

Abstracts of the Projects 2013

Branch of Hydraulics, Hydrology and Hydrogeology

The evaluation of current and potential future drought periods in small and medium catchments in the Czech Republic and in the Slovak Republic

Project team: Ing. Martin Hanel, Ph.D., Ing. Stanislav Horáček, Ph.D., Ing. Adam Vizina, Mgr. Marta Martínková
tel.: (+420) 220 197 404, e-mail: martin_hanel@vuv.cz

Duration: 2012–2013

The project objective was to acquire new findings on mutual relationship among components of water balance in different natural conditions particularly in different geological-tectonical, hydrogeological and climatic circumstances in the Czech Republic and in the Slovak Republic.

The set of six small and medium catchments was selected (areas were from dozens to hundreds of sq km). The geological-tectonical, hydrogeological and climatic conditions in the catchments were different. The climate change scenarios were prepared for these catchments by using the outputs from climate models. The model of chronological hydrological balance was prepared for the current circumstances in the catchments. Consequently, the hydrological circumstances in the catchments were simulated in the conditions given by the scenarios of the climate change. The drought periods were detected in the outputs based on chosen indicators; they were statistically evaluated and their importance was assessed. The analysis of the links between drought occurrence and catchment characteristics did not lead to unambiguous conclusions; the Slovak catchments were more influenced by continental climate. The drought propagation in individual components of hydrological cycle was also evaluated.

Proposal of a system for managing emergency situations associated with drought and water scarcity in the Czech Republic

Project managers: TGM WRI – Ing. Radek Vlnas, Ing. Ladislav Kašpárek, CSc., RNDr. Tomáš Hrdinka, Ph.D., Ing. Magdalena Mrkvičková, Ing. Martin Hanel, Ing. Adam Vizina, Ing. Renata Fridrichová, Ing. Oldřich Novický, Mgr. Pavel Tremel, Mgr. Marta Martínková
Czech University of Life Sciences – prof. Ing. Pavel Pech, CSc., Ing. Petr Máca, Ph.D., Ing. Jiří Pavlásek, Ph.D., Ing. Lukáš Jačka, Ing. Petr Bašta
tel.: (+420) 220 197 253, e-mail: radek_vlnas@vuv.cz

Duration: 2010–2014

The objective of the project is to develop a methodology and procedures to manage emergency situations caused by drought similarly as methodology that 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 periods. 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 2013, the approach to determination of drought indicators using the empirical probabilities of occurrence was tested in pilot catchments.

The approach was integrated in the methodology that addresses meteorological drought (indexes SPI, DMPI, API), hydrological drought in surface water (indexes SRI, DMRI) and in groundwater (indexes SGI, DMGI) in unified way. The procedure of how to integrate the data connected to these indicators in information system was proposed. The map software for their display was designed. The relationships between meteorological and hydrological droughts were detected by using of artificial neural networks.

The parameterization of the BILAN model (modified to week time step for the warning system) was carried out by using a method of moving windows with restriction of time interval when the optimization algorithm can look for parameters between the individual time steps. Optimization on separated baseflow allowed to reach good correspondence of the model and observed flows in the area of low flows.

The selected drought indicators and economical measures for drought mitigation were integrated in the software of water management simulation game focused on drought management. The evaluation of influence of reservoirs on progress of hydrological drought and comparison of the determination of dry period by water management coefficient and probability method using index SDI were carried out.

The proposal of measures and their hierarchy for individual phases of dry threat was prepared including effectiveness and economic and ecological impacts. The water levels from early instrumental period not included in database of CHMI were digitalized in the other catchments. The conditions and manifestations of importantly dry periods in 1746, 1790, and from 1834 to 1836 were described.

Critical source areas of phosphorus in watersheds

Project manager: Ing. Šárka Blažková, DrSc.
tel.: (+420) 220 197 222, e-mail: sarka_blazkova@vuv.cz

Duration: 2012–2015

P-pathways is a project of the American-Czech cooperation on the leaching of phosphorus from agricultural land and/or diffuse pollution leaching from small municipalities and buildings with insufficient removal of sewage.

We work on 4 agricultural catchments with a different intensity of agricultural production. In 2012 we have constructed a device for artificial rain in order to be able to work with intensities which occur only very rarely; checked the absence of the pesticides with P on 1 catchment; and carried out a preliminary trial with sprinkling on 2 catchments.

In 2013 further experiments with artificial rain and phosphorus leaching have been carried out. Samples have been taken in a number of points in the catchments in order to map the diffused pollution sources.

Protected areas of surface and groundwater for human consumption: assessment of raw water quality and its use in practice

Project managers: Ing. Anna Hrabánková, Ing. Jiří Píček
tel.: (+420) 220 197 437, e-mail: anna_hrabankova@vuv.cz

Duration: 2011–2013

The project has several objectives. Because of the impacts of climate change, which are permanently increasing, variability of quantities of groundwater and surface water is also increasing and

consequently the water quality is also fluctuating. 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 different time 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 fulfillment of the requirements of the Water Framework Directive (2000/60/EC).

In the last year of the project, the main objective was the verification of proposed methodological approach: "Methodology for comprehensive processing and evaluation of data on quality of raw ground and surface water" and creation of the new software. Consequently to approval of the amendment to Act No. 274/2001 Coll., the proposed methodology was updated in such way that it can be used also from 1st January 2014 (validity of the amendment). The methodology was certified by the Ministry of Agriculture of the Czech Republic in the end of 2013. The planned application of the methodology is mainly in the government administration: the outputs will be used by the Ministry of Agriculture, the Ministry of Environment, regional and other water administration offices, river basin administrators, and other bodies involved in the water management decision-making. It will be also helpful for all the water supply networks operators. The second main project output software was developed as an interactive internet application. The database of data on abstracted water (the basement of the application) was gradually filled up with the processed data. The application is publicly available at the address <http://heis.vuv.cz/projekty/jakostsurovevody>.

Development of a tool and methodology for continuous measurements of snow water equivalent in the field

Project managers: Ing. Alena Kulasová, Ing. Zdeněk Bagal, Ing. Šárka Blažková, DrSc., et al.
tel.: (+420) 220 197 372, e-mail: alena_kulasova@vuv.cz

Duration: 2011–2014

The objective of the proposed project is the development of a field measurement device and a methodology for continuous determination of snow water equivalent, its comprehensive testing in various types of terrain and vegetation cover conditions and creating a methodology of installation and handling the device to measure the snow water equivalent, including in places which are difficult to reach but which have the greatest influence on the computed snow water storage.

The repeated manual inspecting measurement of snow water equivalent continued in vicinity of the prototype II of snowmeter that is situated at the research facility "U Dvou louček" in Orlice Mountains. The data measured by the prototype and by inspecting measurements were mutually compared. In the end of winter 2012–2013 the experience and results of measurements of realized prototypes (in TGM WRI laboratory and at experimental catchment "U dvou louček") were summarized. Based on the results the fundamental priorities of further development and optimization of technical solution were stated. Manufacturing documentation was updated. In the end of spring, the manufacturing of other prototype of the scale started and after its localization in the field the manufacturing of two other devices was ordered. The prototypes of the device were installed at the selected representative localities: experimental catchment Jezdecká in the Jizera Mountains, experimental catchment "U dvou louček" in the Orlice Mountains, experimental area Česká Čermná and gauging station of CHMI in the village Šindelová. In winter 2013–2014, in total five devices have been tested in the field, two of them are prototype III. The system of each tested device is equipped with device for data transmission via GPRS system. The data are monitored in one hour time step. The information on meteorological parameters that are important for checking

of system functionality is available for each locality. The parameters are air temperature, soil temperature and radiation. Simultaneously, the manual inspecting measurements continue in similar way like in winter 2012–2013. The sensors for automated monitoring of snow height are prepared; their functionality will be optimized in the beginning of 2014.

The progressive technology of environment protection and effective water management in small catchments

Project team: doc. RNDr. Zbyněk Hrkal, CSc., Mgr. David Rozman, RNDr. Eva Novotná, RNDr. Pavel Eckhardt

tel.: (+420) 220 197 463, e-mail: zbynek_hrkal@vuv.cz

Duration: 2010–2013

The objective of the project that is sponsored by Technology Agency of the Czech Republic is to verify different technologies of the infiltration of pretreated waste waters in rock environment. The planned and achieved outputs are types of different technology procedures that were tested at two localities with different hydrogeology conditions. They differ also in type of infiltrated waters, the method of pretreatment and length of infiltration process.

The short-term monitoring of groundwater was finished in 2013 at the locality Horní Beřkovice, where the municipal waste water is infiltrated in Turonian marlites for long time. The waste water contains large amount of different pharmaceuticals. This specific type of contamination is from local psychiatric hospital and it is not treated at the local waste water treatment plant. The conclusions proved that pharmaceuticals spread in groundwater even in longer distances. In Daminěves, village that is approximately 950 meters from the infiltration site, the high concentrations of many pharmaceuticals were detected in monitored wells (e.g. 1,740 ng/l of carbamazepine, 58 ng/l of ibuprofene and 30 ng/l of diclofenac). The issue of extreme time and spatial variability of pharmaceuticals distribution followed from the results. This fact will put great demands on improvement of the monitoring network. The improvement should be based on detailed geological, geochemical and hydrogeological survey.

Support of long-term planning in water management sector in context of climate changes

Project managers: Ing. Martin Hanel, Ph.D., Ing. Magdalena Mrkvičková, Ing. Stanislav Horáček, Ph.D., et al.

tel.: (+420) 220 197 404, e-mail: martin_hanel@vuv.cz

Duration: 2012–2014

The project objective is the creation of the methodology for verification of the measures proposed in the frame of long-term planning in water management regarding their effectivity under conditions of climate change and distribution of selected data via information portal.

The methodology "The evaluation of possible climate change impacts on water resource management and on water planning" was created. The methodology is currently under review and we are expecting its certification during 2014. The pilot version of the web rscn.vuv.cz that presents the methodology and contains the testing versions of the applications for viewing the estimations of climate change impacts on hydrological variables and enables download of these data was put into service. The extensive hydrological modeling of climate change impacts according to the latest climate change scenarios was carried out. More than 200 simulations of climate models were evaluated.

Ensuring the quality of drinking water supplied to small municipalities from local sources

Project managers: RNDr. Josef Vojtěch Datel, Ph.D., Ing. Anna Hrabánková
tel.: (+420) 220 197 543, e-mail: josef_datel@vuv.cz

Duration: 2012–2015

The objective of the project supported by the Technology Agency of the CR is the creation of certified methodology "Comprehensive Management of Small Water Sources for Optimal Securing of Quality of Drinking Water at Usual and Exceptional Situations" that is aimed for administrations of small municipalities (focused at municipalities with up to 1,000 inhabitants) with own local water sources. Management of small water sources has its specifics and current legislative, technical and legal solutions mostly reflect the situation of big municipalities and big water companies.

The project is focused on creation of suitable tools for comprehensive management of quality of water from small water sources for municipalities with up to 1,000 inhabitants. The groundwater withdrawal prevails in case of the small sources. The certified methodology will be created based on analysis of relevant directives and methodology documents. The methodology will be an effective tool for administrations of municipalities and operators of small water networks; it will allow the systematical securing of water quality as good as possible under usual conditions as well as during exceptional situations. It will cover all the issues from technical status of the water intake facility and its regular maintenance, securing a sufficient protection of abstracted water, an optimal regime of water intake to arranging the most suitable frequency of water sampling. It will be possible to determine the robustness and vulnerability of usual water sources against different exceptional situations and to determine usability of other backup sources in the municipality cadastral area or in its close surroundings in case of emergency supply.

The project dealt with the survey of the pilot localities and water works in its second year. The natural characteristics that influence a local water source, the type of water acquiring and its inspection according to the Regulation No. 428/2001 Coll. were determined. The vulnerability of the water source and possible measures to increase its resistance to risks were evaluated at the pilot localities. The detailed monitoring of water sources was proposed based on the findings. Simultaneously, its realization started. The development of the methodology continued. The publication of authors Kožíšek, Paul, Datel: Ensuring the quality of drinking water in small water supply systems was published. The publication is the first part of the new methodological tool. It was tested at the pilot localities during 2013.

The project partner is GEOTest, a.s., Brno (RNDr. Josef Slavík, Ing. Ludmila Hartlová).

The methodologies of evaluation of the chemical and quantitative state of groundwater bodies for the 2nd cycle of River basin plans in the Czech Republic

Project team: RNDr. Hana Prchalová, Ing. Martin Durčák, Ing. Marie Kozlová, Ing. Adam Vizina, Mgr. Pavel Rosendorf, Ing. Magda Mrkvičková, et al.
tel.: (+420) 220 197 356, e-mail: hana_prchalova@vuv.cz

Duration: 2012–2013

The project objective was to develop the methodologies of the evaluation of the chemical and quantitative state of the groundwater bodies, which would include new requests of European Commission concerning groundwater and respect the conditions in the Czech Republic as well as the availability of the existing data and doability in relatively short time period.

The methodology addresses the individual aspects of the evaluation of chemical and quantitative state of groundwater bodies including climate change. The following are proposed: new limits of the good chemical state of groundwater bodies, the evaluation of trends and changes

of trends of groundwater pollutants, evaluation of contamination plumes, the general evaluation of the chemical and quantitative state of groundwater bodies, identification of groundwater bodies with direct connection to the surface water bodies and terrestrial ecosystems and methodology of identification and evaluation of pressures and impacts on the state of groundwaters.

The identification and evaluation of state of the areas delimited according to the Article 7 of the Water Framework Directive

Project team: Ing. Anna Hrabánková, RNDr. Josef V. Datel, Ph.D.
tel.: +420 220 197 437, e-mail: anna_hrabankova@vuv.cz

Duration: 09/2012–02/2014

Consistently with Annex V to Directive of the Ministry of the Environment of the Czech Republic No. 6/2010 on the Provision of Funds from the State Environmental Fund of the Czech Republic in the frame of the Programme of Support of ensuring the monitoring, the project objective was to propose the identification and evaluation of the areas delimited according to the Article 7 of the WFD that will respect the requirements of the Directive 2000/60/EC of European Parliament and Council from October 23 2000 establishing a framework for the Community action in the field of water policy (WFD).

According to the Article 7 of the WFD the member states shall to identify all bodies of water used for the abstraction of water intended for human consumption providing more than 10 m³ a day as an average or serving more than 50 persons, and those bodies of water intended for such future use. The member states have also to monitor these water bodies providing more than 100 m³ a day as an average. The project objective was to propose the new procedure of evaluation of such bodies and creation of the list of such bodies.

The proposal of the new Methodology for evaluation of the state of protected areas of groundwaters identified according to the Article 7 of the WFD is based on available data on quality of abstracted raw water that are registered after the Regulation No. 428/2001 Coll. and data on volume of abstracted water (according to the Regulation No. 431/2001 Coll.). The aspect of the future development of the quality of raw water was implemented in the evaluation for the assessment of the individual abstractions and consequently the surface water bodies and the bodies and working units of the groundwater. The request of WFD not to worsen the water quality was respected with special attention. The evaluation of trends is involved in the evaluation of qualitative indicators for this reason. The proposed general evaluation includes four stages.

The formation of the list of the water bodies identified according to the Article 7 of the WFD was limited by availability of fundamental data. The main information source was the database of water abstractions registered according to the Regulation 431/2001 on water balance. Consequently, the evaluation could be done based only on registered abstraction above 6,000 m³ a year (500 m³ a month). The data from water supply network operators were also used. They report the volume of abstracted water in individual abstractions. The third data source was the fee database of the Czech Inspection of the Environment. However, this database is relevant only for groundwater. The evaluation of groundwaters and surface waters was carried out separately, but the procedure was similar.

Constraining continuous simulations of flood frequency using mapping saturated areas to constrain prediction uncertainties

Project manager: Ing. Šárka Blažková, DrSc.
tel.: (+420) 220 197 222, e-mail: sarka_blazkova@vuv.cz

Duration: 2011–2015

Project deals with variable saturated areas in catchments from the point of view of the frequency of flood runoff generation. The research is done in cooperation with the Lancaster University.

Data on the saturation of small catchment originated in our research in the Jizera Mountains. Modelling is being carried out with TOPMODEL and uncertainties are being estimated with the GLUE method – Generalized Likelihood Uncertainty estimation. We have confirmed the hypothesis that saturation areas mapping enhances not only the hydrograph predictions from observed precipitation, but also the prediction of the flood frequency curves.

Hazard assessment of dangerous landslides and glacial lake outburst floods, Cordillera Blanca, Peru

Research team: Ing. Petr Bouška, Ph.D., Ing. Miroslava Benešová, RNDr. Jan Klimeš, Ph.D. (IRSM ASCR), doc. RNDr. Vít Vilímek, CSc. (Charles University, Faculty of Science)
tel.: (+420) 220 197 268, e-mail: miroslava_benesova@vuv.cz

Duration: January 2011–December 2014

The project deals with the assessment of natural hazards (landslides and floods from glacial lakes) in selected glacial valleys in the Cordillera Blanca in Peru. A part of the research is focused on stability of sides near glacier lakes, rainwater infiltration modeling, vulnerability and hazard landslides. TGM WRI provides research on the modeling of floods caused by overflow or dam breaks of glacial lakes due to the landslide of rock and ice into a lake. The entire project should contribute to increase the safety of local inhabitants and to develop a methodology applicable in other mountain areas.

In 2013, the project continued with mathematic flood modeling on the Chucchún River. It followed up the activities of previous two years and new field data were added to the model. Also new basis data from aerial measurement of site of interest were provided. In order to compare the results based on directly measured field data and data from aerial survey, a new mathematical model was created based on aerial survey. Results of both mathematical models were compared – water surface extents, peak flows based on flood marks found in field after flood event in April 2010 and treats. Several simulation scenarios for different discharges were also simulated on current mathematical model and possible threats of site of interest were identified.

The project results were presented in specialized journals in 2013 – in Natural Hazards (Klimeš, J., Benešová, M., Vilímek, V., Bouška, P., and Rapre, A.C. The reconstruction of a glacial lake outburst flood using HEC-RAS and its significance for future hazard assessments: an example from Lake 513 in the Cordillera Blanca, Peru) and in Springer (Klimeš, J., Vilímek, V., Benešová, M., Bouška, P., and Cochacin, A. Glacial Lake Outburst Flood in the Chucchún Watershed, Cordillera Blanca, Peru).

Review of Groundwater Resources in the Czech Republic: Hydrology documentation for Activities 2, 4 and 6

Project managers: Ing. Ladislav Kašpárek, CSc., RNDr. Josef V. Datel, Ph.D., Ing. Pavel Balvín, Ing. Martin Hanel, Ph.D.
tel.: (+420) 197 227, e-mail: ladislav_kasperek@vuv.cz

Duration: 12/2011–6/2014

The project coordinator is the Czech Geological Survey. TGM WRI, p.r.i., is responsible for the Activities 2, 4 and 6.

Activity 2 The processing of source part of the evaluation of the quantitative state of groundwater bodies

The objective is the simplified determination of natural groundwater resources for 55 hydrogeological regions.

The natural reserves of the groundwater have been calculated for 55 hydrogeological regions using several methods. The three indirect methods use the relation between the precipitation and outflow (the principle of hydrological balance). The outputs from hydrological model Bilan were used additionally for several regions. The two maps of baseflow distribution in the Czech Republic were used for verification. The results of the evaluation of 257 hydrometric measurements were used for the part of the regions. They were carried out at 40 selected sites as an addition to information from hydrometric network of CHMI and hydrometric monitoring that is included in Activity 4.

Activity 4 Hydrological measurements including the construction of gauging stations on selected surface watercourses

The Activity is focused on selection of sites for new gauging stations, designs and construction of approximately 80 gauging stations, monitoring including the hydrometric measurements, processing and evaluation of obtained data.

The monitoring of water surface elevation (stage) continued at 80 gauging stations (constructed as an addition to the network of CHMI). The following activities were carried out: maintenance of instruments and necessary adjustments of water control structures at the stations (mainly on the watercourses where occurred important floods), collecting of digitalized data in the field, their checking and the assessment of the progress of the stages. 335 hydrometric measurements were carried out as a base for the construction of the rating curves. The rating curves were constructed and the discharge series were calculated for selected stations.

Activity 6 The processing of hydrological models based on existing and newly measured data

The Activity is focused on determination of the development of groundwater recharge in time using the water balance models for 56 hydrogeological regions.

The water balance models were compiled for 56 hydrogeological regions in 2013. The main output of the models is the series of groundwater recharge from precipitation for individual regions in monthly time step for the period 1981–2010. The following procedure is used: the parameters of the Bilan calibrated on the catchment (or more catchments) are transferred to the water balance model of the hydrogeological region. The input data are precipitation and temperatures in the area of the region. The results were evaluated using the groundwater levels. The processing of the following items was carried out: probability characteristics of precipitation, total outflow, baseflow and groundwater recharge and evaluation of their progress in time including the possibilities of changes due to potential of climate changes.

The determination of flow capacity of the weir of the small hydroelectric plant Ružbašská Miřava

*Project managers: Ing. Ján Šepelák, Ing. Ondřej Motl
tel.: (+420) 220 197 383, e-mail: jan_sepelak@vuv.cz*

Duration: 2012–2013

The research was focused mainly on the evaluation of the capacity of the weir of the small hydroelectric plant Ružbašská Miřava and the approach to the reduction of the kinetic energy below the dam.

The research was carried out on the hydraulic model in scale 1 : 40 which was situated in the experimental channel. The model contained the whole weir structure. The combination of physical and mathematical modeling was used.

The Hněvkovice Reservoir: The evaluation of the rating curves

Project managers: Ing. Ondřej Motl, Ing. Ján Šepelák
tel.: (+420) 220 197 233, e-mail: ondrej_motl@vuv.cz

Duration: 2013

The project objective was the evaluation of possibilities and conditions of the management of the extreme floods at the Hněvkovice Reservoir. The needed adjustments and flood protection measures were proposed. The security of the dam during the 10,000 years flood of the reservoirs of category 1 has to be evaluated according to the current regulations. The Hněvkovice Reservoir was classified as a water structure of category 1 and consequently the evaluation of the security and outflow devices had to be carried out and relevant measures for the increase of the flood security should be proposed, if needed.

Based on the measurements on the constructed hydraulic model of the Hněvkovice water structure in scale 1 : 50 the rating curves were created as dependencies of the discharges transferred through the water structure on the water levels at the river km 210.530 up to elevation of the deck of the dam, i.e. 376.10 m a.s.l. Rating curves were created for two options: current conditions and water structure secured for the $Q_{10\,000}$. The security measures were the closing of the spillways below the deck for the ensuring the security of the hydropower station and the bank foundations of the dam.

Water management balance of the current and prospective status of groundwater quantities in the partial catchments of the Upper Vltava, Lower Vltava, Berounka and other Danube tributaries

Project team: RNDr. Hana Prchalová, RNDr. Renata Filippi, Ing. Marie Kozlová, Ing. Anna Hrabánková
tel.: (+420) 220 197 356, e-mail: hana_prchalova@vuv.cz

Duration: 2012–2013

The project objective was to process the periodic water management balance of the current and prospective status of groundwater quantities in the partial catchments of the Upper Vltava, Lower Vltava, Berounka and other Danube tributaries. The important component of the project results was the proposal and filling of the management sheets of the groundwater bodies and individual management units.

The water management balance of the current and prospective status of groundwaters is processed according to the relevant regulation periodically every six years. The methodical approach for the processing of the water balance exist, but the availability of the data on the natural resources is changing in time and the requests on the processing the plans of the partial catchments are also changing. The outputs are also used in these plans. The methodology of the water management balance was updated based on these changes and methodological approaches were implemented in four partial catchments administrated by Vltava River Board, s.e.

The important component of the project results was the proposal and filling of the management sheets of the groundwater bodies and individual management units. The sheets were filled up with data, outputs of the balance and the plans of the partial catchments. The management sheets allows to collect and visualize the individual data on quantities of the groundwaters and individual outputs (results of the balance evaluation and results from the plans of the partial catchments) including overview maps.

The navigation step Přelouč II: the modeling research of the transfer of the ice over the upper head of the lock

Project team: prof. Ing. Pavel Gabriel, DrSc., Ing. Ondřej Motl, Ing. Ján Šepelák
tel.: (+420) 220 197 233, e-mail: ondrej_motl@vuv.cz

Duration: 2012–2013

The research was focused on the evaluation of the functionality of the lock during the transfer of ice from the navigation channel and upper berth over the lock with regard to reduction of the kinetic energy of the transferred ice floes and enabling their fluent transfer to lower basin. The project objective was the evaluation of the functionality of upper flap gates for the transfer of ice floes including the testing of a different type of gates.

Based on client request, the research was carried on using the section hydraulic model in scale 1 : 20. It followed from the analysis of the conditions of mechanical similarity, limiting conditions and the possibilities of localization of the model that such model can be situated in experimental channel in small hall of the TGM WRI hydraulic laboratory. The model included the foreland of the lock (approximately 50 m), the upper head with moving flap gates (Čábelka type), the cushioning wall with the stilling basin floor for reduction of kinetic energy of the water poured below the gates and approximately the half of the length of the lock. The best solution for the transfer of thin ice floes was determined based on the results of the experiments carried out on four different upper heads of the lock Přelouč II.

The best solution had to fulfill three main requests: smooth overflow of the ice floes over the flap gates, the outflow of the ice floes through the lock as smooth as possible and protection of the area between the cushioning wall and lock gates against the inflow of the ice floes.

Model research of the stilling basin floor of the navigation step Děčín on the section physical model

Project team: Ing. Ondřej Motl, Ing. Ján Šepelák, prof. Ing. Pavel Gabriel, DrSc., Ing. Petr Bouška, Ph.D.
tel.: (+420) 220 197 233, e-mail: ondrej_motl@vuv.cz

Duration: January–November 2013

The project objective was the verification of the newly proposed variant of the weir and the area below the weir without the stilling basin floor. This variant was detected as optimal during the research on the section model in scale 1 : 20. The suitability of the proposed solution was evaluated on the spatial model in scale 1 : 70.

The changes in the arrangement of the area below the lock were carried out during the optimization of the navigation step Děčín. The (classical) solution with stilling basin floor was replaced with the solution without the stilling basin floor. The reason was the secure and smooth transfer of ice floes over the water structure. Four variants of the arrangement of the area below the weir were evaluated. The sets of experiments were carried out at each variant. The transferred discharges were from the minimal navigation discharge up to discharge of the flood in 2002. As the optimal one followed the variant with short dividing pillars and a combined backfill: heavy backfill from the rock up to 1.0 m in diameter in the first section (length 10 m) and backfill 0.45 m in diameter in the second section (length 20 m). This variant also lowers the investment costs of the construction of the water structure.

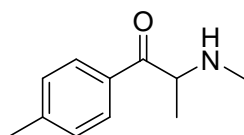
New drugs – market analysis, epidemiology of use and identification of preventive and harm minimisation strategies

Project manager: MUDr. Tomáš Zábranský, Ph.D. (Charles University Prague)

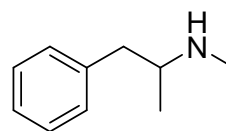
Research team (TGM WRI): Ing. Magdalena Kvíčalová, Ing. Alena Svobodová
tel.: (+420) 220 197 544, e-mail: magdalena_kvicalova@vuv.cz

Duration: May 2013–December 2015

The project is focused on new types of drugs and TGM WRI contributes to it by 1) qualitative analysis of new synthetic drugs that are used in the Czech Republic and 2) dealing with issues of their identification and quantification in waste water and consequent mathematical estimates of amount of consumed drugs. These estimates are based on detected values and knowledge of degradation processes in waste water and metabolic processes in human body. The project is focused mainly on cathinones (e.g. mephedrone). The GS/MS and LC/MS apparatuses will be used for analyses of solid substances and waste water samples.



Mephedrone, 4-MMC, 4- methylmethcathinone
NSD



Methamphetamine, crystal meth
"classic drug"

In the first project year, the literature research of relevant topics was carried out. The development of the method of determination of mephedrone using GC-MS has been started. 31 samples of waste water were collected in the end of 2013 at four selected sites in Prague sewerage system.

Investigation of the impact of the Temelín Power Plant accident on contamination of the Vltava and Elbe Rivers up to boundary profile Elbe at Hřensko

Project managers: Ing. Eduard Hanslík, CSc., Ing. Eva Juranová

tel.: (+420) 220 197 269, 220 197 335, e-mail: eduard_hanslik@vuv.cz, eva_juranova@vuv.cz

Duration: 2013

The project objective is to evaluate migration of radioactive substances in case of accident in nuclear power plant Temelín in water environment.

The migration of tritium along the Vltava and Elbe Rivers was monitored. The tritium discharged during the usual operation of the plant was used for monitoring as a tracer. The time of transfer of the tritium dependent on river flow was evaluated. The distribution coefficients of radionuclides among water and river sediments and insoluble substances were determined in laboratory conditions. The data were prepared for analysis for localization, needs and possibilities of automated monitoring station for continual sampling and radiological analysis.

Determination of the amount of illicit drugs and their metabolites in municipal wastewater – new tool for obtaining of complementary data on illicit drug consumption in the Czech Republic

Project manager: Ing. Věra Očenášková

tel.: (+420) 220 197 451, e-mail: vera_ocenaskova@vuv.cz

Project team: Ing. Petr Tušil, Ph.D., MBA, Ing. Danica Pospíchalová, Ing. Alena Svobodová

Duration: 2012–2015

The project objective is to apply the “sewage epidemiology” in the Czech Republic. The sewage epidemiology is epidemiology of waste water. The project aims to create methodological approach for estimation of amount of consumed illicit drugs and their metabolites in municipality waste waters. The estimation is then used for calculation of illicit drugs consumption among the population. In comparison with classical methods of research and screening of illicit drugs consumption among the population, the methods of sewage epidemiology are less financially demanding, anonymous and can be performed almost in real time. The sewage epidemiology method has also many general advantages in comparison with conventional methods of research. The method is more universal than conventional methods and consequently can be used for fast identification of hot-spots (the sites with high consumption of illicit drugs), testing of comparability of different programmes of drugs abuse prevention in specific locality, the validation of results of conventional methods of determination of illicit drugs consumption among the population and estimation of value of financial resources at illicit drugs market at the given locality.

The new approach of the project DRAGON (abbreviated name) is the monitoring of illicit drugs concentration and concentration of their metabolites in raw municipality waste waters not only at the inflow to a waste water treatment plant but also in nodes of the sewage network. It will allow to estimate the amount of consumed illicit drugs in individual town districts that are connected to common town waste water treatment plant. The agglomerations selected for the monitoring are Praha, Brno, Ostrava, Plzeň (Pilsen) and Ústí nad Labem. Other monitored localities are Havířov, Český Těšín, Orlová, Frýdek-Místek and Karviná.

In total four seven days sampling campaigns took place at each monitored locality in 2013; the implementation and validation of suitable analytical method of determination preceded the campaigns. The differences of illicit drugs use during the week were assessed by the seven day campaigns. The sampling campaigns will continue in 2014 in similar way.

The ACCENDO – Centre for Science and Research, o.p.s. processed the "Socio- demographic study including analyses of spatial distribution of population and identification of risk groups of users of addictive substances (drugs)" for the DRAGON project. The project is financed by the Programme of Security Research (2010–2015) sponsored by Ministry of the Interior of the Czech Republic.

Preliminary results of the project were presented at the national and international conferences and workshops: Hydrochémia 2012 (Bratislava, Slovakia), 64th General Assembly of the Association of Czech and Slovak chemical associations (Olomouc, Czech Republic), the workshop The analysis of organic substances in the environment (Komorní Lhotka 2012, Czech Republic), Hydroanalytika 2013 (Hradec Králové, Czech Republic), Testing the waters: first international multidisciplinary conference on detecting illicit drugs in wastewater (Lisbon, Portugal), the workshop Prevention of social and security risks (Ostrava, Czech Republic).

New methodical approach to the control and evaluation of bathing waters

*Project managers: RNDr. Dana Baudišová, Ph.D., Ing. Andrea Benáková, Ph.D., et al.
tel.: (+420) 220 197 219, e-mail: dana_baudisova@vuv.cz*

Duration: 2011–2013

The project objective is the verification of evaluation indicators of surface waters quality, the solution of critical items of methodologies of determination of microbiological and biological indicators and evaluation of occurrence of pathogenic organisms and their correlation with used indicators. The acquired findings should be summarized in Technical recommendation as a base for other

methodological instructions (the Ministry of Health of the Czech Republic, main Hygienist of the Czech Republic etc.). Technical recommendation will optimize the determination and evaluation of micro- and biological indicators and it should be useable for inspection laboratories, for operators of bathing establishments and government administration.

In 2013, the project focused on processing of laboratory results obtained in previous years, the needed analyses were added. Main outputs of the project were prepared: Technical recommendation Baudišová D., Pumann P., Šašek J.: Microbiological analyses of bathing waters, Technical recommendation, Sweco – Hydroprojekt. 2013; Certified methodology (Ministry of Health of the Czech Republic) Pumann P., Baudišová D., Kožíšek F., Šašek J., Myšáková M.: Methodological manual for sampling, field and laboratory analyses and evaluation of water quality in natural bathing establishments and bathing surface waters and Czech national standard ČSN 75 7717 The quality of water – Determination of planktonic Cyanobacteria (2013).

Optimization of method for detection of assimilable organic carbon by optic detection

Project managers: RNDr. Dana Baudišová, Ph.D., Ing. Andrea Benáková, Ph.D., et al.
tel.: (+420) 220 197 219, e-mail: dana_baudisova@vuv.cz

Duration: 2012–2014

The project objective is the experimental development of the method and instrument (functional specimen) for determination of assimilable organic carbon (AOC) by optical detection, the comparison of the results with cultivation method and research of AOC in waterworks facilities with risk technology (ozonization).

The second version of functional specimen for determination of AOC by optical detection was prepared in 2013. The relevant software was optimized. The optimal cuvettes for optical measurements were selected and tested. The effects on determination of AOC by optical detection were monitored (effect of inoculum, optimization of handling with sampling containers, the comparison of the result with previous technique etc.). The testing of changes of AOC was carried out at the selected water treatment plants (Hosov, Polná, Heraldice and Štítary) in connection with surroundings conditions. Other indicators were also tested. The detailed evaluation was carried out including the running determination of the other selected microbiological and physically-chemical indicators. The results have been presented at the seminars and conferences for expert public.

Research of optimization possibilities of operation and of effectiveness increase of wastewater treatment from small municipalities using non-conventional technologies

Project team: Ing. Eva Mlejnská, Ing. Lenka Matoušová, Ing. Miloš Rozkošný, Ph.D., Ing. Filip Wanner, Ing. Alžběta Petráňová, et al.
tel.: (+420) 220 197 36, e-mail: eva_mlejnska@vuv.cz

Duration: 2012–2015

The project is focused on research of possibilities how to increase the effectiveness of waste water treatment from individual buildings or small municipalities in soil filters, root zone waste water treatment plants and biological tanks (so called extensive technologies of waste water treatment). The main goal of the project is to develop the new technology components for increase of effectiveness of the treatment by the extensive technologies. Other goal is the development of suitable bacteria preparations aimed to support the treatment processes of above mentioned technologies and most of

all the regeneration of clogged filtration fillings of root zone waste water treatment plants and soil filters.

In the second year of the project (2013), the main attention was focused on laboratory and field research of new technology components and bacterial preparations. The research was going on at many localities with a root zone waste water treatment plant or final treatment biological tanks, in laboratories and also at outdoor premises of TGM WRI.



Floating island

The main attention was paid to the new biological preparations aimed to decrease the clogging of a filtration filling of root plants and soil filters and to increase the effectiveness of devices for mechanical pretreatment including the testing of first model of mobile device for cultivation and dose of bacterial preparations. The filters for decrease the secondary contamination discharged from biological tanks were tested along with planted and unplanted floating islands aimed to improve oxygen conditions and to reduce the discharge of floating dirt from biological and final treatment tanks. The use of nontraditional species of wetland plants for vegetation cover of filters was also tested. The technology components were developed and tested: new types of regulation shaft with aim to increase the volume of oxygen presented in filtration filling (pulse filling and emptying), new distribution piping for root plants and soil filters and new type of distribution shaft. The monitoring of effectiveness of treatment of individual components at localities was carried simultaneously with research activities (hydrochemistry, hydrobiology).

Support to activities of the permanent and emergency component of nationwide Radiation Monitoring Network

Project managers: Ing. Eduard Hanslík, CSc., Ing. Barbora Sedlářová
tel.: (+420) 220 197 269, 220 197 280, e-mail: eduard_hanslik@vuv.cz, barbora_sedlarova@vuv.cz

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 regime in cooperation with laboratories of the river basin administrations (River Boards, s. e.).

Respecting the Framework Agreement 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., guarantees the activities of the permanent and emergency component of nationwide radiation monitoring network in

cooperation with water management laboratories of the river basin administrations. In the period of the monitoring in the normal radiological situation (in 2013), the development of the concentrations of radioactive substances in surface and drinking waters, sediments, water sludge and fish biomass was monitored at selected gauging stations. Increased concentrations of tritium in comparison with the background were identified in the Vltava River at Prague-Podolí and at the outlets of the Elbe River and the Morava River. This is a consequence 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 assessment of surface water and groundwater quality and its changes in relation to the impact of the Temelín Nuclear Power Plant construction and operation on its vicinity

Project manager: Ing. Eduard Hanslík, CSc.
tel.: (+420) 220 197 269, e-mail: eduard_hanslik@vuv.cz

Duration: 2000–2013

The objective of the project 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 the Czech Power Works, respecting the conclusions of the examination of the effects of changes in buildings (EIA) on the environment. The outputs of the projects provide the new reference level before the construction of a new nuclear source at the Temelín Power Plant.

Microbiological monitoring of sludge bed waters

Project managers: Ing. Andrea Benáková, Ph.D., RNDr. Blanka Desortová, CSc., RNDr. Ladislav Havel, CSc., Mgr. Jan Šťastný
tel.: (+420) 220 197 407, e-mail: andrea_benakova@vuv.cz

Duration: January–November 2013

In connection with the problem of the deterioration of water quality in the pond E (phase II) and in the pond E1, especially with high concentrations of $N-NO_3^-$ and its sudden changes in March, June and August 2012, processing of quantitative and qualitative analyses of selected planktonic communities (physiological types of bacteria, bioeston, phytoplankton, zooplankton) during the seasons, and the assessment of their potential impact on water chemism in both profiles were realized. The number of samples, sampling points and the interval between the samplings followed the requirements of the customer.

According to the agreement with the customer, the microbiological analyses of total counts of micro-organisms, cultivable micro-organisms at 22 °C and 36 °C, nitrifying bacteria and denitrifying bacteria and hydrobiological analyses focused on the analysis of bioeston (abundance and qualitative composition), the determination of the concentration of chlorophyll-a and on the detection of the qualitative composition of zooplankton in each sampling profile during the seasons have been carried out. The effect of planktonic biota on the possible formation of undesirable substances which may cause complications in subsequent processing of sludge bed waters was assessed. Customer requirements have been met within the agreed range.

Content of radioactive substances in the Orlick Reservoir and its tributaries after commissioning of the Temelin Nuclear Power Plant – period 2013

Project managers: Ing. Eduard Hanslík, CSc., RNDr. Diana Marešová, Ph.D.

tel.: (+420) 220 197 269, 220 197 335, e-mail: eduard_hanslik@vuv.cz, diana_maresova@vuv.cz

Duration: 2013

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

The development of concentrations of tritium volume activity was monitored in surface water downstream from waste water discharge from Temelin Nuclear Power Plant, including the vertical distribution of tritium in the Orlick Reservoir, and further the reference (unaffected) localities. The monitoring was carried out for the needs of the Vltava River Board, s. e.

The monitoring in the area of contaminated sites at Nuclear Research Institute Řež

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

tel.: (+420) 220 197 269, 220 197 256, e-mail: eduard_hanslik@vuv.cz, michal_novak@vuv.cz

Duration: 2013

The objective of the project was to monitor and evaluate the impacts of the radioactive substances from past contamination sources.

In the framework of the project, the effects of remediation of impacts of past contaminations at the Nuclear Research Institute Řež, a. s., on the hydrosphere and other components of the environment were monitored. These are part of the bases for the assessment of the effectiveness of remedial measures taken in the framework of the Implementation project of the remediation activities.

The research of detection and determination methods of radioactive contamination

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

tel.: (+420) 220 197 269, 220 197 280, e-mail: eduard_hanslik@vuv.cz, barbora_sedlarova@vuv.cz

Duration: 2013

The project objective is the development of a fast method for determination of total volume activity Beta and strategy of sampling in case of nuclear accident.

The possibility of fast determination of the total volume activity Beta in water samples in case of a nuclear accident in the Czech Republic or abroad was verified. The proposed method was verified in cooperation among TGM WRI, p.r.i., water contamination measuring sites and water management and radiological laboratories. Newly, the possibility of calibration with use of standard strontium 90-yttrium 90 was verified. The results show that values of the indicator of total volume activity Beta will be higher in case of this calibration in comparison with the use of standard Potassium 40 that is defined in the standard methodology of determination of total volume activity Beta according to the Czech national standard ČSN 75 7612. From point of view of samples collecting, the irreplaceable role of water management radiological laboratories of Water administrators (River Boards, s. e.) has been proved. The fast screening measurements for determination of the samples contamination with special focus on drinking water resources and the water supplied to the public water supply networks proved to be also very important.

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

Project manager: Ing. Hana Nováková, Ph.D., et al.
tel.: (+420) 220 197 226, e-mail: hana_novakova@vuv.cz

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 type of land-use (the characteristics of the surface of landscape, vegetation, urban areas), hydrological and other parameters, affecting the accuracy of the results of hydrodynamic modeling, 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 modeling (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. The classification method will be a suitable additional tool for decisions on priorities of new delimitation of flood plain areas. Subsequently, the method will be applied to the development of a methodology for delimitation of flood plain areas according to the requirements on inputs, hydraulic aspects of mathematical modeling, and outputs.

In 2013, the previous modelling of flood curves output processing was finished. Results were summarized in cooperation with subcontractor Hydro Expert Company in so called Comparison Study. There is a detailed description of particular reference sites with photo-documentation from terrain survey and with parameter values, which influence hydrodynamic modelling results. In Study, there is also statistical analysis of input altimetry datasets. The differences between primarily and newly designed floodplains were quantified. The classification scale of the accuracy of floodplain definition was suggested according to the value range. In the next step the functional dependence between floodplain differences values and particular sites characteristics were examined. Ascertained relations were then used for analogical determination of floodplain accuracy in the Czech Republic.

Accuracy classification of current floodplain definition was solved on 5 km long segments of all streams in the Czech Republic with currently defined flood curves. Results are summarized in tables and draft maps. Cartographical outputs will be created in 2014.

At the end of the year the structure concept of floodplain definition methodology was written with the help of subcontractors. The methodology formulation is the main goal in the last year of the project.

Creation and maintenance of data sources, support of data and map outputs of the reporting: International Commission for the Elbe River Protection, International Commission for the Protection of the Danube River and International Commission for the Odra River Protection against Pollution

Project managers: Ing. Tomáš Fojtík, Ing. Michael Jakš
tel.: (+420) 220 197 355, e-mail: tomas_fojtik@vuv.cz

Duration: 2013

The objective of the project is to provide a support to contract owner with fulfillment of obligations consequent from requests of international commissions of protection of Elbe, Oder and Danube Rivers.

In 2013, following the instructions of contract owner, only several necessary tasks were fulfilled. Decision tables, which delaminate the differences and potential sources of ambiguity resulting from update of water bodies, were updated. The outputs of these analyses are presented in tables and displayed in summarizing maps. Other activities were: checking and correction of border data with Saxony, Bavaria and Poland and setting of HPoints and HStretches. The results of these activities were presented in PDF maps. The support to contract owner with fulfillment of specific tasks for international commissions of Elbe, Oder and Danube Rivers. E.g. the exhaustive template for ICERP (DrainBasin) was created (including attribute data and check of topology). It would be convenient to agree on planned activities with sufficient time reserve and to take into consideration all obligatory deadlines.

The support of the representation of the Czech Republic in activities of the International Commission for the Protection of the Elbe River (ICPER)

Project managers: Ing. Marie Kalinová, RNDr. Hana Prchalová, Ing. Pavel Balvín
tel.: (+420) 220 197 213, e-mail: marie_kalinova@vuv.cz

Duration: long term activity

The aim of the project is to provide expert support for ICPER activities in certain fields, the preparation of documents and participation of the TGM WRI employees at the activities of the ICPER expert groups – in 2013 at the activities of expert group Surface Water, expert group Groundwater, ad-hoc group Management of Water Quantity. The employees of the other organizations (River Boards, s.e., CHMI etc.) participate also in activities of expert groups.

Main task of the expert groups was in 2013 the audit of fulfillment of objectives of International Elbe River Basin Management Plan, creation of materials for public participation and preparation of the next planning cycle. Specifically, the International Program of Measurements on Elbe was updated. The common principles for dealing with lack of water were created. The information on methodologies of assessment of ecological status of surface water and status of groundwater were exchanged.

The support of the participation of the Czech Republic in activities of Permanent Committee Saxony and Permanent Committee Bavaria of the Czech-German Commission for CrossBorder Water

Project managers: Ing. Marie Kalinová, Ing. Věra Kladivová, Mgr. Pavel Eckhardt, et al.
tel.: (+420) 220 197 213, mail: marie_kalinova@vuv.cz

Duration: long term activity

The objective of the project is a long term provision of expert materials to Ministry of the Environment for cooperation on cross-border water and a support of activity of both the Permanent Committees.

The issues are solved in Czech-German expert groups, alternatively in direct collaboration of Czech and German experts. Employees of TGM WRI, p.r.i., participate on preparation of expert materials for meetings of expert groups and superior bodies of this cooperation.

The project activities are diverse: from conceptual and methodological documents to solving of specific problems of individual localities, e.g. protection of *Margaritifera margaritifera* and *Unio crassus*. The procedures of the Water Framework Directive are implemented on border waters.

Employees of other organizations (River Boards, s.e., CHMI etc.) also participate in this activity. In 2013 experts from TGM WRI, p.r.i., participated in following topics: quality of surface- and groundwater.

Emissions and their impact on water environment

Project team: Ing. Petr Vyskoč, RNDr. Hana Prchalová, Mgr. Pavel Rosendorf, Ing. Alena Kristová, Ing. Tomáš Mičaník, RNDr. Jitka Svobodová, Ing. Petr Tužil, Ph.D., MBA, Ing. Jiří Pícek, Ing. Pavel Richter, RNDr. Renata Filippi, Mgr. Silvie Semerádová, Ing. Martin Durčák, Ing. Jaroslav Beneš (Vltava River Basin, s. e.)
tel.: (+420) 220 197 425, e-mail: petr_vyskoc@vuv.cz

Duration: 2012–2014

The objective of the project is the creation of tools (methodology and relevant software) for assessment of impacts of emissions on state of water. Methodology and software will allow for the each of water bodies, where is emergency not to meeting the objectives of water protection regarding the specific criterion, to quantify the share of individual pollution sources that cause the adverse status. Consequently, the information basis for the proposal of measures will be provided. The tools will respect the specific properties of the substances and characteristics of their pathways to water (soil, rock environment). The project is supported by Ministry of Agriculture of the Czech Republic in frame of Program of Agriculture applied Research and Experimental Development Complex Sustainable Systems in Agriculture 2012–2018 (project ID QJ1220346). The organizations participating in the project are TGM WRI, p.r.i., and Vltava River Board, s.e.

In 2013, the activities were focused on creation of the methodology for assessment of impacts of emissions and its verification at subcatchments administrated by Vltava River Basin, s.e. The methodology described the procedure of assessment of emissions: determination of hazardous substances in catchment, analysis of the sources and contamination pathways and assessment of importance of sources (their groups) and pathways on the level of water body. The methodology describes the potential sources and contamination pathways relevant for individual substances. It specifies economic activities and land use related to emissions of individual substances. It describes the most important physical and chemical properties of the substances regarding their behavior in water environment. The determination of the importance is based on sources analysis and the analysis of the contaminant pathways. This analysis is complemented by analysis of their abundance in surface waters (the dependence of concentration on flow). The findings from implementation of proposed procedures on test catchments were presented at the conference Vodní nádrže (Water Reservoirs, September 25–26 2013, Brno) and published in conference proceedings. The title of contribution was: "The determination of proportion of emissions of contaminants from different sources into surface water".

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

Project managers: Ing. Marie Kalinova, Mgr. Pavel Eckhardt, et al.
tel.: (+420) 220 197 213, e-mail: marie_kalinova@vuv.cz

Duration: 2011–2014

The objective of the project is a protection of water sources and identification of causations of dropping of groundwater levels in two cross-border areas: Hřensko–Křinice/Kirnitzsch a Petrovice–Lückendorf–Jonsdorf–Oybin. Creation of groundwater flow models, monitoring of springs abundance, study on age and mixing of groundwater, study on climate change impact on water in both areas and study on groundwater fauna are ongoing. Cooperation between Czech and German experts and public

participation are the important parts of the project activities. Common strategies of groundwater resources protection in both areas will be created subsequently. The project publicity is provided via web pages of the project (<http://www.gracecz.cz>). The project is supported by European Regional Development Fund via Program Objective 3 for support of cross-border activities between the Czech Republic and the Free State of Saxony, in which TGM WRI, p.r.i., is the lead partner and Sächsisches Landesamt für Umwelt, Landwirtschaft und Geologie (LfULG) in Dresden is a cooperating partner. The Czech Ministry of the Environment ensures co-funding of the Czech project partner.

In 2013, the information research, field work and data and another background information gathering continued. Common workshops and coordination meetings on particular solved problems (groundwater flow models, groundwater fauna, hydrogeology of areas of interest) were organized. Among the project outcomes in 2013, it is possible to highlight the information on the project and the state of groundwater resources in observed areas for Standing Committee Saxony of the Czech-German Commission for Transboundary Waters, the results of springs and headwater areas monitoring compiled into information sheets and the results of water age and mixing assessment via method of tritium evaluation for both areas of interest as a basis for water age verification via other methods.

The processing of water management balance of current and projected status of surface water quantity in subbasins of the Upper Vltava, Berounka, Lower Vltava and other Danube tributaries

Project team: Ing. Petr Vyskoč, Ing. Jiří Pícek, Ing. Jan Brabec, RNDr. Hana Prchalová, RNDr. Renata Filippi, Ing. Libor Ansorge, Mgr. Silvie Semerádová, Ing. Jiří Dlabal
tel.: (+420) 220 197 425, e-mail: petr_vyskoc@vuv.cz

Duration: 2012–2013

The objective is processing of water management balance of current and projected status of surface water quantity in subbasins of the Upper Vltava, Berounka, Lower Vltava and other Danube tributaries. The client is the Vltava River Board, s.e.

The processing of water balance is according to the Water Law the component of the survey and evaluation of the status of surface and groundwater. The principles, procedures and tools developed in earlier research activities of the TGM WRI are implemented. Mainly the outputs from the research project MZP0002071101 are used.

The previous outputs are: harmonization of water balance with the requirements of the Water Framework Directive, using the results of water balance at water management planning and implementation of simulation modeling methods of storage function of water management systems. The project follows on similar focused projects at TGM WRI, p.r.i., from 2006.

The current and prospective (to 2021) balance status of surface waters was evaluated in check gauging stations. The securing of requests of water demands and minimum flows was evaluated. The potential climate change impacts were taken into account.

A safety assessment of the emergency infrastructure components – drinking water

Project managers: Ing. Václav Štastný, Ing. Lubomír Petružela, CSc., Ing. Jana Hubáčková, CSc.
tel.: (+420) 220 197 249, e-mail: vaclav_stastny@vuv.cz

Duration: 2010–2014

The objective of the project is to propose and to optimize methods for resolving emergency events (pollution accidents 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 supply of 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 the last year, the general crisis analysis of the issue of security of water pipelines and water towers was carried out in form of an analytical table. The evaluation of risk for qualitative and quantitative aspects of water supply was done. The activity of the TGM WRI were focused mainly on evaluation of crisis situations connected to transport and storage of drinking water. The approach to minimize risks or to eliminate consequences of individual components of water supply system was developed. The approach emphasize the coordination between the keeper of the system and Fire Rescue Service of the Czech Republic.

Alternative sources of water in municipalities during the state of emergency – exploitation of original local sources and springs

Project manager: RNDr. Josef Fuksa, CSc.
tel.: (+420) 220 197 330, e-mail: josef_fuksa@vuv.cz

Research team: Mgr. Pavel Eckhardt, Ing. Lenka Matoušová, Ing. Eva Mlejnská, Ing. Alžběta Petráňová, Ing. Milena Forejtníková, Ing. Václav Štastný

Duration: 2011–2014

Aim of the project is the research of possibility of use of existing water springs in cities (over 20,000 inhabitants) to supply water in the state of emergency.

In the 3rd year of the 4 years project, field and laboratory activities of case studies in selected municipalities over 20,000 inhabitants (Decin, Brno, Plzen and Praha) were finished, 89 springs were sampled totally 4 times per year.

The seminar for public and municipal administrators was arranged (in Praha and Brno) and results of the project were presented on two conferences.

The results show that water quality of monitored springs is relatively stable, so a prediction of water quality for the emergency use is possible for a longer period. Data on the discharge were also obtained for 75% of springs; the measurements are not possible at the rest of them. The state of the springs or their immediate surroundings have a fundamental influence on the values of microbiological water quality indicators. In most cases the disinfection (boiling) should be necessary before the use of water. The rest of characteristics determined allows direct use of water. In the last year of the project, its entire outputs will be elaborated, especially a certified methodology (protocol) of the search, securing and use of springs as possible emergency sources of water.

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

Project managers: Ing. Václav Šťastný, Ing. Martina Beránková, RNDr. Dana Baudišová, Ph.D.
tel.: (+420) 220 197 249, e-mail: vaclav_stastny@vuv.cz

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 wastewater treatment plants, both activated and extensive. The main objective of the project is then to develop the optimum method for monitoring of the application of biotechnological products on wastewater treatment plants.

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

In the third year of the project, the measurements of influence of the use of biotechnological product on small standardized household waste water treatment plants were carried out (influence on start after the accident). These measurements were carried out also in ground on a rural waste water treatment plant with stabilization reservoir (continuation of the activities of 2012). The measurements of influence of the use of biotechnological products on improving the quality of the operation of a rural activation waste water treatment plant was realized. The preliminary evaluation of the results of measurements from the first three project years was carried out and the data were processed for the methodology of monitoring of the use of the biotechnological products.

Final treatment pools used with low intensity

Project team: Ing. Filip Wanner, Mgr. Ondřej Simon, Mgr. Michal Bílý, Ph.D.
tel.: (+420) 220 197 241, e-mail: filip_wanner@vuv.cz

Duration: 2012–2015

The project is focused on potential of final treatment of wastewater from activating wastewater treatment plants (WWTP) in final treatment pools that are newly designed. The project is based on the prototype WWTP Zbytiny for 500 Hab. Eq. The objective of the project is a quantification of processes that take place in final treatment pools under various conditions and optimalization of the processes. Concurrently, the attention is focused also on potential of pools while the domestic WWTPs are used.

In 2013, the detailed monitoring of example locality Zbytiny was finished. The focus was on the description of principles and processes that are involved in final treatment of waste waters. Simultaneously, the sampling was carried out at the locality with focus on description of general effectiveness of treatment in biological ponds. The effectiveness of treatment stages was described for individual parameters and indicators of pollution. The attention was also paid to the quantification of the transfer of different forms of pollution (mainly nitrogen and phosphorus) among the individual substances. The obtained results proved the long term ability of the final treatment ponds to decrease the concentration of nutrients discharged from WWTP to recipient. During the second year of the project the searching for suitable localities was finished (the combination of the existing/planned domestic WWTP and possibility to built a ground reservoir for final treatment). After the thorough selection, two localities were selected for construction of ground reservoirs with planned launching in the first quarter of 2014. The preparation of grounds for construction of plastic reservoirs and construction itself was going on. The domestic WWTP provided by project partner is used as a source of treated waste water for these pool experiments.

The first experimental arrangement of reservoirs was focused on verification of functionality of new reservoirs in different reduction scales. Next phases of experiments are planned on 2014.

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

Project team: Ing. Miroslav Váňa, RNDr. Josef K. Fuksa, CSc., Ing. Jana Hubáčková, CSc., Ing. Roman Jobánek, Ing. Jiří Kučera, Ing. Magdalena Kvíčalová, Ing. Pavla Martinková, Ing. Lenka Matoušová, Ing. Danica Pospíchalová, Ing. Filip Wanner
tel.: (+420) 220 197 371, e-mail: miroslav_vana@vuv.cz

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) and especially important pharmaceuticals from wastewater. Knowledge obtained from the research will be applied by project designers, operators and water management authorities in designing of wastewater treatment plants restoration projects and it will also serve as a base for the application of verified components of the treatment technology process 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 2013 (last year of the project), the proposed technology of waste water treatment with increased pharmaceuticals removal was verified on pilot plant. The technology was based on addition of filtration over activated carbon to mechanical-biological treatment. The technology included technological parameters of filtration. The monitored substances were: salicylic acid, clofibric acid, Carbamazepine, Ibuprofen, Diclofenac. Simultaneously, the other possibilities of removal of these substances by different ways of tertiary treatment were tested (combination of UV light and filtration over activated carbon, filtration over FENIRAMA FPP2 material, ozonation).

The obtained results showed that the most suitable technology for removal of pharmaceuticals is their capture on activated carbon. It is possible to use other technologies (UV light or ionization in combination with activated carbon). However, these destructive methods may cause the fission of the monitored substances to substances potentially even more dangerous that may not be captured on activated carbon.

Fungal biofilms for wastewater bioremediation complementary to wastewater treatment plants

Project managers: Ing. Filip Wanner, Ing. Miroslav Váňa, Ing. Václav Šťastný, Ing. Eva Mlejnská
tel.: (+420) 220 197 241, e-mail: filip_wanner@vuv.cz

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 wastewater 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 properties. The project will include measurements of the biofilm capacity in degradation of selected pollutants and elimination 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.

The research on bioremediation ability of fungi *Irpex lacteus* with using of real waste water continued in 2013. The colourful waste water was prepared from ordinary waste water from input to waste water treatment plant; insoluble substances were removed by filtration and colour Remazol Brilliant Blue R (RBBR) in concentration 150 mg/l was added. The experiments run in the two reactors with different design ("trickling-bed" and "rotating disc"). The experiments with the "trickling-bed" reactor were not successful: during the individual experiments the partial decrease of absorbance was detected (wave length 592 nm), however the liquid was still colourful. It was caused with high probability by increase of pH during experiment. Even while the phosphate or amber buffer was added to the tested water, the increase occurred. The distinct decrease of absorbance (70% reduction at wave length 592 nm) and visible loss of color were observed (color RBBR) in the same colored waste water while the "rotating disc" reactor was used. It was the reason why for further test, only the "rotating disc" reactor was used. The "rotating disc" reactor was evaluated as a more suitable and efficient for such type of activity. Next, the real colourful waste water from dye bath used for dyeing of fabrics.

Several experiments were carried out with this colourful waste water from dye bath in "rotation disk" reactor during the year. The distinct decrease of the value of absorbance was observed in whole spectrum of visible light. The complete loss of colour was not observed in all monitored experiments; after the initial decrease of absorbance in the first days, the absorbance increased distinctly again. The modified waste water was then mixed with activation mixture and aerated. The activation mixture that is used commonly in waste water treatment plant was selected for the experiments. The objective was to find out whether the modified waste water can lose its colour during classical biological waste water treatment. From the results followed that further loss of colour is hardly possible to obtain by biological methods at a classical waste water treatment plant.

Activities of the Testing Laboratory for Water Management Facilities

Research team: Ing. Věra Jelínková, Ing. Martina Beránková, Vojtěch Mrázek, Vojtěch Orlický, Dis. tel.: (+420) 220 197 464, e-mail: vera_jelinkova@vuv.cz

Duration: unlimited (according to the contract)

The Testing laboratory for water management facilities is a part of the Testing laboratory for the technology and environmental components in WRI TGM, p.r.i., that is accredited by the Czech Accreditation Institute under the number 1492. The Testing laboratory for water management facilities mainly tests treatment efficiency of domestic waste water treatment plants (WWTP) according to CSN EN 12566-3+A1. We also do accredited tests of separators for light liquids and grease separators. It is also possible to test different water management installations according to customer requirements.

One domestic WWTP was tested by the accredited test procedure in the Testing laboratory in 2013. Another WWTP was tested according to customer requirements in another mode of test beyond standard CSN EN 12566-3+A1. One of the tested WWTPs, which is used for river boats, was tested according to Commission Directive 2012/49/EU. During the year 2013 two separators for light liquids and two grease separators were tested.

The properties of the Testing laboratory are also used for other projects of the Branch of Water technology. From 2011 until the end of 2013, a laboratory model of WWTP was installed here for testing the degradation of residues of pharmaceuticals.

NAVARO – The development of early warning and rapid reaction tools in the area of surface water protection

Project team: RNDr. Přemysl Soldán, Ph.D., Ing. Martin Durčák, Mgr. David Chrastina, Ing. Jiří Šajer, Ing. Ivana Truxová
tel.: (+420) 595 134 813, e-mail: premysl_soldan@vuv.cz

Duration: 2011–2014

The project objective is the development of a certified methodology and a consequent manual describing the tools of rapid detection of pollution accidents and their causes, terrorist attacks or criminal activity with an impact on the quality of surface waters.

The project has been running for three years and the activities of the project third phase fully corresponded with the approved project plan. Specifically, the proposal of a system of sampling and selection of optimal methods of analysis for the rapid detection of the causes of the emergency situation. In addition, the work on a development of specialized database software has started. The software is intended to deepen effectiveness of the components involved in the resolution of the pollution accidents, terrorist attacks or criminal activity with an impact on the quality of surface waters.

Documentation, passportization, archiving and conversion proposals of chimney water tanks as threatened group of industrial heritage sites in the Czech Republic

Project manager: Ing. Robert Kořínek, Ph.D.
tel.: (+420) 595 134 823, e-mail: robert_korinek@vuv.cz

Duration: 2013–2015

The main objective of the project is to create foundation for protection, identification and presentation of the chimney water tanks. The chimney tanks belong to the group of the most threatened, very rare and unique industrial heritage sites. The main outcome of the project is a specialized publication.

In 2013, localization of existing and non-existing smokestacks with water tanks in the Czech Republic was carried out. The complete structural-historical research on site was finished for the first ten existing buildings (Nymburk, Rosice, Kolín, Mělník, Sudkov, Litovel, Choceň, Vilémov-Zahořany, Slaný, Dobruška). Furthermore, a photographic documentation of listed buildings and the new construction documents were created. A survey of archival materials related to the existing and non-existing factory chimneys in the governmental and corporate archives and publications available started. Beta version of specialized maps of factory chimneys and water reservoirs was created. The project results were presented to the professionals and general public.

Cooperation in transboundary waters with Poland

Project team: Ing. Luděk Trdlica, RNDr. Jaroslava Procházková, Mgr. Pavel Eckhardt
tel.: (+420) 595 134 800, e-mail: ludek_trdlica@vuv.cz

Duration: 2006–2013

The main objective of the project is to collect and provide requested water management fundamental data and information in the frame of the international activities and fulfillment of requests connected

with issues of transboundary waters at Czech-Polish section on national borders. The important part is the preparation of basis documents for negotiations of representatives of Czech and Polish Republics.

In 2013, the project has been divided in three subprojects:

The subproject *Cooperation on Czech-Polish transboundary waters – Group P* covered the securing of specific technical support for activities of Czech delegation in working group for issues of preparation of investment projects and concepts on transboundary waters (Group P) and securing of presence at negotiations focused on these issues. In the beginning of the year, the negotiations with Polish partners took place. The topic of negotiations were compensations of property owners on the Czech side that were affected by construction of Krzanowice polder in the Polish area. In the end of the first half of the year, all the materials were handed over to newly named head of the Czech delegation.

In the frame of the subproject *Implementation of CD 2000/60/EC - Group WFD* the documents connected to geometrical harmonization of transboundary water bodies at the Czech-Polish border were handed over to Polish partners. It was agreed that the further activities would continue after the acceptance of geometrical harmonization by the GIS experts.

The subproject *Groundwaters in the area of Police Basin and Stěnava River* is focused on issues of transboundary groundwaters and surface waters in the following areas: Police nad Metují–Kudowa Zdrój (OPKu), Krzeszów–Adršpach (OkrA) and in the upper and middle Stěnava River catchments (OS).

The continual monitoring of water regime continued on groundwaters and surface waters. The inspections and measurements take places at the all monitoring sites 5 times per year at minimum. The hydrometry is carried out on the surface watercourses for determination of flow and evaluation curves. The data are provided to Czech Hydrometeorological Institute always for the hydrological year. The information on Czech hydrogeological districts and chemistry of groundwaters for prepared Polish publication about the area was send to Polish partners based on their previous request.

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 team: Ing. LuděkTrdlica, Ing. PetrTušil, Ph.D., MBA, Ing. Martin Durčák
tel.: (+420) 595 134 800, e-mail: ludek_trdlica@vuv.cz

Duration: 2006–2013

The objective of the project is to support the active participation of the Czech Republic (via TGM WRI) in the activities of International Commission for the Protection of the Odra River against Pollution and expert support for the activity of the Czech delegation in this commission. It includes the preparation of documentation for meetings of Czech parts of individual working groups and preparation of documentation for the meetings of heads of delegations and for the plenary meetings of the International Commission for the Protection of the Odra River against Pollution.

The project was divided in three subprojects:

Coordination of activities and works of individual subgroups by the managing group WFD-G1
The main focus of the managing group WFD-G1 was in the first half of 2013 on ongoing actualization of the time schedule and coordination of the activities of the subgroups. The document "The Conditions of Using and Providing of data from data sources of International Commission for the Protection of the Odra River against Pollution" was prepared and agreed. In the second half of the year, the attention was paid to finishing of individual strategies of reaching of common objectives for important water management issues. The report describing realization of measure programme was prepared and published. Time plan was made accessible to general public.

In the frame of the *Support to the working subgroup Monitoring (GM)* the focus was mainly on preparation of emissions list, discharge and leaks of all the priority and polluting substances in accordance with paragraph 5.1 of CD 2008/105/EC. The list will be based on individual national reports. Additional focus was on harmonization of the geometry of the transboundary water bodies in cooperation with the commissions for transboundary waters, common procedure in case of different assessment of ecological status of transboundary water bodies and agreement about approach to processing of a common report about comparison of national methods of evaluation of ground water bodies status.

The Support to activities of subgroup GP – planning covered help with finishing of the Strategy of reaching of common objectives for following themes:

- morphological changes in surface water bodies,
- water withdrawals and transfers,
- important contamination load,
- reaching of environmental goals in protected areas,
- international harmonization of characterization of border and transboundary water bodies.

Additionally, following documents were prepared by the subgroup: The preliminary overview of important problems of water resources management in International Oder River Basin District for 2nd planning cycle. Time schedule for creation of the Proposal of the Plan of the International Oder River Basin District and the Structure of updating of the Plan.

Preparation of technical documentation for the Waste Prevention Program of the Czech Republic

Project manager: Ing. Robert Kořínek, Ph.D.
tel.: (+420) 595 134 823, e-mail: robert_korinek@vuv.cz

Duration: 2013

The aim of the project was to elaborate the basic technical data for Waste Prevention Program of the Czech Republic (master thesis) and detailed technical documentation (analysis and design program document).

Activities implemented earlier were evaluated in 2013. Measures for prevention were also evaluated. Problematic areas of waste prevention were defined and specified along with evaluation of waste prevention measures, priority (directions) of waste prevention for the Czech Republic, the draft program structure, the general design objectives and measures, targets and proposals for action for selected waste streams (municipal waste, biodegradable waste, food waste, waste of product directives – packaging, electronics, batteries and accumulators, cars at the end of life, building waste, textiles and others). Proposals for activities leading to the fulfillment of prevention measures and proposals quantified and qualified indicators (criteria) for evaluating waste prevention programs were also prepared. The usefulness of the examples of measures was evaluated. Database of contacts was updated and processed expert estimates of costs and benefits in the implementation of the Program were evaluated.

The evaluation of chemical and ecological state of surface waters for purposes of creation of Second River Basin Plans

Project team: Ing. Petr Tušil, Ph.D., MBA, Ing. Martin Durčák, Ing. Petr Vyskoč, Ing. Pavel Richter, Mgr. Libuše Opatřilová, Mgr. Pavel Rosendorf, RNDr. Hana Prchalová
tel.: (+420) 595 134 899, e-mail: petr_tusil@vuv.cz

Duration: 2013

The project objective was to process evaluation of chemical and ecological state of surface water bodies for purposes of creation of second river basin plans. The methodology for synthesis of evaluation of chemical and ecological state of surface water bodies will be one of the project outcomes.

The chemical and ecological state of surface waters was evaluated. The evaluation was based on available data for individual monitoring sites of surface water bodies. The evaluation of chemical status of heavily influenced and artificial surface water bodies was also carried out (categories river and lake). Another output was proposal of a comprehensive methodology for general evaluation of chemical and ecological state of surface water (category river). The proposal covers also methodology for estimation of reliability and accuracy of results obtained by monitoring programmes. During preparation of individual project outputs, the expert assessment of partial outputs and results of evaluation was carried out. The project outputs will be used by individual river administrations (Povodí, state enterprises) and central water management offices for purposes of creation of river basin plans. The format of outputs will respect also current requirements of reporting duties of the Czech Republic towards European Union.

Expert activities

Project team: Ing. Ivana Truxová, RNDr. Přemysl Soldán, Ph.D., Mgr. David Chrastina
tel.: (+420) 595 134 812, e-mail: ivana_truxova@vuv.cz

Duration: 2013

The project objective is a comprehensive fulfillment of external contracts by employees of Laboratory of Hydrochemical and Hydrobiological Analyses of TGM WRI, p.r.i., Ostrava Branch. The contracts can be divided into two major groups. First group covers routine sampling and routine hydrochemical and hydrobiological analyses. The second group covers the expert consulting activities. The important component of the project is acquiring of new contracts by participation in announced programmes calls and acquiring of new contacts.

Fifteen contracts were realized in 2013. Sampling of industrial waste water and waste sampling with consequent chemical and ecotoxicological analysis was the most common. The department of hydrochemistry continued in all year monitoring of industrial waste water with expert consulting activity for Lakum-KTL, a. s., Frýdlant nad Ostravicí. The chemical analyses of industrial waste water for ČEZ Energetické služby, s.r.o., Ostrava also continued. One of the important contracts was the processing of delivered air samples from center of Ostrava town (sampled by Czech Hydrometeorological Institute, Ostrava Branch) for Faculty of Natural Sciences of Ostrava University. It was preadjustment of the samples for determination of acute toxicity via luminescent test on bacteria tribe *Vibrio fischeri*. Simultaneously, PAHs and selected metals were determined in the samples. The other contracts were relatively smaller. E.g. the Department of Hydrobiology carried out determination of acute toxicity in samples of waste water using method "Determination of inhibiting effect of samples on light emission of luminescent bacteria *Vibrio fischeri*" for Vodárenská akciová společnost, a. s., Brno and toxicological analysis of groundwater for Ostravské vodovody a kanalizace, a. s. In 2013, the Laboratory of Hydrochemical and Hydrobiological Analyses TGM WRI, p.r.i., Ostrava Branch wined the contract on preparation of samples for exams of qualification carried out by ASLAB in the area of basic chemical analysis and analysis of Adsorbable organic halogen compounds (AOX).

Possibilities of using information and resources of waste management data as tool for identification and solution of unauthorized waste management

Project team: Ing. Věra Hudáková, Ing. Dagmar Sirotková, Ing. Jana Zuberová, Ing. Světlá Pavlová, Ing. Eva Kajanová
tel.: (+420) 220 197 470, e-mail: vera_hudakova@vuv.cz

Duration: 2012–2013

The aim of the project is to show possibilities of using information and resources of waste management data as tool for identification and solution of unauthorized waste management. The outcomes will be used for increasing the level of knowledge and maintenance the required knowledge base in this area. The readiness of police and the Fire Rescue Service will increase and consequently the effectiveness of their intervention in case of suspected unauthorized waste management or during an emergency situation will increase as well.

Based on information obtained in 2012, two manuals were completed during 2013 related to cross-border shipments of waste which are directly useful for field work. The manuals are available in the electronic form on the website www.ceho.cz in the folder SOLVED PROJECTS. Furthermore, a manual with a file containing information on related legislation, on hazardous waste properties in relation to legislation for chemicals, an overview of data sources containing information about the movement of waste both in the Czech Republic and across borders was elaborated. This manual is designed to train the workers who are in contact with unauthorized waste management.

The setting of the optimal procedure for identifying and addressing unauthorized disposal of wastes in the processed Guidance is discussed with the staff of the Ministry of the Environment of the Czech Republic, CEI (The Czech Environmental Inspectorate), Police of the Czech Republic, customs authorities and other experts.

The upgrade and expansion of the teaching aimed at the environmental issues on Faculty of Science of Masaryk University in Brno

Project manager (TGM WRI): Ing. Dagmar Sirotková (project was coordinated by Masaryk University)
tel.: (+420) 220 197 270, e-mail: dagmar_sirotkova@vuv.cz

Duration: 2011–2013

The project objective was to create robust system of environmental education at Faculty of Science of Masaryk University in Brno. The system is aimed to produce the graduates that will be prepared for the jobs demanded by market and systematically educated in the field of sustainable development. The experts from practice help to strengthen the practical orientation of education.

TGM WRI as a project partner has prepared many activities for students and lectures. The prepared activities contributed to the achievement of the project objectives. The student research projects were prepared. TGM WRI collaborated on bachelor and diploma theses (proposals of themes and opponent's reviews). The lectures on topics related to water and waste issues were prepared. The wastes were also topic of one day workshop, where the participants could meet with innovations and interesting examples from the field of the waste management.

Erosion washout: increased possibility of danger for population and water quality in connection with expected climate change

Project managers: Mgr. Pavel Rosendorf, Ing. Martin Hanel, Ph.D., Ing. Jiří Píček, doc. Dr. Ing. Tomáš Dostál (Czech Technical University in Prague)
tel.: (+420) 220 197 413, e-mail: pavel_rosendorf@vuv

Duration: 2012–2015

Torrential precipitation accompanied by soil washout is a risk factor that threatens population, municipal infrastructure, even surface water resources and important recreation areas. The amount of torrential precipitation increases with climate change.

Future risks connected with these extreme events might influence important parts of the area of the Czech Republic. The main objective of the project is to propose conceptual approaches for area assessment with regard to risks of erosion washout connected to expected climate change.

In 2013, the focus of the project was mainly on data preparation for modeling of erosion risk and sediment transport in connection with threats of municipalities and critical infrastructure under current conditions. New R factor (rain factor) was developed based on data on intensities from rain gauging stations in the area of the Czech Republic. The R factor is used for calculation of erosion with universal formula of soil loss. The changes of precipitation intensities for expected climate change were analyzed. The procedure was developed for determination of critical points where the municipalities and important components of infrastructure are threatened. The modeling of influence of transported sediment on special protected areas including localities of Natura 2000 network was started in the second half of the 2013. The concept of creation of software tool for visualization of project results was finished during the year. The tool will include extensions for simulations of suitable measures. The first project results were published in peer reviewed journals and at several scientific conferences.

The development of the system for automated monitoring of influence of water management structures on the environment using the technology of passive integrators TROVAN

Project manager: Mgr. Libor Závorka
tel.: (+420) 220 197 402, e-mail: libor_zavorka@vuv.cz

Duration: 2010–2014

The main objective of the project is to create new standardized system for an automated monitoring of influence of water management structures on the environment using the technology of passive integrators. The mutual tuning of antennas, readers and used chip has a very important role in the whole system.

The applicability of the system for monitoring of fishes in rivers was optimized. The focus was on cyprinid fishes. In addition, the new construction components were tested in challenging conditions of a small watercourse.

In this stage, the focus was more (in comparison with previous years) on legal protection of project outputs and their formal processing. In the end of the testing season, the creation of methodology and prototype of tuned RFID antennas has been started since the project has to be ended up by main planned outputs in 2014. The other current project outputs were processed into the two utility models, prototype and manuscript for the international scientific journal – *Biologia*.

The testing of the system tuned on the basis of the previous project stages proved also in this project stage excellent properties both in a large and a small watercourses. The system is almost ready to be used broadly. After finishing the last details of the prototype and certification of the methodology, the system will have great potential to be used and it will be able to contribute to the better quality of the monitoring of the environment in the Czech Republic.

Optimization of large wood structures for stream restoration and semi-natural stream regulation

Project managers: Mgr. Pavel Kožený, Ing. Ondřej Motl, Ing. Ján Šepelák, Ing. Pavel Balvín, Mgr. Ondřej Simon
tel.: (+420) 220 197 265, e-mail: pavel_kozeny@vuv.cz

Duration: 2012–2015

The aim of the project is to develop new technical solutions and methods for safe and effective application of large wood structures in stream restoration and semi-natural stream regulation. The project also deals with the management of woody debris in streams and its influence on water animals.

In 2013, the evaluation of the hydromorphological development of semi-natural treatment of the bank ripping at the locality of Bečva-Slavíč and stabilization of river wood at the locality of Morava-Litovel. The Summary of experience with the realization and development with applied wooden structures at the other localities was created. The influence of ten-year flood on dynamics of natural river wood in channels of different geomorphologic types was described at model localities in the Blanice catchment in the Šumava Mountains. Mobility of river wood was monitored also at watercourses in regions of Českomoravská vysočina and Litovelské Pomoraví. The biological sampling was going on in the autumn. The sampling is a part of the biological study that evaluates the importance of river wood for the abundance and diversity of macrozoobenthos populations in different types of watercourses with diverse occurrence of the bottom habitats. The experiments were going on at the hydraulics laboratory at the Prague TGM WRI premises on the physical hydraulics model. The experimental data were obtained for five types of wooden structure regardless the flood in June. The stability and hydraulic effectiveness of the wooden structures at Q_{30} – Q_{100} flows was checked. These wooden structures will be prepared to be registered as utility models and used at real watercourses after additional research in 2014.

The methods of optimization of the proposed measures in watersheds of reservoirs leading to effective decrease of their eutrophication

Project managers: Mgr. Pavel Rosendorf, Ing. Libor Ansorge, Ing. Vlastimil Zahrádka (Ohře River Board, s. e.), doc. Dr. Ing. Tomáš Dostál (Czech Technical University in Prague)
tel.: (+420) 220 197 413, e-mail: pavel_rosendorf@vuv.cz

Duration: 2012–2015

One of important problems of status of water bodies according to Water Framework Directive (2000/60/EC) is nutrients loading in water reservoirs as it followed from approved District Water Management Plans for period 2010–2015. The most important nutrients are phosphorus and nitrogen. The issue expresses by eutrophication which is caused by increased nutrients loads in watercourses. In the end, the eutrophication may cause the changes of status of many water reservoirs. The project objective is to propose methodology and suitable technical tools for identification of such pollution sources that have the most negative impact on eutrophication of water reservoirs with regard to technical-economical possibilities and impacts of individual solutions.

In 2013, the project objective was to create a complete methodology for evaluation of the influence of the pollution sources on the eutrophication in water reservoirs and to carry out its testing in test catchment of the Stanovice Reservoir. Methodology uses the term eutrophication potential that allows to compare the influence of different pollution sources in a catchment on the evaluated catchment. The base of the methodology is characterization of all pollution sources in a catchment by emissions of diluted (biologically available) phosphorus with determination of other characteristics of pollution sources (distance from the reservoir, retention of phosphorus in river network and reservoirs and seasonality of emission). The evaluation output is the ranking of the pollution sources sorted after the importance of the pollution sources for the eutrophication of the target reservoir.

Alongside this fundamental activity, the data on suitable types of measures of elimination of phosphorus emission from different sources were collected. The data on their financial expensiveness and effect on elimination of emission of different phosphorus forms were collected. The workshop was organized in October. The expert public could get acquainted with basic principles of the project and preliminary results of the methodology testing in the test catchment.

Numerical and functional analysis of aquaculture sector including recreational fishing focused on the increase of competitive ability of the Czech Republic and the improvement of the status of water ecosystems

Project managers: Ing. Jiří Musil, Ph.D., Ing. Tereza Vajglová (TGM WRI, p.r.i.); doc. Ing. Lukáš Kalous, Ph.D., Ing. Miloslav Petrtýl, Ph.D. (Czech University of Life Sciences), et al.
tel.: (+420) 220 197 542, e-mail: jiri_musil@vuv.cz

Duration: 2012–2013

The aim of this project is the numerical and functional analysis of aquaculture, recreational fishing and farming of aquarium and ornamental fish, including their interactions and harmonization with the objectives of aquatic ecosystems conservation with the aim to sustainability and competitiveness.

The project deals with the identification of the effects of environmental phenomena on the sector of aquaculture and recreational fisheries and vice versa. On the basis of the socio-economic and environmental analyses of these sectors, priorities, strategies and remedial measures will be formulated in accordance with the policies and regulations of the EU. The overall aim is then to harmonize strategies of these sectors with environmental and conservation objectives to increase sectors sustainability and competitiveness.

The analysis and solutions of the environmental risks of operation of small hydropower plants in connection with water organisms

Project team: Ing. Jiří Musil, Ph.D., Ing. Miroslav Barankiewicz (TGM WRI, p.r.i.); doc. Ing. Lukáš Kalous, Ph.D. (Czech University of Life Sciences in Prague), et al.
tel.: (+420) 220 197 542, e-mail: jiri_musil@vuv.cz

Duration: 2013–2014

*The project objective is the analysis of current risks connected with operation of small power plants in the river network of the Czech Republic having regard to Council Regulation EC 2007/1001, which establishes measures for regeneration of the population of European eel (*Anguilla anguilla*). The population of eel is negatively influenced by hydropowers in a significant extent. The proposal of measures leading to minimization of risks connected with the operation of small hydropower plants is the important part of the project.*

The operation of small hydropower plants is one of the most important causes of population decline of European eel (*Anguilla anguilla*).

This species ends its life cycle with catadromous (migration from fresh water to the sea) reproduction migration back to the sea. The turbines of hydropower plants cause mass wounding and mortality of the eels during this phase of their life cycle. This so-called turbine mortality is relevant for all water organisms. The project is focused on essential solution of this issues. The project aims are: 1) The determination of actual mortality of eel during the catadromous migration on the meso-scale and large watercourses, 2) the study on behavioral aspects of eel while meeting with the obstacle to propose minimizing technical measures and 3) the creation of relevant methodology for the government administration.

The methodology for determination of reference conditions for the individual biological components of quality

Project team: Mgr. Libuše Opatřilová, RNDr. Denisa Němejcová, doc. RNDr. Světlana Zahrádková, Ph.D., Ing. Pavel Horký, Ph.D., RNDr. Petr Marvan, CSc., RNDr. Blanka Desortová, CSc., doc. RNDr. Vít Grulich, CSc., Ing. Petr Tušil, Ph.D., MBA, Ing. Martin Durčák, Mgr. Matúš Maciak, Ph.D. tel.: (+420) 220 197 224, e-mail: libuse_opatrilova@vuv.cz

Duration: 2012–2013

The project objective was to create a methodology for determination of the reference conditions for biological components benthic invertebrate, fishes, phytobenthos, phytoplankton and macrophytes.

The requests of CD 2000/60/EC, principles of the Guidance documents No. 10 and No. 13 and relevant national legislation (namely Decree No. 49/2011 Coll. and no. 98/2011 Coll.) were taken into consideration. The project was going on in several steps. First step was the selection of physical-chemical and hydromorphological parameters suitable for determination of the impacts on water organisms in the environment of given locality. Second step was the analysis of available data on proposed physical-chemical and hydromorphological parameters in the river network of the Czech Republic. The last step was to select several examples for each biological component and to describe the expected reference population on these examples. The methodology contains also list of reference and the best available localities that are specific for individual biological components. Reference conditions represent the values of relevant biological components of the water quality at the very good ecological status. The methodology presents also the tables with values of the individual biological metrics for boundary between the ecological status very good and good. These limits can be used for verification of the correctness of the selection of the reference locality that must be done in the first step based on abiotic factors.

The methodology for evaluation of ecological potential of heavily modified and artificial water bodies - category river

Project team: Mgr. Libuše Opatřilová, RNDr. Denisa Němejcová, doc. RNDr. Světlana Zahrádková, Ph.D., Ing. Pavel Horký, Ph.D., RNDr. Blanka Desortová, CSc., Ing. Petr Tušil, Ph.D., MBA, Ing. Martin Durčák tel.: (+420) 220 197 224, e-mail: libuse_opatrilova@vuv.cz

Duration: 2012–2014

The project objective is the creation of the methodology for evaluation of ecological potential (EP) of heavily modified and artificial water bodies of running waters (Heavily Modified Water Bodies – HMWB). The methodology will be created in accordance with WFD CIS Guidance documents No. 4 (Identification

and Designation of Heavily Modified and Artificial Water Bodies), No. 7 (for monitoring) and No. 13 (for process of classification of ecological status and potential).

The achieving of good ecological potential is an alternative environmental goal for surface water bodies that were designated as heavily modified or artificial. Reference status is defined as the maximum ecological potential and it takes into account the irreversible hydromorphological changes that have to be preserved in the water resource management of the Czech Republic (navigation, drinking water supply, electricity production, flood protection, irrigation, water supply for industry, fish-farming, recreation and individually evaluated natural, cultural or historical values).

The evaluation of ecological potential is composed (similarly as for ecological status) by evaluation of components of biological quality and supporting components: hydromorphology, general physical-chemical parameters and specific synthetic and unsynthetic pollutants. Different evaluation of ecological potential is set only for some of the components (these which significantly react to hydromorphological influence). The project output is the methodology that states which biological components will be evaluated separately and in which way (macrozoobenthos, fishes, partially phytoplankton that reacts to the hydrological influence of watercourse). It is based on evaluation of natural water bodies (i.e. evaluation of ecological status); it adjusts limit values of selected biological metrics that cannot have reference (natural) values but only values of maximum ecological potential because of eligible use of water bodies. The evaluation of biological components phytobenthos and macrophytes remains same as the evaluation of natural water bodies.

The limit values of parameters influenced by hydromorphological status of watercourses and describing temperature conditions (water temperature measured in the field), oxygen conditions (oxygen saturation and BOD₅) and acid base status (pH and ANC 4.5) are adjusted based on physical-chemical parameters in frame of evaluation of ecological potential of running waters. The evaluation was set differentially for two specific categories of bodies: bodies influenced by discharge from water structures (below selected reservoirs) and other bodies influenced by weir backwaters, fortification, damming etc. Same limit values are used for nutrient conditions as for evaluation of ecological status since the hydromorphological changes of a water body influence these parameters only limitedly.

The evaluation of ecological potential of artificial water bodies of running water (four in the Czech Republic) will be processed (given the current status of knowledge about them) based only on evaluation of physical-chemical parameters and specific pollutants; biological components will be not evaluated in these bodies.

Monitoring of catadromous migration of the European eel (*Anguilla anguilla*)

Project managers: Ing. Jiří Musil, Ph.D., Ing. Tereza Vajglová
tel.: (+420) 220 197 542, e-mail: jiri_musil@vuv.cz

Duration: 2012–2014

*The goal of this radio-tracking telemetry project is to determine the migration success of European eel (*Anguilla anguilla*) within its native range of distribution concerning the territory of the Czech Republic*

With regard to dramatic population decline of the European eel, every member state of EU had to prepare the Eel Management Plan (EMP) on the basis of the Council Regulation EC 1100/2007. This plan guarantees the free migration for at least 40% of the eel adult population with respect to population state before any negative human impacts had occurred. For the purpose of the EMP in the Czech Republic, used estimation models of eel migration success were based on the catch statistics and expert judgments since real, exact data are still missing. Therefore, the aim of this project is to determine the actual migration success of the eel within its native area of distribution in the Czech Republic (Elbe and Oder rivers) using the biotelemetry method.

The determination of portion of erosive phosphorus in eutrophication of threatened bodies of stagnant surface water

Research team: doc. Ing. Josef Krása, Ph.D. (Czech Technical University in Prague), Mgr. Pavel Rosendorf (TGM WRI), doc. Ing. Josef Hejzlar, CSc. (BC ASCR), RNDr. Jindřich Duras, Ph.D. (Vltava River Board, s. e.), et al.

tel.: (+420) 220 197 413, e-mail: pavel_rosendorf@vuv.cz

Duration: 2010–2013

The purpose of the project is to propose effective water management solutions for securing of long-term sustainable quality of water in important reservoirs mainly with regard to their eutrophication with preservation of their full functionality. The sites suitable for proposals of retention elements and anti-erosive measures will be localized by defining the sediment source plains in the catchments and their actual effect on sedimentation and potential eutrophication. The transport sediment volumes will be quantified in selected catchments. The total phosphorus load from the catchment will be determined for all the reservoirs at risk. The proportion of individual sources in their eutrophication will be evaluated.

In 2013 (last year of the project), the project focused on creation the methodology "Evaluation of vulnerability of water reservoirs by sediment and eutrophication conditioned by erosion of agriculture soil". The methodology was published as a certified methodology with contracted using by individual "River Boards" state enterprises. The calculations of balances of phosphorus pollution sources were finished in selected catchments and derived new procedures of determination of the significance of the erosive washout and transported sediment for eutrophication of target reservoirs. The newly proposed evaluation procedures were tested in the selected catchments. The outputs of erosive washout were compared with other types of phosphorus pollution in selected catchments. The results of the project were presented at several international or national conferences. Intermediate results were published in journals with IF or peer reviewed journals. The summary of all results will be published in monograph "Erosion of agriculture soil and its importance for eutrophication of water reservoirs in the Czech Republic".

Water quality model of the Jihlava River within the Dalešice Reservoir watershed

Project manager: Mgr. Daniel Fiala

tel.: (+420) 220 197 348, e-mail: fiala@vuv.cz

Duration: 2012–2013

The project objective was to create a qualitative model for the watershed of the Dalešice Reservoir. The input data are from monitoring programmes of Morava River Board, s.e., hydrological measurements of the Czech Hydrometeorological Institute and standard entries about agriculture, industry and inhabitants provided via Regional administration Vysočina. The important data source was a special monitoring of agriculture and forest micro-catchments. The water quality model was created in MIKE Basin and its outputs are used as data basis for water management planning.

The study mapped the status of waters in watershed of Dalešice Reservoir, it identified the individual pollution sources, it determined the portion of point and non-point sources and analyzed their impact on water quality, mainly at the outlet in Vladislav. The remedial measures are proposed by the study. The measures lead to most possible effective decrease of concentration of selected indicators (P, N, COD) with several scenarios influenced by the potential climate change.