Pavel Eckhardt, and others
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Duration: 2011–2014

The project is focused on the protection of water resources and derivation of causal factors of the decreasing groundwater levels in transboundary areas of the Czech-Saxony border.

After long term preparation by the TGM WRI, p.r.i., in August 2011, subsidy was allocated from the EU Programme Objective 3 for support of transboundary cooperation between the Czech Republic

and the free State of Saxony in the project on Together used the groundwater on the Czech-Saxony border (GRACE), in which TGM WRI, p.r.i., is a head partner and the project partner is the Sächsisches Landesamt für Umwelt, Landwirtschaft und Geologie in Dresden.

Both the Czech and the German party used to supply the population from groundwater resources in the areas of Hřensko–Křinice/Kirnitzsch and Petrovice–Lückendorf–Johnsdorf–Oybin. In the framework of the project it is planned to develop models of groundwater flows, to monitor the development spring yields and spring areas, age and the mixing of water, the impacts of climate change on water resources in both areas and to study the fauna of the groundwater. Subsequently, a joint strategy for protection of the groundwater in these areas will be developed.

In 2011, basic steps relating to contracts, financing and acquisition support for the project from the Ministry of the Environment were carried out as well as further steps leading to the initiation of the expert activities, to ensuring the required publicity of the project, and also research activities and field measurement were initiated.

Branch of Water Technology

Safety assessment of emergency infrastructure components – drinking water

Project managers: Ing. Václav Šťastný, Ing. Lubomír Petružela, CSc., Ing. Jana Hubáčková, CSc.
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Duration: 2010–2014

The objective of the project is to propose and to optimize methods for resolving emergency events (pollution releases and natural disasters) in drinking water supply. The outputs of the project will be used by government authorities in the development of integrated emergency plans and securing drinking and technological water under emergency situations.

The project, carried out in collaboration with several specialised organisations and coordinated by CITYPLAN Prague, is financed by the Ministry of the Interior of the Czech Republic. The project was launched at the end of October 2010.

In 2011, a literature review was completed being focused on the security issues of water distribution and water tanks under emergency situations. Documents were prepared for emergency analysis in the form of analytical table and expert sheets, a part carried out by TGM WRI, p.r.i., concerning the transport and storage of drinking water.

Alternative resources of water in the municipalities under emergency situation – the use of original resources and springs

Project manager: RNDr. Josef K. Fuksa, CSc.
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Duration: 2011–2014

The objective of the project, financed by the Ministry of the Interior of the Czech Republic from the Security Research Programme of the Czech Republic (the project VG20112014028), is to examine the possibilities for supplying the population under emergency situations by basic quantities of water from local springs, i.e. resources independent on the operation of the networks. For selected municipalities above 20 000 inhabitants, appropriate resources and potential catchment areas will be identified. The results of case studies will be generalized for the needs of the local authorities and the public.

In the first year of the project the preparatory works were carried out as follows:

- selection of municipalities for the case studies,
- selection of localities, collection of basic data,
- preparation and application of methodology for field and laboratory works,
- basic hydrogeological assessment.

As practical results, the known springs in the cadastre of Prague (146 objects) and Brno (21 objects) were localised and studied and localities were selected for the standardized monitoring – case studies (65 resources in Prague and 14 in Brno).

Research on the intensification of rural and small waste water treatment plants by non-capital means

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Duration: 2011–2015

The objective of the project is to show whether the utilization of biotechnological products can improve the status and the function of small waste water treatment plants, both activated and extensive. Additional goal of the project is to develop optimum method for monitoring of the application of biotechnological products on waste water treatment plants.

The project deals with both the influence of the dosage of a biotechnology product on the operation and function of small household waste water treatment plants and verification of the influence of biotechnological products on the treatment effect and the operation of the extensive waste water treatment plants with biological stabilization tank. In the course of the project the input documentation will be prepared for the elaboration of the certified procedure for the success of these non-traditional methods of intensification of waste water treatment plants.

In the first year of the project, in addition to the selection of localities and literature reviews, the project team organised comparative measurements on a small unified household waste water treatment plants and a rural waste water treatment plant equipped with stabilization tank in Kobylice locality, as a basis for the evaluation of the influence of the application of a biotechnology product in 2012.

Registers of point pollution sources and support to the reporting on the performance of the transitional period for the application of Council Directive 91/271/EEC and reporting according to the Articles 15, 16, 17 of this directive

Project managers: Ing. Eva Mlejnská, Ing. Elzbieta Čejková
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Duration: permanent activity

The objective of the project is to acquire, collect, process and provide information on municipal and industrial pollution sources.

In 2011, the project was concerned with updating, evaluation and forwarding of information on removal of wastewater via public sewerage systems and on the degree and manner of treatment of such wastewater. Furthermore, the activities included digitalization of data available from Assets and operational records of water supply and sewerage systems and Summary water balance for reporting to the European Commission on the implementation of Council Directive 91/271/EEC on the territory of the Czech Republic pursuant to article 15 for agglomerations above 2 000 PE. Some data are also being prepared required for reporting in accordance with articles 16 and 17 thereof,

and last but not least the data relating to the industrial pollution sources discharging waste water into surface water or to municipal sewerage systems in quantities greater than or close to 6 000 m³/year.

Possibilities for removal of specific pollutants (PPCPs) at waste water treatment plants

Project managers: Ing. Miroslav Váňa, RNDr. Josef K. Fuksa, CSc., Ing. Jana Hubáčková, CSc., Ing. Roman Jobánek, Ing. Jiří Kučera, Ing. Magdaléna Kvíčalová, Ing. Pavla Martinková, Ing. Lenka Matoušová, Ing. Danica Pospíchalová, Ing. Filip Wanner
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Duration: 2009–2013

The objective of the project is to describe and test the most suitable technologies and to improve the existing wastewater treatment technologies in order to achieve maximum possible degree of removal of selected pharmaceuticals and personal care products (PPCPs), especially important pharmaceuticals, from wastewater.

Knowledge obtained from the research will be applied by project designers, operators and water management authorities in designing of waste water treatment plants restoration projects and it will also serve as a base for the application of verified elements of the treatment technology line to eliminate selected PPCPs from wastewater. The studies of these issues are implemented in the framework of a research co-financed by the National Agency for Agricultural Research of the Ministry of the Agriculture.

In 2011, the project included continuous updating of the literature review on the issues of PPCPs removal from wastewater by biological treatment but in particular the completion of detailed monitoring of selected waste water treatment plants and its evaluation. Waste water samples were collected at key points in these plants and from the activated sludge and tested for the presence of specific pollutants (salicylic acid, clofibrac acid, carbamazepine, ibuprofen, diclofenac, estrone, 17β-estradiol, 17α-ethynyl estradiol) as well as basic chemical indicators significant for biological treatment of wastewater (pH, conductivity, COD_{Cr}, BOD₅, SS₁₀₅, N-NH₄⁺, N-NO₂⁻, N-NO₃⁻, N_{org.}, N_{tot.}, P-PO₄³⁻, P_{tot.}).

The concentrations determined were used as a base for final assessments of efficiency in removal of the monitored substances at individual stages of the technological line. Having regard to the reconstruction of one reference locality, however, the completion of the evaluation and publication of the measured data is postponed into the year 2012.

At the same time, a pilot operational model of a plant of the size of approximately 300 l was developed and put into operation. The pilot model is designed so that it is possible to modify the different systems of waste water treatment (to change the technological arrangement) and also to change the technological parameters of water treatment.

Fungal biofilms for wastewater bioremediation complementary to waste water treatment plants

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Duration: 2009–2013

Fungal biofilms have a considerable degradation potential that has not been satisfactorily used for remediations. Immobilised cultures of ligninolytic fungi utilising unspecific enzyme mechanisms to

degrade pollutants can be applied alongside activated sludge technologies in the decomposition of recalcitrant substances that are not degraded in water treatment plants.

The project focuses on the research of fungal biofilms colonising inert or lignocellulosic materials and acting over an extended period under conditions of bacterial stress, and on investigation of the structural, biological and biochemical qualities. The project will include measurements of the biofilm capacity in degradation of selected pollutants and removal of heavy metals and determination of the potential for "trickling-bed" and "rotating disc" type purification reactors. Functioning of constructed biological reactors will be subject to analyses, optimisation and tests in combination with traditional activated sludge processes in treatment of wastewater contaminated with heavy metals and other pollutants.

In 2011, the main attention was focused on the ongoing experiments with decolorization of waste water from textile industry in the pilot model, which was designed as a precipitated biological column. For the tests of decolorization, the testing samples of the waste water I and waste water II were used, being obtained from the dyeing mill Inotex, Ltd. In all cases fungus *Irpex lacteus* were used for tests of the biodegradation. The tests were focused primarily on the validation of the technological parameters (in particular pH and temperature), as the limiting factors of the whole process. Between two samples a significant difference was not recorded in the ability of discoloration. During the tests, a great problem was in clogging of the entire biological reactor, which led to frequent interruptions in the tests. The main reason was the composition of tested waste water – the concentrations of suspended solids were at a level of grams per litre.

Activities of the Testing Laboratory for Water Management Facilities

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Duration: permanent activity

The Testing Laboratory for Water Management Facilities is primarily used to accredited testing of the treatment efficiency of household waste water treatment plants (WWTP) according to CSN EN 12566-3+A1. It is also possible to carry out accredited test to determine the content of residual oil from oil/water separators of light liquids and grease traps.

In 2011, the laboratory tested, according to an accredited test procedure SOPC1, four waste water treatment plants. Two of them will be also tested during the year 2012. On the one of the plants equipment for the precipitation of phosphorus is installed. In this manner the manufacturer tries to comply with a new Government Regulation No. 416/2010 Coll. whose amendment specifies stricter limits for discharges from treatment plants and the newly requires the removal of total phosphorus in waste water treatment, if necessary, infiltration of waste water into groundwater. On the other two waste water treatment plants, within the non-accredited testing the efficiencies of treatment was compared for alternatives without and with the use of floating means for delivery of biomass in the activation tank.

Furthermore, the testing laboratory is available for tasks that are addressed in the Branch of Water Technology. A model that was installed monitors the degradation of the residues of pharmaceuticals during the activation purification process and effect of barches enzymes on the treatment efficiency in household waste water treatment plants is tested.

Maps of the risks arising from the flood risk in the Czech Republic

Project manager: Ing. Karel Drbal, Ph.D.
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Duration: 2007–2011

The project was during the whole period in the years 2007–2011 aimed at testing the methods for risk analysis in flood plain areas or at improving these methods or developing new methods for reliable derivation of flood risks.

Troubled areas of the project covered the relatively broad interval of the scientific disciplines. In addition to the research on the methods for improving flood risk derivation through adequate means of mathematical modelling of flood discharge (1D, 2D modelling) or examination of the usefulness of the various basic topographical and altitude map documentation in connection with the necessary accuracy of the determination of flood hazards and risks, the project activities included testing of appropriate methods for the use of different forms of documents on territorial planning and topographical documentation for identification of functional use of the areas.

The research on the new methods to reduce the uncertainties which are associated with the individual steps of the developed methods was a very interesting challenge. The attention was also devoted to the flood problems in the broader economic context. On the basis of analyses of existing macroeconomic predictions of the Czech economy the alternative proposals for financing the flood protection as the public service in each scenario of the GDP growth of the Czech Republic to the year 2030 was submitted.

One of the main outputs of the project is a Methodology for the development of flood hazard maps and flood risk management, which was published in the Journal of Ministry of the Environment in April 2010 (Drbal et al., 2010).

Implementation of EU Directive on the assessment and management of flood risks

Project manager: Ing. Karel Drbal, Ph.D.
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Duration: 2007–2011

The objective of the project was to develop an efficient method and appropriate tools for transposition of the Directive of the European Parliament and of the Council on the assessment and management of flood risk (2007/60/EC) into the legal system and institutional framework of the Czech Republic.

On the basis of the results of the detailed analysis of the requirements of the Directive of the European Parliament and of the Council on the assessment and management of flood risk (2007/60/EC, hereinafter referred to as the Directive) and the relevant legal regulations in force in the Czech Republic a detailed proposal was submitted for a method for the transposition of the Directive into the conditions of the Czech Republic and the last version of the implementation plan, which should ensure the fulfilment of the all requirements in the Directive.

In 2011, the project was focused on the refining of the methods for derivation of reduced value of the weighted mean of the indicator of critical conditions of flooding from the flash rains with the negative impacts on the urbanized territories. At the same time the updated outline and draft of the necessary scope of the content of the plan for the management of flood risks were submitted. The proposal is based on the application of such a procedure in accordance with the general

principles of the development of the content of the strategic plans and takes into account the new knowledge obtained in the framework of research in other projects.

Technical support to the participation of the Czech Republic in the International Commission for the Protection of the Danube River

Project manager: Ing. Stanislav Juráň
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Duration: 2008–2011

The objectives of the project were focused on the support to a wide spectrum of activities resulting from the Czech Republic's participation in the activities of the International Commission for the Protection of the Danube River and its key expert groups. Results and outputs of the project in 2011 include the basis for ensuring the currently handled issues defined by the plan of activities of the various expert and ad hoc groups of the International Commission for the Protection of the Danube River.

The activities in 2011 were focused on those related to the Danube River Basin Management Plan (DRBMP), with the preparation of the Joint Danube Survey 3 (JDS 3) and on the activities of the permanent type. In the framework of the project the supporting documents to the database of municipal and industrial point sources of pollution were secured, the fundamental measures which should in the near future contribute to a substantial reduction in the pollution of water in the basin of the Danube River were defined and the documents to the questionnaires concerning the analysis of the situation and the problems associated with the assessment of the chemical and ecological status of waters etc.

Cooperation in transboundary waters with the Slovak Republic

Project manager: Ing. Stanislav Juráň
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Duration: 2008–2012

The task is intended to the support to the activities of the joint Czech-Slovak working group on water protection under the auspices of the Czech-Slovak Commission on transboundary waters. The support includes, in particular, the coordination of tasks arising at meetings of the working group and relating to the Czech side, organisation and management of the Czech delegation in the negotiations. The evaluation of the results of the monitoring of surface waters at transboundary watercourses in accordance with the national legislation of both countries, and registration and evaluation of accidents are the permanent activities.

In 2011 the evaluation of the results of monitoring for the year 2010 in the permanent inspection sites of transboundary waters, which are localized to major watercourses, was carried out. The project team also evaluated the quality of surface waters in selected rotating control sites located at other transboundary waters, in accordance with the approved international program. In the framework of the project, a list of watercourses and water bodies as defined in second zone of interest within the Czech-Slovak transboundary waters was developed. In 2011, two joint meetings were organised of the working group, being focused mainly on the fulfilment of the tasks arising from the meetings of the Commission and for the preparation of the monitoring and its evaluation in 2012.

Cooperation in transboundary waters with Austria

Project manager: RNDr. Hana Mlejnková, Ph.D.
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Duration: 2011 (with a view to a long-term activity)

The project includes activities resulting from the Protocol of the Czech-Austrian Commission for transboundary waters, aimed at the monitoring and quality control of transboundary watercourses.

In 2011, the activities in the framework of the project were oriented on the monitoring of the quality of the Czech-Austrian transboundary watercourses (Moravská Dyje, Dyje, Pulkava, Lužnice, Malše, Dračice and Větší Vltavice). According to the updated Programme of the monitoring of the Czech-Austrian transboundary watercourses the water quality was monitored with monthly frequency. The results of the analyses were used for evaluation of the pollution transported by flows across international borders and of the general trend in the development of the quality of transboundary watercourses. In 2011 the special monitoring included the Dyje River and its highly polluted Austrian tributary, the Pulkava River, and the Lužnice River at the outflow of the waste water from Agrana Stärke plant. In the framework of the project, the developments were also monitored in constructing those waste water treatment plants outside the vicinity of the international borders, which can contribute to the improvement of the quality of transboundary watercourses. The documents referred are prepared for 20th meeting of the Czech-Austrian Commission on transboundary waters.

Support to the activities under the Convention on the protection and use of transboundary watercourses and international lakes

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Duration: 2011

The objective of the project was to ensure the activities in support to the performance of the state administration for Ministry of the Environment in the implementation of the Convention on the protection and use of transboundary watercourses and international lakes. The project involved the cooperation of a staff member of TGM WRI, p.r.i., in the preparation of the Second assessment report and his participation, as the representative of the Czech Republic, at 12th negotiation of the working group on Monitoring and assessment (MA) of the Convention and related activities.

In support to the activities under the Convention on the protection and use of transboundary watercourses and international lakes in the past year the reports were prepared as well as evaluations of transboundary waters relating to sub-regions of Caucasus, Central Asia and South-Eastern Europe, as part of the Second assessment report. This year the development continued in the Second assessment report with information from sub-regions in Western and Central Europe, which also include the evaluation of areas of transboundary basins on the territory of the Czech Republic. This sub-region included evaluation of the catchment area of the Meuse River, the Mosella River and the Saara River, the Odra River, the Rhine River, the Scheldt River and the Elbe River. The sub-region of South-Eastern Europe newly incorporated the catchment area of the Danube River and the Czech part of the basin drained by the Morava and Dyje Rivers. These activities included also the participation in the meetings of the Group on Monitoring and cooperation in the development of the Second assessment report of the UN/ECE region as a whole, focusing on information and evaluation relating to the Czech Republic.

System approaches to reducing the adverse environmental impacts of floods and soil erosion in the Czech Republic

Project managers: Ing. Karel Drbal, Ph.D., et al.
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Duration: January–November 2011

The project dealt with the proposal and preparation of an integrated flood and soil erosion protection system according to the strategy approved by the Government and methodology issued by Ministry of the Environment in 2008.

The flood and soil erosion protection system applying the nature friendly measures is a part of the strategy approved by the Government in November 2010. Implementation of the guidelines of Ministry of the Environment, which proposes to address this issue comprehensively, currently requires to specify and verify the relevant method. The focus in 2011 was thus aimed at setting the system approach, specification of the methods and verification of the method in a pilot catchment area of the Svatka River downstream from its confluence with the Svitava River. From the most important results, which can be applied in other territories of the Czech Republic, can be noted as follows: methods for the derivation of priorities, the delimitation of river sections, the schedule for the development of nature friendly measures, the preparation of the Geographic information system (GIS) tools for the development of appropriate scale of map outputs, the proposal of the central data archive and also the determination of the methods for managing the relevant data.

Specialist training for experts of the State Hydrometeorological Service of Moldova

Project managers: RNDr. Denisa Němejcová, doc. RNDr. Světlana Zahrádková, Ph.D.
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Duration: June–November 2011

The aim of the project was to train and organise the fellowships for Moldovan experts – hydrobiologists from the State Hydrometeorological Service in Chisinau (Moldova) at Brno Branch of T. G. Masaryk Water Research Institute, p.r.i.

Moldova is one of the so-called priority countries, which the Czech party supports according to the possibilities and the significance of the individual issues in selected areas, which include the protection of the environment. The fellowship contributed to the deepening and widening of the professional knowledge and skills of the Moldovan biologists in the area of biomonitoring of biological components of the watercourses by increasing the knowledge in taxonomic determination of key biological components of ecosystems of running surface water – macrozoobenthos, phytobenthos and macrophytes.

Potential flood damage and risks in the catchment area of the lower Morava River and the Dyje River – CEframe international project (work package 4)

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Duration: 2011–2012

Project CEframe (Central European Flood Risk Assessment and Management in the CENTROPE region) deals with assessing and managing flood risk in the Central Europe, in particular, on the transboundary rivers, the Morava, Dyje, Danube and Lajta. The project was carried out by representatives of Austria, Slovakia, Hungary and the Czech Republic.

Work package 4 of the project deals with the determination of flood risk on the basis of the potential damage to selected transboundary watercourses. Having regard to the diversity of data and data bases in the individual countries involved in the project, the first activities included the development of common methods for the calculation of the potential damage and, subsequently, for the derivation of the risk. The proposed model for the calculation of the potential damage is based on the methods referred to in the so-called Rhine Atlas (Atlas of flood risks and potential damages on the basis of the evaluation of extreme floods on the Rhine River). As input data into the calculations the water depths from maps of flood risk areas will be used for each scenario and CORINE land cover geodatabase (source of information on the use of the territory). In the event of national methodologies for the calculation of flood damage, the project results will be compared with the outputs of these methodologies. Information on flood risk on the basis of potential damage will serve as a basis for the activities in work package 5 of the project, which deals with the development of flood management strategies in the project territory.

Information platform for cultural landscape

Project managers: Ing. Hana Hudcová, RNDr. Denisa Němejcová
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Duration: 2010–2012

The project supports collaboration with institutions dealing with research, development and education in the field of the cultural landscape. The project is co-financed from the European Social Fund and the state budget of the Czech Republic.

In 2011, key activities of the project continued, covering the activities of the focal points in each of the institutions, the management of the information portal, the study of good practices (placements in foreign networks) and the activities of the Centre for professional contacts (internal exchanges of students, communication courses in English and German language, seminars to current challenges). In addition to these activities, open days were organised in individual institutions, as well as lectures and a dictionary of the landscape at the information portal.

The perspectives of landscape management – innovation of landscape disciplines

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Duration: 2011–2013

The objective of the project is to achieve, with the contribution of experts from the practice, a significant improvement of the skills of academic staff and improvement in the training of students in resolving problems arising from the increasing frequency of dangerous natural phenomena, the development of accessible e-learning study materials, and changing of the stereotype of the lectures by incorporating those prepared by experts from practice and short-term intensive training scholarships at partner sites and universities in the EU and in the Czech Republic.

The participating institutions include Faculty of Forestry and Wood Technology of Mendel University in Brno, ARVITA P, Ltd., Faculty of Civil Engineering of Technical University in Brno and T. G. Masaryk Water Research Institute, p.r.i. The project is co-financed from the European Social Fund and the state budget of the Czech Republic.

In 2011, the objectives of the project were achieved, firstly, by the key activities leading to the development of learning materials and technical texts in e-learning format, and by lecturing activities and organising student professional practice at the Brno Branch of TGM WRI, p.r.i.

Educational and research centre for flood protection

Project managers: Mgr. Pavla Štěpánková, Ph.D., et al.
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Duration: 2011–2014

The project financed from operational programme on Education for competitiveness on behalf of the Ministry of Education, Youth and Sports of the Czech Republic and co-financed from European Social Fund and the state budget of the Czech Republic is focused on the development and innovation of education and its link with the research and development activities in order to improve the competitiveness of the Czech Republic.

The project aim is to develop communication and interactive platform, which will promote cooperation in the field of water management, in particular in flood protection. Faculty of Economics and Administration of Masaryk University, Faculty of Civil Engineering of Technical University in Brno and T. G. Masaryk Water Research Institute, p.r.i., will develop and share experience in this issue with students, thanks to the integration into the platform and use the rich offer of practice and traineeships substantially extend their skills and increase their competitiveness in the labour market. For more information about the project see the information portal www.pvvc.cz.

ProFor Weinviertel – Southern Moravia

Research of self-purification processes of small, heavily modified watercourses in the Weinviertel and Southern Moravia regions: development of the methodology for sustainable measures to improve water quality

Project manager: Ing. Milena Forejtníková
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Duration: 2009–2011

The objective of the project is to develop possible measures for improving the ecological status or potential in accordance with the Water Framework Directive for strongly modified watercourses of low order according to Strahler. The project is focused on the relations between morphology of river channel, anthropogenic influences and self-purification. The project includes also simulation of the relationships between the basin and watercourse and monitoring of the dynamics of the processes in watercourse linked to the inflow and distribution of nutrients.

Region of Southern Moravia and region Weinviertel have similar natural conditions and similar problems in the management of small watercourses in the agricultural landscape. A common project for the period 2009–2011 was therefore initiated, being supported from the European Fund for Regional Development, from the programme on European territorial cooperation between Austria and Czech Republic 2007–2013.

Final year of the project (2011) was focused on the use of the results for preparation of the final guidelines and the decision - making matrix of remedial measures. All of the proposed points were widely discussed also with the authorities and the involved public from agricultural sector, in particular in Austria. The main output is a bilingual guidelines together with three pilot studies. The progress in the project and more information about the project are available from www.profor.eu.com.

Documentation of the existing flood protection in the territory of the catchment area of the lower Morava River and the Dyje River – CEframe project

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Duration: January–August 2011

The main objective of the project was to document the current status in flood protection in the territory of the catchment area of the lower Morava River and the Dyje River and at the same time the common sections of the rivers compare with the neighbouring states of Austria and Slovakia.

The project was carried out as a part of the work package WP3 of the international CEframe project. The work was divided into the following three main activities:

- An overview of the current status in flood protection – flood management strategies – an overview of methodologies and specific methods relating to the implementation of the Flood Directive of EU in the Czech Republic and an overview of the entry maps and other data necessary for subsequent determination of flood hazard and flood risk.
- The establishment of uniform maps of flood plain areas – the GIS map of the transboundary part of the Morava River and the Dyje River with relevant thematic layers, including topography. A part of the GIS project was also focused on the development of geodatabase of hydraulic infrastructure of the project territory.
- Current practices in flood protection (legislation) – an analysis and an overview of the legislation and the specific strategies related to flood protection in the Czech Republic.

Ostrava Branch of the Institute

Research in the area of waste as a replacement of primary raw material resources

Main project manager: Ing. Tomáš Sezima, Ph.D.
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Duration: 2007–2011

The main objective of the project was to study the options for the use of waste (in particular sewage sludge) in producing solid alternative fuels (SAF), including the validation of new methods of control processes of waste management with the aim to identify potentially dangerous properties of batches and solid residues after incineration due to their recovery. The project was addressed to the maximum use of waste as a replacement of primary natural resources.

In 2011, the emphasis was put on research of combined physico-chemical and biochemical pre-purification of waste, in particular sewage sludge, in order to reduce some of their dangerous characteristics. An important part was also the development of the proposals and verification of the recipes of compound mixed solid alternative fuels, including analytical and toxicological monitoring. Due attention was paid to project presentation to professional public.

NAVARO – Development of tools for early warning and responses in the field of the protection of surface waters

Project manager: RNDr. Přemysl Soldán, Ph.D.
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Duration: 2011–2014

The objective of the project is to develop a certified methodology, tools and relevant manual, which would describe a method for rapid detection of the emergence situations and casual factors of accidents, terrorist attacks or criminal activities with an impact on the quality of surface waters.

The activities carried out in the year 2011 reflect the main objectives of the first phase of the project:

- search for information about major accidents with the contamination of surface water at the CR and abroad,
- study of documentation on methods for the continuous monitoring of water quality, aimed at the detection of accidental releases of pollution,
- selection of an appropriate device for continuous monitoring of emergency releases of pollution to the area of the Czech Republic,
- elaboration of an overview of potential contaminants and determination of their priorities for the sub-basins of the Czech Republic
- the development of a web page of the project.

Support to Ministry of the Environment in the field of water protection focused on the problem of dangerous substances

*Project manager: Ing. František Sýkora
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Duration: 2008–2011

The objective of the project was to support the implementation of the Directive 2008/105/EC and the activities arising from the obligations of the working group WG (E) of the European Commission – Directorate General Environment and the external activities of the working group CMA falling under the Common Implementation Strategy of Water Framework Directive.

Substantial parts of Directive 2008/105/EC were transposed into an amendment to the Government Regulation No. 61/2003 Coll. and into the Decree on the evaluation of the status of bodies of surface water, which was at the beginning of 2011 in the stage of the legislative approval.

In the framework of the support activities to the WG E of the European Commission Directorate General Environment, the revision of documents on priority substances for the Czech Republic for the three required substances: heptachlor, PCBs and benzene was made.

In 2011, technical support to external activities of the Working Group CMPE (Chemical Monitoring and Emerging Pollutants) falling under the WFD Common Implementation Strategy included preparation of questionnaires and fulfilment of the tasks arising from the participation in the plenary sessions of the CMPE group. The second plenary session of the CMPE group was organized in TGM WRI, p.r.i., in Prague.

Register of industrial sources of pollution – dangerous substances

*Project manager: Ing. Alena Kristová
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Duration: since 1998

The main objective of the project is to update annually the data on the management of selected hazardous substances and on their discharges into the aquatic environment. The types of the data are

adapted to meet the requirements stipulated in legislative provisions and requirements necessary for processing of materials and specific outputs required by Ministry of the Environment.

The inventory covers 17 specifically dangerous harmful substances and 66 dangerous harmful substances or their groups, which are specified in substance lists I and II to Council Directive 76/464/EEC, including the 32 priority substances from Annex X to the Water Framework Directive 2000/60/EC. The data include particularly those on actual discharges (data on the quantity and quality of discharges of waste water) and on the practices in managing dangerous substances (the way of the use). In 2011, the evaluation was carried out of emissions of particularly dangerous harmful substances from industrial sources in accordance with the requirements of the Government Regulation No. 61/2003 Coll., as amended (referred to in Annex 1, Section C, Table 3) and emissions of selected priority substances (Polycyclic Aromatic Hydrocarbons).

Cooperation in transboundary waters with Poland

Project managers: Ing. Luděk Trdlica, RNDr. Jaroslava Procházková
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Duration: 2011 (long-term activity)

The main objective of the project is to ensure the required water documentation and relevant information for the activities of the representatives of the Governments of the Czech Republic and the Republic of Poland for transboundary waters, as well as to fulfil all the requirements associated with the transboundary waters on the Czech-Polish section of the international border.

In 2011, Group of Planning (VH) at transboundary waters focused on the issues of flood protection measures at the border sections of the Petrůvka River and the Opava River and the construction of Nové Heřminovy reservoir. The working group for the implementation of Directive 2000/60/EC addressed, in particular, the evaluation of the progress made in the implementation of the programmes of measures. This dealt with the construction of the fish ladders and remediation of watercourses. For areal and diffuse sources of pollution the measures were undertaken in the area of protection against the erosion and of the requirements of the nitrate directive. On the Polish side the practical implementation of the programmes of measures was incorporated into the catalogue of measures, which was submitted to the Czech side.

The working group of hydrologists and hydrogeologists carried out, in the area of the Police Basin and the Stěnava River, joint expeditionary measurement on the Czech and Polish side of the interest of the territory. The Czech side also prepared the report on Update and improvement of the model for the circulation of groundwater in the transboundary territory between Poland and the Czech Republic.

Support to the participation of the Czech Republic in the activities of the International Commission for the Protection of the Odra River against Pollution

Project managers: Ing. Luděk Trdlica, Ing. Petr Tušil, Ph.D., MBA, Ing. Martin Durčák
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Duration: 2011 (long-term activity)

The objective of the project is to support the implementation of the provisions of the Agreement on the International Commission for the Protection of the Odra River against Pollution and the Convention on the reduction of pollution of the Baltic Sea. Furthermore, the project aims at ensuring the activities and documents for the negotiations of the Czech parts of the working groups of the International Commission for the Protection of the Odra River against Pollution, including the preparation of

documentation for the meeting of heads of delegations and for the plenary meetings of the International Commission for the Protection of the Odra River against Pollution.

The main activity of the working sub-group on Planning (GP) was aimed at preparing the strategy for morphological changes, which is focused on migration improvement of watercourses for priority species of fish, including the relevant proposals for transverse structures.

The working sub-group on Monitoring (GM) prepared the documentation and a summary table of all evaluation methods which are relevant for the international river basin district of the Odra River and comply with the requirements of the Water Framework Directive, and methods for the derivation of the reference conditions and boundaries of the classes.

Programme to support the organizational-methodical management of the monitoring and assessment of the status of water bodies of flowing surface waters including updates of the delimitation of water bodies

Project managers: Ing. Petr Tušil, Ph.D., MBA, et al.
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Duration: 2010–2011

The main objective of the project was to ensure methodological and technical support to the system for monitoring and surveys of the status of bodies of flowing surface water from the viewpoint of the proposal of the system for evaluation of chemical and ecological status in accordance with the requirements of Directive 2000/60/EC.

In 2011, all proposals of the above methodologies were prepared. At the same time two summary reports were forwarded to the Department of Water Protection of Ministry of the Environment on ensuring the participation of the Czech Republic in intercalibration exercises for the years 2010 and 2011, including the underlying databases. During the year 2011, the proposals of all methodological procedures were properly commented by independent opponents and the observations were settled in the form of a protocol.

In 2012, the national methodological procedures will be submitted to Ministry of the Environment for certification, to be subsequently used in assessing the status of bodies of flowing surface water under the 2nd cycle of planning in the area of water in accordance with the requirements of the relevant EU and the Czech Republic legislation.

Centre for Waste Management

Education in the field of waste management

Project managers: Ing. Eva Kajanová, Ing. Dagmar Sirotková, Ing. Pavel Vejnar, Ing. Věra Hudáková
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Duration: 2009–2011

The objectives of the project are to ensure adequate education and information in the field of waste management, to improve the performance of the public administration as a result of obtaining quality documents on production and waste management for decision-making and control activities in the field of waste management.

In 2011, four seminars were held on the theme of the register of waste. The first two seminars related to the management and reporting on the registers provided for in Act No. 185/2001 Coll., on waste, as amended, and were intended for originators and manufacturers of the waste electrical and electronic equipments and car wrecks. Two seminars were intended for the staff working in public administration in the field of waste management, being dedicated to information about the legal provisions and keeping of registers of waste.

Implementation of this project also provided a basis for further improvement of the related legislation. In 2011, the project was evaluated and terminated.

Technical support to the Department of Waste of Ministry of the Environment in the area of inventory of devices and substances containing polychlorinated biphenyls (PCBs)

Project managers: Ing. Dagmar Sirotková, Ing. Kateřina Poláková, Ing. Světlá Pavlová
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Duration: January–April 2011

The objective of the project was to ensure income and processing of the accounting data and other related activities in the framework of the development of inventory of devices and substances containing polychlorinated biphenyls (PCBs), which is stipulated in the Act No. 185/2001 Coll., on waste and amending the certain other acts, as amended.

The project, carried out since 2001, was aimed at providing income, validation and processing of paper-based and electronic registration of devices and substances containing PCBs, as laid down in Act No. 185/2001 Coll., on waste and amending the certain other acts, as amended (article 39, section 8) and its implementing Decree No. 384/2001 Coll., on the disposal of PCBs. Other continuous activities included the certificated training in sampling, so called managers for sampling of substances containing PCBs for the registration of the laboratories carrying out analysis of PCBs in mineral oils and other matrixes, distribution of unique sampling labels, consulting activities and updates of the PCB/PCT website (<http://www.ceho.cz>).

In 2011, the project team prepared paragraph wording of the new version of the Act on waste – the part that deals with PCBs and persistent organic pollutants (POPs), with effect from the year 2014, paragraph wording of the implementing Decree of this part of the Act on waste, furthermore the methodology for managing inventory of devices and substances containing PCBs and carried out training of personnel of the CENIA Agency in maintaining the inventory.

Branch of Applied Ecology

American little catfish and Black little catfish in the waters of the Czech Republic and the Slovak Republic

Project managers: Ing. Jiří Musil, Ph.D., PaedDr. Ján Koščo, PhD. (University of Prešov, the Slovak Republic), et al.
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Duration: 2010–2011

*The objective is the taxonomic revision of the non-native North American little catfish (*Ameiurus melas* and *Ameiurus nebulosus*), who were registered in the free waters of the Czech Republic and the Slovak*

Republic on the basis of their external morphology, furthermore, the determination of their current range and the preparation of a joint international project.

In 2010 and 2011, the Contact project included three research expeditions – two on the Eastern Slovakia and one in the catchment area of the Elbe River, whose aim was the sampling of non-native fish populations. From the results of the project, it is evident that *A. nebulosus* currently appears exclusively on the territory of the Czech Republic. On the contrast, *A. melas* occurred in the time of the monitoring only in the territory of the Slovak Republic but its occurrence in some river basins of the Czech Republic is very likely. In the framework of the project the team collected rich and valuable ichthyological material which is currently analysed in detail (morphological and genetic analysis) and will be a part of the other upcoming publications devoted not only to both types of North American little catfish, but also to the other non-native species and also the management measures in order to control the biological invasions in general.

Development of the system for the automatic monitoring of the impact of water management equipment on the environment with the use of technology of TROVAN passive integrators

Project manager: Ing. Pavel Horký, Ph.D.
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Duration: 2011–2014

The main objective of the project is to develop a completely new standard system for automatic monitoring of the impact of water management equipment on the environment with the use of technology of passive integrators.

Fundamental role in the development of the entire system plays mutual tuning of antennas, readers, and the chips. The main problem concerning the antennas is mainly their physical shape and debugging the shape and the stability of the electromagnetic field, which is radiated by the antenna. Similarly, the antenna must be harmonised with the reader. All equipment must be in addition to the reliable functionality also resistant to long-term exposure to weather conditions in the nature. The development includes also testing of the functionality of the system in the laboratory and field environment and the development of applications for commercial use.

Development of an integrated approach for improving conditions for migration in rivers

Project managers: Ing. Jiří Musil, Ph.D., et al.
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Duration: 2011

The objective of the project is therefore to develop a system solution to the problem of fragmentation of watercourses by the gradual restoration of the river continuum, which is required by a number of legislative frameworks and conservation activities in the national and international level.

In 2011, the project focused on the determination of the anthropogenic pressure on the fragmentation of the European major fish and lamprey species in the framework of the NATURA 2000 and an evaluation of the proposed measures to improve the present situation, including the prediction of their efficiency. From the results it is evident clear that the planned construction of the fish ladders has significant influence in relation to the extension of the river stretches compared with the current status but the fragmentation of some sites of the NATURA 2000 system will be a major negative factor. The results of the study are applicable as a proposal for sites, which should

be from the perspective of the NATURA 2000 system or from the perspective of the individual Natura's fish and lamprey species preferably stretched in second stage of strategy.

Salmonid and cyprinid waters, including the support of reporting

Project manager: Ing. Věra Kladivová
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Duration: 1999–2012

The objective of the project is a comprehensive implementation of Directive 2006/44/EC (codified version) on fresh water. This includes primarily the evaluation of the quality of surface waters, which are suitable for life and reproduction of native species of fish and other aquatic animals – designated as salmonid and cyprinid waters.

In 2011, the quality of the salmonid and cyprinid waters was evaluated for the years 2009–2010 as a part of the Report on the status of water management in the Czech Republic in 2010 produced for the needs of the Government. The evaluation was carried out with regards to the amendments contained in codified version of the Directive 2006/44/EU. For this evaluation, however, the data were available from only the 50% of the salmonid and cyprinid waters of the Czech Republic.

The project team analysed the fulfilment of permitted levels of fish waters (I-values) as well as all of the target limits (G-value) for each designated fish waters. The most problematic indicator was ammonia in ammonium ions, for which 20% stretches fail in the permitted limits and almost 100% in target limits. A complete evaluation is available on the website www.vuv.cz in the section HEIS – Salmonid and cyprinid waters.

Development of new methods for breeding of selected promising aquaculture species with the use of non-traditional technologies

Project manager: Ing. Pavel Horký, Ph.D.
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Duration: 2007–2011

The objective of the project is through the observation of the behaviour of wild and artificially bred specimens of trout and grayling in conditions of natural watercourses to address the issue of the introduction of artificially bred fish into natural watercourses.

Artificial breeding of salmonid fish and its putting back into natural watercourses is one of the ways to improve the status of their weakened stocks. The effectiveness and real contribution to the putting back of artificially bred fish for wild population, however, is debatable, since artificially bred fish can be considered domesticated. Their putting back into free waters may negatively affect the original individuals and entire populations, for example, as a result of a lower success of natural reproduction, a higher aggressiveness, reduced ability to escape predators etc. The above mentioned effects are relatively well described in the laboratory environment, but missing is their quantification in conditions of natural watercourses and an estimate of their real impact on the existing fish stocks. In 2011, collection was completed of data on spatial distribution of wild and artificially bred juveniles of grayling (*Thymallus thymallus*) in the conditions of the natural watercourse and also a summary of the results obtained. The outputs of the project were i. a. published in impacted journals.

Monitoring of community of macrophyte in the Teplá Vltava River threatened by water tourism

Project managers: Ing. Věra Kladivová, Mgr. Ondřej Simon, Mgr. Matúš Maciak, M.Sc.
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Duration: 2011

*The objective of the project was to monitor submerge stands of macrophyte of the community *Myriophylletum alterniflori* Steusloff with regard to the evaluation of the impact of the water tourism on the unique ecosystem of the Teplá Vltava River on the territory of Šumava National Park.*

In 2011, the burden of the river fell to 3 600 ships and the total coverage of macrophyte in the whole of its segment increased. The difference between the coverage before the introduction of the regulation (including the height of the water level and hourly numbers of ships) and after its introduction was significant. The trends in the individual cross sections were different depending in a majority on local changes in morphology. In many places colonization was observed of the bottom by the new clumps of macrophyte, which are already close to the size of the stable clumps.

The interesting information on the seasonal dynamics of the coverage and the changes in the representation of individual species within the community brought in this year a detailed evaluation of cross section at Dobrá.