

T1 – Natural and Accidental Floods

T1.1 The challenge of urban floods management

Gourbesville P.

University of Nice - Sophia Antipolis, France

Urban waters management is clearly one of the most important challenge for the humankind. Due to high demographic pressure and demands from populations, urban water management need some urgent redefinitions and new strategical orientations. Recently, major changes in drainage design and operation philosophy have been introduced. For the flood analysis in the urban area, there is today a clear demand for an accurate evaluation of the physical process and especially a good knowledge about velocities and water levels into the streets, along the buildings and the infrastructures. 2D modelling approach offers a number of advantages regarding the more conventional approach based on 1D models. However 2D approach must be adapted to the urban environment. The acquisition and the integration of data are two essentials steps for the quality of the numerical models. New available technology in data acquisition can today significantly improve modelling procedure. This paper presents some of the most important issues related to the management of the urban floods and underlines some aspects of modelling methodologies through an example located on the French Riviera (France).

T1.2 Worst case scenario for flood wave propagation in hydrological modelling

Drobot R., Ilinca C.

Technical University of Civil Engineering Bucharest, Romania

In the current practice the distance between two successive hydrometric stations where accurate hydrographs are available is quite large. Instead of a repeated numerical propagation of a flood wave along a number of sub-sectors, the downstream hydrograph can be theoretically obtained applying successively the Muskingum relation. The downstream discharge is expressed as a convex linear combination of the upstream discharges at previous steps and the downstream discharge at the previous moment. The tributaries are also considered. The river characteristics are reflected by the propagation coefficients, while the specific flood conditions (rain all over the river basin or only on a part of it, succession of the rain occurrence on different sub-basins) are characterized by the lag factors.

If more registered floods are available a part of the floods are used for calibration, while the remaining floods are used for the model validation. As a result, one obtains the lag factors and average values for each parameter. Keeping the lag factors, propagation coefficients are obtained for moving intervals; the length of an interval corresponds to the largest lag factor. Finally, all values for a given parameter are statistically processed, resulting a distribution function for each coefficient. This approach is justified by the fact that the floods occur in different conditions of the riverbed (presence or absence of vegetation, winter conditions, ice blocks, concentration of sediments etc); as a result, the flood propagation coefficients are not constant values.

From different repartitions, Beta distribution was chosen to characterize the coefficient statistics. Using high values for the propagation coefficients (90% quintile from the cumulative distribution function) instead of average values like in the normal procedure the worst-case scenario of the downstream flood is obtained.

As a case study, three floods (1981, 1995-1996 and 2000) of Crisul Alb River (Romania) were examined. The most difficult issue is the evaluation of the lag factors. In the case of Crisul Alb River, due to their different genesis three different models of flood wave propagation resulted. For operational purposes, at the beginning of a flood, all the models (characterized by different lag factors) should be used simultaneously. The propagation coefficients can be their central values (in order to anticipate the most probable flood downstream) or their extreme values (to forecast the worst downstream flood). According to the flood evolution in the downstream section, before the occurrence of the maximum discharge the most appropriate model will then be chosen.

T1.3 Reliable flood modeling in natural environments

Pasche E.

Hamburg University of Technology, Germany

Research Activities in the 80th have considerably improved our understanding about the dominating processes in natural rivers. They lead to the development of new improved mathematical methods for the hydraulic calculation of the flow in natural rivers with vegetation and compound channels (Pasche/Rouvé 1985). Despite this improved knowledge the engineers still sustain in the application of traditional less reliable methods. Especially the resistance is high to give up the Manning's formula and to apply the more physically based Darcy-Weisbach-Formula. They argue with the complexity of these methods and the new empirical parameters which are not well understood yet. In the meantime computer models are state of the art in flood modeling and the complexity of a mathematical method should not be an argument. But most of the international known flood models like MIKE, SOBECK and HECRAS still use only the Manning's formula for the evaluation of the flow resistance with the argument that the quality of the calculation is only a matter of how well the empirical parameters are calibrated. Thus simple flow formulas with only one parameter are advantageous compared to a multi-parameter approach. But this statement is only true if the flow situation with calibration data correspond to the flood events of interest. Uncertainties exist if the calibrated model is applied in a prognostic sense. This is quite often the case for extreme flood events.

It is the objective of this paper, to discuss the need for a more physically based hydraulic modeling of floods. The refined methods of flood modeling are explained and based on case studies with 1-dimensional and 2-dimensional flow models the benefits are demonstrated. Results gained with the Manning's formula are directly compared with the ones of the Darcy-Weisbach formula and the reasons for the observed deviations are explained. Finally recommendations are given for engineers to choose the right mathematical method for the determination of inundation areas and the hydraulic design of natural rivers.

T1.4 Upstream floods and damages: heavy rains. Example of 2 December 2005 at Nice (France) and mechanisms analyze

Carrega P.

University of Nice - Sophia Antipolis, France

Floods are often considered as hazard part of natural risk, and also the damages caused by flood are considered to depend upon vulnerability.

In fact if we want to have a chance to modify risk and damages (in term of human lives and costs), a flood must be considered as the result of the capacity or, more accurately, the susceptibility of the environment to transform fallen rain in a flood. The intermediate role of topographic slope value, of ground permeability, of vegetation cover, etc. constitute the susceptibility, a parameter on which we can act at least a little (but less than on vulnerability). Thus, the only parameter on which we cannot act is the real hazard: rain (not flood).

In this paper we take a recent and good example, in the region of Nice (south-east of France): heavy rainfalls which were in some places over 50 to 100 years return period for a daily quantity (100-200 mm).

The interest of this example is that from a meteorological point of view it is well isolated from rains before and after the sequence, and parameters are easy to identify. Atmospheric circulation models had well forecasted the situation which has so a very good pedagogic value.

All conditions were joined to get important rain quantities:

- Presence of great amount of water vapor in air, due to Mediterranean sea the temperature of which is about 16) at this period of the year. Model show thus great quantity of water vapor, which is the raw material of rain;
- Combination of various mechanism able to cause air ascend: cyclonism (strong vorticity and helicity), vertical thermal unstability, and orografic forcing because of the south part of Alps mountains in front position of the flux.

The association of all those parameters is generally realized from September to December: during summer, air is rich in water vapor (sea temperature 26°) but no mechanism is able to force air to ascend (anticyclonic period); and during winter, mechanisms can be present, but water vapour quantity is light. That is why autumn is the traditional season of heavy rainfalls and of important floods in Mediterranean part of France.

T1.5 Preventing hydrological disasters by restoring river/floodplain interconnection – the Danube between Neuburg and Ingolstadt (Bavaria/Germany)

Cyffka B.

Flood plain Institute Neuburg, Germany

During the first half of the 19th century works started to embank the main parts of the Upper Danube completely. Since that time the river flows in dikes, normally without any contact to its floodplain and the wet riparian areas. In the majority this brought advantages to the population. It was possible to use the former wetlands for settlements, agriculture and forestry. After several decades typical floodplain and wetlands features became invisible – no oxbows, no softwood riparian forest, and no shallow waters with the appropriate fauna and flora. The interconnection between river and floodplain had diminished – the river flew like and alien through a cultural landscape. The second half of the 20th century brought the construction of hydroelectric power stations in form of large barrages. From this time also the migration of fish was stopped. The Upper Danube was/is more or less a human managed canal.

But there is one thing which remains natural and living all over the time – the floods. These partly disastrous events remind man that a river cannot be managed completely. Some of these floods were really dangerous and after a few decades the authorities understood that it was a fault to cut the interconnection between the river and the floodplain because the latter one is the best natural storage for the masses of water coming down from the Alps after the snow melt or even in summer after violent rain storms. Several losses of life were to be mourned not to mention the material losses.

The first solutions were of a technical kind. Some of the barrages could help to hold back the water and the construction of polders starts. But these measures were expensive and no universal remedy which was proofed by the latest floods in 2002 and 2005. Nowadays the floodplain experiences a revival in the thinking of man. Unfortunately many parts of them have diminished, and with the Bavarian Floodplain Programme the search for suitable (floodable) areas began in 2002. The largest joint part was found with the riparian forests between Neuburg and Ingolstadt. In November 2005 the Bavarian Minister for the Environment dug the first turf to start an 11 million Euro pilot project named “Remediation of riparian areas on the Danube floodplain between Neuburg and Ingolstadt”. In future about 2,000 hectares of forests are used for both artificial man-controlled flooding to improve biodiversity in the riparian forest and the flood meadows and to serve as a flood storage in case of disastrous floods.

This contribution will show the natural basis of the pilot project, the technical pre-conditions and buildings to steer the flooding, and the hopes of authorities and environmental associations connected with the project. The scientific attendance is carried out by the newly founded Floodplain Institute Neuburg which future task it is to spread the results on a national and international level. Apart from the mentioned benefits the pilot project is scientifically.

T1.6 Arade river physical model: a tool to validate dam-break flood simulation numerical models

Viseu T., * Betamio de Almeida A., Antonio Bento Franco

** Technical University of Lisbon, Portugal*

BIPLAN 2-D computational model simulates dam-break flood propagation in a natural river stretch. The model is based on the numerical scheme MacCormack-TVD applied to the Saint-Venant equations and was validated for flood propagation on regular channels.

Further investigation was needed to calibrate BIPLAN model in what concerns dam-break flood propagation in an irregular topography valley. Therefore, a physical model reproducing an Arade river stretch, in Portugal, was constructed and several tests were undertaken.

The main characteristics of the Arade river physical model are described and a comparative analysis of it's the results with BIPLAN numerical model outputs is presented. This analysis also allowed to build conclusions about BIPLAN model results accuracy.

T1.7 Flood wave analyzing by catastrophe theory

David I., Sumalan I., Achim C.

“Politehnica” University of Timisoara, Hydrotechnical Faculty, Romania

The interplay between continuity and discontinuous defines the mathematical description of the world. During the history many scientists (Newton, Euler, Lagrange, Zeeman and others) developed the basic stability theory by using specific terms like catastrophes, singularities and instabilities, bifurcations.

The paper presents some mathematical aspects of the catastrophe theory with specific terminology and mathematical description followed by examples to catastrophes, instabilities, bifurcations and singularities in the field of civil engineering.

From mathematical point of view two kinds of singularities are specified. A first kind of singularity is called fold that occurring when a sphere is projected onto a plane; the second kind of singularity is cusp when a curved 3D surface is projected onto a same plane. Both of above singularities are described by different mathematical functions.

In the field of civil engineering different kind of catastrophes are presented: bifurcational collapse of a complete spherical shell, galloping and flutter suspension bridges and two kind of hydrodynamic instabilities.

From the last category a case study from hydrology field is presented so called hydrological catastrophe and numerical catastrophe.

In fact is about the mathematical interpretation of the flood wave passing along a river. The maximum flood is determined by analytical formula and can be called a hydrological catastrophe. The shape of the passing wave and the travel time depends on the flood hydrograph and the flow conditions.

By the other way, the flood wave in the case a simplified scheme can be interpretate by numerical methods. If the discretization technique doesn't respect specific rules for space and time steps (Courant condition) the numerical catastrophe is occurring.

The same rules must be respected by working with 2D models developed today in numerical modeling of the surface waters in the unsteady flow.

T1.8 Fast systems for protection against floods

*** Nitescu E., Dascalita D.**

** "Gh Asachi" Technical University of Iasi, Hydrotechnical Faculty, Romania*

The floods produce the damages with disastrous effects at population and the social economic objectives.

The climatic changes from the last century and the human activities conducted to floods with high frequency, in the high risk areas as in the areas without this kind of phenomena.

The existent measures of defense against floods (regularizations of rivers, banking protection zone of the of banks, etc.) could become inadequate in the extraordinary conditions. It is sufficient the exceed with several centimeters of the defense work quotas by the maximal calculated flow level, in order that the localities, in fields or socio-economic objectives to be flooded. The frequency of this phenomenon is increasing in Romania and in another areas of the World.

In such of situations the existence of the measure intercession with the fast technologies of defense against floods, could represent concrete solutions which head off he damages. Such of technologies are especially useful in the situation of the producing of the maximal floods with historical character and fast propagation.

The systems of fast protection (in real time) contain 2 distinct subsystems:

- The informatical forecast and warning subsystem, which the function of warning the floods that exceed the flooding level and that establish automatically the risk areas, emplacements and the dimensions of the protection devices.
- The technological subsystem of execution of the protection dimensional commanded work of the informatical forecast and warning subsystem.

This paper proposes to present theoretically and succinct few examples of fast protection of the socio-economic objectives in the imminent cases of floods.

T1.9 1D Modeling of the water exceptional flow along several regulation canal courses

**Lazar Gh., Ion M, Constantin A.T., Girbaci C.,
Busan A., Ghitescu A.**

“Politehnica” University of Timisoara, Hydrotechnical Faculty, Romania

The water flow along the branched courses of the Morilor, Zadarlac and Tiganca Canals, which cross Arad city south of the Mures River, has a torrential character, with significant discharges during the raining and snow melting periods and, excepting the Morilor Canal, with no flow during the droughty seasons.

The estimation of the exceptional discharges transition on the three canals is not too easy, the water course being endowed with footbridges and pipes of various diameters, and the useful data such as levels or water discharges are quite poor.

The free surface unsteady water flow in river courses is described by the Saint-Venant differential equations. The flowing regime can be simulated by solving these equations to which the initial and boundary conditions are associated. The equations numerical solving was performed by using the DUFLOW package of programs which employs the finite differential method.

The procedure considered in the paper was employed in two designing contracts aiming to redevelop and regulate the existing water courses. The hydraulic modeling leads to the attainment of two numerical models representing two interconnected discrete networks of segments, also presenting several specific discharging structures such as weirs, pipes, spillways and bottom gates.

The first analyzing numerical model consists of 214 sections and 215 joints for the Morilor and Zadarlac canals, together with two sections from the Tiganca canal. The canals' parts were meshed by a sequence of discrete elements connected to each other and endowed with 23 water discharging structures - immersed plane gates, spillways, free flow and pressured pipes – that influence the water level at each time step. The second model represents the Tiganca canal from its starting point to the junction with the Morilor canal. The water canal was similarly meshed by a sequence of 106 discrete elements connected to each other and endowed with 9 water discharging structures. For each analyzed flow regime the second mentioned model (Tiganca canal) is first operated, and than the obtained variation of the water discharge at the canal's end - joint no.89 - is considered as input data in the joint no.199 of the first model (Morilor - Zadarlac canals) in order to complete the numerical simulation.

The paper presents the numerical simulation procedure for the water flow in the redeveloped regime, the criteria and boundary conditions employed for setting, the discharges transiting way, the velocity and level changing.

T1.10 Considerations about water discharge, from surface drainage systems

Wehry A., Modra C.

"Politehnica" University of Timisoara, Hydrotechnical Faculty, Romania

After the inundation which took place in Timis County, April 2005, and working with IPROTIM into an experts group, regarding the 18 flooded pumping stations, I changed some coefficients to compute the water discharge, from surface drainage systems.

The result was to be necessary to double the installed water discharge at this 18 pumping stations; Cruceni, Otelec, Rudna I-II, Mlaca, Bica, Temesit, Surgani I-IV, Sant in cot, Gai, Carastau, Capat, Racovita, Dicsani, Chizatau, Lugoj.

The technical solution was to use submersible electro pumps, installed into aspiration basin and drive back with pipeline in emissary, rounding the pumping station building, or drive back in parallel binding with the existent pipeline, of pumping station.

The working execution began with pumping stations: Cruceni, Otelec, Rudna and Mlaca in December 2005.

The beneficiary of this working is ANIF-territorial branch, "Timis - Mures inferior" from Timisoara.

Like this, the standard formula in Romania for specific water discharge in surface drainage system is:

$$q = 2.8 \frac{\sigma^P K_1}{t K_2} < \text{l/s/ha} >$$

and the water discharge is

$$Q = q S < \text{l/s} >$$

For Teba -Timisat surface drainage system we have $Q = 4 S^{7/8} < \text{l/s} >$, where $S < \text{ha} >$ is the collecting surface drainage system, for Aranca surface drainage system we have $Q = 5.8 S^{4.7/5.7}$ and the generally equation for the west part of Romania surface drainage system is $Q = 8 S^{3/4}$.

The inundation cause in Timis County, in April 2005, was the superposition Bega River high flood, with Timis river high flood, and over discharging more, in Timis River, with the double binding system Timis - Bega.

To prevent in the future these disasters, it was design a modern pumping station at Cruceni by IPROTIM in December 2005. I suggest to be realized more flat accumulations belong the Timis River, to cut the high flood top from hydrographer . I also suggest to be realized more water gate into canals systems, for water hold back.

T1.11 Actual and perspective methods for diminuation the maximum peak of discharge on the small basins

Achim C., David I., Girbaciuc A., Titan G.

"Politehnica" University of Timisoara, Hydrotechnical Faculty, Romania

Directly evacuation of the meteorological water in the sewerage system lead at the maximum water discharge. Although this water discharge has a very short duration it may overcharge the system and lead local flood. A classic method to minimize this problem is to oversize the sewerage system which is very expensive.

Until the present, from water management point of view, in some areas it is wanted to evacuate quickly the precipitation water from localities and the circulation areas.

The exceed waters from rich rains threat large areas by flooding with grave consequences from economically and environmental point of view. Because of the high quantity of precipitation the floods which appear generated problems with a lot of time ago. From this reason in this period we have to find some solution to prevent and control these floods. These problems can be resolved by modeling of the superficial runoff and infiltration hydrograph into underground.

From a lot of technical possibilities, which usually consist in the retention system which is insert in the system, through is realized the attenuation of the runoff wave, this paper is concentrated by a new system which combine the retention with infiltration. This idea is new because combine the attenuation function of a retention basins by the absolute decreasing of the runoff infiltration in underground.

The most important systems from this type are: infiltration depression, depression-gutter, transport depression and ditch, basins with bad filter. This paper analyzed in detail the retention system through infiltration in underground and analyzing the combine attenuation effect above runoff hydrograph. It is important to model the effect of these systems and must take in consideration by complexity of hydraulic function that is determinate by simultaneous accumulation and infiltration in the system.

It is established a quantitative evaluation method of attenuation effect by taking into account the runoff hydrograph like input element in the system, also the complex process of simultaneous accumulation and infiltration which is influence by shape and dimension of the basin, by the type of infiltration and also by the aquifer characteristics parameters where it is infiltrated.

In this paper is analyzed the most representative combinative systems, accumulations and infiltration systems, resulting a good element for the young engineers for conception, design and analyzing of this attenuation systems of maximum runoff flow on the small basins.

T1.12 Flood forecasting system in Turkey

Keskin F.

*State Hydraulic Works, Investigation and Planning Department,
Flood Forecasting Division, Ankara, Turkey*

As a result of extreme rain on May 21, 1998, the Western Black Sea Region of Turkey was affected by a devastating flood which appears to have been a one in a thousand year occurrence in some locations. During the same week, severe floods also occurred in the other parts of the country like Izmir, Aydin, Manisa, Denizli, Hatay, Trabzon and Rize.

The flood in late May, 1998 in West Black Sea Region and also in other regions exposed both the strengths and weakness of the present disaster response system in Turkey. The response of governmental organizations is not enough. But the great stress which this extreme event placed on the response system also exposed gaps and weaknesses, not only in the system for responding to the flood, but also the forecasting, warning and flood management system. The need to modernize the system and increase its capability have been recognized in Turkey in the past, but their solution has been deferred at significant cost by budget constraints and blocked by institutional fragmentation and other barriers. By the help of the World Bank fund, Turkey implement a project for the disaster (Earthquake, Flood) mitigation and forecasting system named as TEFER (Turkey Emergency Flood and Earthquake Recovery). Within the scope of the TEFER, several governmental and non-governmental organizations implement in cooperation the meteorological and hydrological station network, the processing of the collected data, the meteorological and hydrological modeling works, and flood forecasting.

The complete system that was established through this project is consisting of 3 Meteorological Doppler Radars and 206 automatic real-time meteorological stations and 129 real-time hydrological stations. Data transfer from the RADAR, Meteorological and Hydrological stations is carried out headquarters by means of VSAT (Very Small Aperture Terminal) satellite communication technology using TURKSAT 1C Satellite. The flood forecasting system takes real time monitoring data of the regional meteorology and the catchment status, and produces forecasts of the flood state of the catchment. The forecasting system is based on MIKE FLOODWATCH and SCOUT.

MIKE FLOODWATCH is a GIS based decision support system for flood management, with MIKE 11 at its core. SCOUT integrates real time numerical weather prediction, radar and raingauge data to produce rainfall forecasts. The system combines the compilation of real time data with rainfall and flood forecasting and presentations of the information and results.

The System is operational now. But after the completion of the project by the companies, the governmental organizations experienced big problems because of the lack of experience and know-how about the system. Several problems were encountered about the communication system, stations and modeling.

The aim of this paper is to explain the flood forecasting system in Turkey and the encountered problems during the operation of the system.

T1.13 The floods on Danube river in period March - May 2006, Dolj area

Stoica S.B.

Jiu Water Branch, Romania

In this paper is presented a hydrological characterization for Jiu catchment area during March - May, 2006. There are analyzed the causes of the flooding and the particular floods occurred, which in the catchment area overlapped the high soil humidity degree (almost the saturation degree). It has occurred in a period with positive temperatures, and precipitation with high intensity leading to snow melting, being registered high flows at the monitoring point, at the entrance in Romania.

The Danube level reached the maximum levels registered in 1895 producing overflows causing damages by flooding of an important number of localities from Dolj county and arable lands, imposing measures as people, goods and domestic animals evacuation.

It were analyzed the flood effects in the affected area, regarding the houses flooded, partial or totally destroyed, the affected institutions, the arable surfaces flooded, and the number of persons affected.

T.14 Flood analysis techniques applied to the Var catchment

*** Janssen J., Podaru C.A., Riti A.**

** University of Nice - Sophia Antipolis, France*

In this paper we are presenting a flood analysis techniques to the Var Catchment.

During the flood of 1994, a peak discharge of 3500 m³/s occurred. This is more than three times the normal discharge. This flood destroyed two weirs and leads to large flooding areas and several damages on the infrastructure.

In the day preceding the mentioned flood event (period including 3rd and 4th November), continuous precipitations events were not characterized by high intensities, however, a large part of the catchment's are was concerned. This is situation leads to a critical situation in terms of saturation conditions of the soil. Consequently, the high intensities of the precipitations of the 5th November leads to an important flood event corresponding to the recorded maximal peak flow discharge. Great economic losing caused by flooding is cca 23*10⁶ Euros.

Integrated surface water/groundwater modelling has become a standard in hydrology. Modelling results can provide essential information in water resource assessment and management, in the water supply and allocation, and in the protection of groundwater resources taking into account the effects of surface water interaction with groundwater.

We use MIKE SHE for modelling the discharge

MIKE SHE is an integrated hydrological modelling system which covers the entire land phase of the hydrological cycle. Thus MIKE SHE is not just a three-dimensional, numerical groundwater model, but also includes numerical models for overland flow, unsaturated flow, solute transport, geochemistry, agricultural practice, evapotranspiration.

As we run the model and compare the results with the measured results of the flood event of November 1994.

T1.15 The August 2002 flood in the North West of Lower Austria – a starting point for a new flood forecasting system

*** Krammer Ch., Krammer C.**

** Amt der Niederoesterreichischen Landesregierung, Abteilung Hydrologie,
St. Poelten, Austria*

In August 2002 the population of the north western part of Lower Austria, especially the Kamp Valley, experienced the largest flood which had ever been reported.

The return period was finally estimated between 500 and 2000 years. There were two big waves, and the second fell together with the big Danube flood (which reached a peak of appr. 11300 m³/s at the gauging station of Kienstock in Lower Austria, with a return period of approximately 100 years). These flood events were caused by excessive rainfall which covered wide areas in north eastern Lower Austria and reached over 200 mm in two days, during the whole period of one week partly over 300 mm.

After the flood, not only a general reconstruction of damaged buildings etc. started, but also several measures for a better future flood protection.

These include the regulation of several reaches of the Kamp to a higher level of discharge, and the installation of a flood forecasting system. It should be mentioned that design values for floods had to be reconsidered and were partly raised in comparison to past times.

The behavior of flood waves along the Kamp River can be influenced by a chain of three large artificial basins which were constructed for energy production. Collaboration between the Energy Producer (EVN) and the Administration of Lower Austria has been intensified, and they share the costs for the new flood forecasting system for the catchment of the Kamp River.

This system is based on observation of 6 gauging stations along the river and tributaries, data of water level and outflow of the three big basins, and several automatic raingauges in the catchment. Data of the planned scenario of manipulation of the basin discharges for the next hours are sent to the hydrographic service as well, all data with a renewal interval of 15 minutes. Since the size of the whole catchment is only around 1900 km², there is also an hourly meteorological forecast with a 1x1km grid cell resolution used for the prediction model. The automatically running model gives predictions up to 48 hours.

A very similar model has been developed for the Danube in Austria, in collaboration between Upper Austria and Lower Austria.

T1.16 Tsunami - Induced coastal flooding and hydrodynamic impacts on physical infrastructure in Thailand and Indonesia

Nistor I., Saatcioglu M.

University of Ottawa, Department of Civil Engineering, Canada

The earthquake and resulting tsunami that hit coastal areas of the Indian Ocean on December 26, 2004 was the most devastating natural disaster ever recorded in the history of the humankind in term of loss of human lives and economic losses. The quake was the second strongest ever recorded since 1900, with a Richter magnitude of 9.3. The epicenter was 155 km west of the Indonesian island of Sumatra. The earthquake resulted from the rupturing of the subduction zone between the India plate and the overriding Burma microplate with a vertical uplift of 7.0 to 14 m at the ocean floor. This created a massive tsunami with wave run-ups reaching up to 45 meters. The casualties from the disaster were in excess of 280,000. The tsunami affected Indonesia, Sri Lanka, India, Thailand, Maldives, Malaysia, Somalia, Tanzania and Kenya, as well as other countries around the Indian Ocean.

The authors of the current paper conducted a reconnaissance visit to Thailand (Phuket and Khao Lak) and Indonesia (Banda Aaceh), immediately following the tsunami, in January 2005, together with two other professors from the University of Ottawa and McMaster University. Their findings are presented in the current paper in terms of action of hydrodynamic forces acting on buildings, bridges, coastal structures and other physical infrastructure. A large number of coastal structures were severely affected and/or destroyed. The paper also presents the results of the coastal flooding measurements as well as results of the numerical analysis of the coastal flooding induced by the tsunami. The authors also conducted an analysis of the hydrodynamic impact of the tsunami waves on the structures located in the low-lying areas. It was observed that non-engineered reinforced concrete structures, low-rise timber frames and unreinforced masonry buildings suffered extensive damage due to hydrodynamic pressures generated by tsunami and impact forces induced by floating debris. The engineering significance of the disaster is presented in the current paper, with observations made during the reconnaissance visit. The authors revisited the affected regions in Thailand again in November 2005 with the purpose of analyzing some of the affected regions and assisting a group of Thai engineers with the reconstruction efforts.

T1.17 Floods management in Romania in 2005

Mihailovici M., Gabor O., Radasu S., Asman I.

National Administration "Apele Romane", Romania

The presentation begins with an explicit scheme of informational flow in case of disaster and the inter-institutional cooperation for specific floods management.

The vulnerability degree of Romanian counties in 1992 - 2004 from damages point of view is presented on a country map on four categories (very high, high, medium and low) together with maximum flows on Romanian territory (the repartition of water quantities on basins catchments). A comprehensive history of flooding periods have been developed making large description of first flooding period in Banat region (April 2005) with evacuated localities, in Lower Olt hydrographic basin and Arges - Vedea (June 8 - 18, 2005), on Trotus Valley underlying the zone with massive deforestation which coincide with the peak forming zone (maximum registered precipitation, over 200 l/sqm), in Ialomita and Arges - Vedea hydrographic basins (September 17 - 29, 2005) and the manner of peak flow mitigation upstream of Bucharest.

After massive flooding events the learned lessons are: necessity of a stronger cooperation between all "actors" in flood defence, the need of different disaster scenarios, flood risk mapping, use of railroads and roads as second flood defence line, more specific bilateral agreements between countries and common projects; new law for small reservoirs (especially for fish - ponds)/ Governmental Decision 138/2005, coordination of all hydraulic infrastructures at river basin level, estimation of new importance class of hydraulic structures, coincidence of bad events in water management, necessity of an integrated approach at river basin level, a new communication system for different stakeholders, a modern monitoring system (DESWAT, different local projects), flooding risk maps, re-evaluation of transit capacity between dikes or polders for establishing the real capacity.

T1.18 Great floods in Romania in 2005 – Lessons on preparedness and prevention role in flood control

*** Stanescu V.A., Amaftiesei R., Drobot R.**

** Technical University of Civil Engineering Bucharest, Romania*

During 2005 seven events of very large floods occurred in Romania. First, the magnitude of the 2005 floods as compared with the historical ones occurred in Romania is presented. Then, the meteorological conditions concerning the rainfall regime during 2005 as well as the triggering intensive rainfalls are considered. Their long duration along seven months with very small interruption periods, the flood damages (about 1.5 billion Euro) shows the greatness and aggressiveness of the floods in 2005. More than that, 76 human lives have been lost.

For the months with remarkable floods the map of basins subject to flood formation and time period when the peak discharges occurred are given. The largest floods of the year 2005 were in the Banat region (especially Timis - Bega River Basins) and the Siret river Basin. They are described in more detail starting with the generating rainfall (isohyets maps and time distribution). The flood wave hydrograph are presented in the main points of confluences of the tributaries with the main river course. To analyze and make a comparison with the recorded floods in the past, the flood shape hydrographs of the 2005 floods and the historical ones are centered at their peaks and the probability that is assigned to the recorded peak discharges is highlighted. On many rivers the floods that produced high inundation have a frequency of the peak discharges that ranged between 1/100 years and 1/10 years.

Considering the damages and the losses of lives as well as the manner in which the action for flood control have been conducted, the non-structural and structural measures aiming to improve the degree of preparedness, the prevention and operational intervention are highlighted. Starting from the principle "more space for rivers" proposals for building non-permanent storages or "fusible dikes" on the tributaries and enlarging the distance between dikes and river bank are made. Compartmentalizing the embankments and building ring-shaped embankments around the localities are also foreseen. Among the non-structural measures the role of flood forecast, referred not only to the maximum peaks but equally to the volume and the shape of flood wave and the enhancement of the systems of dissemination, alarm and decision making for triggering actions is highlighted. Finally, the use of hydrologic / hydraulic models for assessing the multiple scenarios of flood formation and routing, considering also embankment and dam failures is to be considered.

T1.19 Is 2005 considered to be as an exceptional year regarding flood occurrence in Romania?

Anghel E., Frimescu L., Simota M.

National Institute of Hydrology and Water Management, Bucuresti, Romania

The year 2005 was characterized by the intensification of flood occurrence phenomenon. Both controlled river basins and also uncontrolled areas such as torrents and small basins were affected by intense floods, beginning with the second decade of February. The most important floods, causing casualties and important damage, occurred during April – September.

Intensive floods were caused by high rain quantities, during a few days (150-300 mm in 48-72 hours) or combined high precipitation with snowmelt (in April on Banat County) or rain with a high torrential character in a short time with flash floods effects (for example: 220 mm / 3 hours were recorded at Biruinta, located in Dobrogea).

In April violent floods were occurred in Banat County and the most important aspect is that a large territory was flooded, the phenomenon lasted a long time and the water withdrew very slowly. For example, the water volume recorded at Sag gauging station on the Timis River was three times, respectively four times bigger than the previous exceptional floods from 2000 and 1966 and this huge volume broke the dam in the Crai Nou area, released 320 billion m³ of water and formed the so called “Sea of Banat”.

In July, historical floods occurred on rivers located in the Siret basin (the lower course of the Bistrita, Trotus, Putna and Rm.Sarat rivers).

Many river basins were affected by floods several times in the same month or during the whole period (the Tur, Crisul Alb, Bega, Timis, Barzava, Jiu, Olt, Vedea, Arges, Prahova, Prut rivers)

The previous floods from 1970, 1972, 1975 and 1991, although exceeded the ones from 2005, occurred on smaller areas.

The maximum discharges recorded in 2005 on some rivers (Barzava, Prahova, Siret, Trotus, Arges, Putna, Rm.Sarat, Prut), were the biggest ones in the annual maximum discharge range.

Although in the last 40 - 50 years floods occurred on the majority of Romanian rivers, the ones registered in 2005 were special because the flooding phenomenon had never such a long duration (from April to September) in the last 100 years. Such long lasting phenomena occurred in the 19th Century (in 1831 the precipitation lasted from May to September and in 1897 from April to August).

In conclusion, 2005 is an exceptional year, considering the amplitude, extension and recurrence of the flood phenomenon.

T1.20 Floods prevention in upper Tisa river basin

Stoica F.S., Sofronie C.

Somes - Tisa Water Branch, Romania

The Tisa River Basin (TRB) is located in the geographical centre of Europe and crosses the new boundaries of the European Union. The streams and rivers feeding into the Tisa originate in the Carpathian Mountains in the territories of Romania, Slovakia and Ukraine. It flows through the Pannonian flood plain of eastern Hungary and then south into Serbia and Montenegro where it joins the Danube.

The Tisa catchment area is characterized by high diversity of landscapes, fauna and flora, with a significant number of nature protected areas and national parks. The region has outstanding natural ecological values such as regionally (and perhaps globally) unique freshwater wetland ecosystems of 167 larger oxbow-lakes and the total of more than 300 riparian wetlands.

The largest part of the TRB lies in Romania (72636 km²). The basin area is located in the western, central and north-western parts of the country. It has 6095024 inhabitants and represents about a third of both the total land surface and population of Romania.

Historically, the main structural changes of the Tisa River happened in the 19th and early 20th centuries. During this period, the former huge floodplain was drained and dikes were constructed, with about 84 per cent loss of the floodplain. The Tisa was also strongly regulated (32 per cent of the river length).

Flooding is a natural disaster crucial for riverine ecosystems, but it is also a significant threat to communities settled in the floodplain.

The rainfall in the Carpathian Mountains is substantial and sudden rains, combined with extensive drainage, floodplain deforestation and river canalization reduce the ability of the catchment to attenuate the flood wave.

The paper presents the most important floods, occurred in Somes-Tisa hydrographical basin during November 1998 and March 2001 in upper Tisa River Basin. In 2001, through National Administration of the Romanian Water was started an important project, with title Floods Prevention in upper Tisa River Basin, which consisting in 38 hydrometric station, 23 alarming stations, Doppler radar and a software package for simulation flows (Mike 11). Also in the paper will be presented the most important results of this project, during 2001 – 2005, especially the Mike 11 simulations flows on Tisa river, and his important tributaries from Romanian area of Tisa River Basin.

Through the accomplishment of this project we will get the following advantages:

- The increasing of the flood wave anticipation degree on the territory of Romania from 1 - 2 hours as it is at present, to 24 - 36 hours. At the same time, the flood's anticipation time on the territory of Hungary will also be increased from 24 - 36 hours, as it is at present, to 60 - 72 hours (through radar surveillance).
- The increasing of the actual knowing frequency of level variation of the Tisa River and its tributaries from once in 2 - 4 hours, as it is at present, to once in 15 - 30 minutes, which means an 8 - 16 times increasing 15 - 30 minutes, which means an 8 - 16 times increasing (through the automatic hydro – meteorological stations network).
- The increasing of the available time for interventions and protection actions with about 24 - 36 hours, for the population living in the areas which might be affected by the floods or dangerous meteorological phenomena (the alarming stations network).

Establishing the flood risk zones for different degrees of probability of the flood waves (GIS), practically non - existent at the moment.

T1.21 The rainfalls and floods produced in the hydrographic area of Siret in the Year 2005

Dascalita D.

Siret Water Branch, Romania

The first 6 months of the year 2005 were characterized by abundant rainfalls, that re-do the humidity deficit from the ground, and in some areas created an excess.

As a result the abundant rainfalls felt in the period 10-12 July, especially in the middle and inferior hydrographic basin of the Bistrita River, in the hydrographic basin of Trotus and in the Vrancea area produced floods with maximal flows that reached probabilities of exceeding of 0.5 - 2%, that produced floods on large areas, with human casualties and material damages.

On the inferior stream of the Siret River, in the downstream of accumulation Calimanesti, the increased flows that came from the Trotus River, cumulated with the ones from the Bistrita River, transited through pools existed, got to the values of over 4500 mc/s.

The exceptionally flows destroyed portions of the dams from the Siret River and produced floods.

In this essay is presented the way of formation, propagation, monitoring and administration of the floods with historical character.

T1.22 Simulation procedure of exceptional water flow through a weir structure on Mures river

Lazar Gh., Ion M., Nicoara S.V., Ghitescu A., Busan A.
"Politehnica" University of Timisoara, Hydrotechnical Faculty, Romania

The Mintia small overflow dam is a concrete structure presenting seven spillway gaps of about 16.00m each, controlled by tainter beam - flap gates. The water development also presents an energy dissipating basin with flexible rear apron and regulated upstream and downstream sections of the Mures River water course.

In the immediate downstream section from the Mintia dam, the Mures River has a minor water course of about 150 m wideness that gets narrower to about 80 m at a distance of 150 m, while the major water course continues at a width of about 148 m. The reference water level in the major water course is at 179.00 mSL.

The estimation of the existing situation regarding the dam downstream river bed processes (banks erosions, bad clogging and scouring, stable or unstable water course, flowing regime) requested a specific procedure for the numerical modeling of the unsteady water flow in order to determine the velocity and level variation. Based on these, specific measures can be established for water course redeveloping and so controlling the bed processes.

The free surface unsteady water flow in a river course endowed with an overflow structure can be modeled by the help of the Saint-Venant differential equations, to which the initial and boundary conditions need to be added. The numerical solving of the equations describing the water flow over the Mintia dam was performed by using the DUFLOW package of programs which employs the finite differential method.

The considered numerical modeling is based on the in situ observations, meaning the bed level measurements performed upstream and downstream of the structure in 1972 and 2005. The 1D model was developed for a section of about 500m length comprising the overflow dam and the energy dissipater downstream area where rearranging works are required in order to reduce bed processes. The entire route was meshed by a net of discrete elements horizontally developed on seven lines (meaning the seven spillway gaps) connected to each other and endowed with discharging structures controlled with gates that determine the water level at different time steps.

In order to set the numerical model the followings were considered: a water discharge of 230 m³/s, a hydrodynamic slope at medium levels of 0.90‰, the Chezy roughness ratio of about 0.030 - 0.035 and the usual retention water level in the upstream reservoir at 179.50 mSL.

The paper presents the numerical simulation procedure for the water flow in the developed regime, the criteria and boundary conditions employed for setting.

T1.23 Ring water supply network behaving in case of floods

Carabet A., Staniloiu C., Florescu C., Girbaciuc A.

"Politehnica" University of Timisoara, Hydrotechnical Faculty, Romania

In this paper is analyzed the function in normal conditions of a ring water supply network supplied from two sources: underground water and surface water. The underground water is collect through wells from 100 m deep, and the surface water is collect from a river.

The treat water is stored in reservoirs which are placed in purification plant and from these reservoirs the water is pumped in the water supply network. In the distribution system don't exist other reservoirs.

After treatment the water is disinfected with chlorine before pumping in the distribution system. The disinfection is done to prevent the increasing of the bacterial flora there where the velocities on pipe line are smaller. The calculus program EPANET helps us to establish the chlorine concentration from treat water in such kind to not exceed the maximum admissible concentration of the free residual chlorine at the beginning of the distribution network (0,50 mg/l) and also to the end of the distribution network (0.25 mg/l), according with Law no. 458/2002 - Potable water quality.

The water distribution system is composed by 19 rings, and the total length of the pipes is 29 000 m. The diameters of the pipe which are used are establish between 100 and 400 mm. The pipes between the underground purification plant and the distribution network have a diameter by 500 mm and a length by 500 m. The pipes between the surface purification plant and the distribution network have a diameter by 600 mm and a length by 100 m. The material of the pipes is steel. The total discharge of treat water is 400 l/s (150 l/s from the underground source and 250 l/s from the surface source). The characteristically discharges are: average daily discharge ($Q_{zimed} = 340$ l/s), maximum daily discharge ($Q_{zimax} = 400$ l/s) and the maximum hour discharge ($Q_{oramax} = 470$ l/s). The junction's water consumptions in maximum consumption hour are between 4.1 l/s and 41.4 l/s.

In a normal function of the water supply system the pressures are assured at 20 mH₂O and also the discharges and the minimum concentration of residual chlorine which is 0.1 mg/l are also assured in the entire network junctions.

In case of high foods on the river and inundation of the purification plant will appear some damages and also out of work for a period of time. It is analyzed the possibility to assure the discharges and the pressures to the people from one source. And also are established the restrictions which must be imposed to the peoples until the rehabilitation of the water supply network.

T1.24 The impact of winter phenomena on navigation across the Danube river between Bazias and Corabia

Damsescu A.

Master Office Zone Drobeta Turnu Severin, Romania

The course of Danube on the sector between Bazias and Corabia there is essential part's Danube of middle, including the sector to the Narrow path the Gates of Iron I and the part south-pontic of the river.

The Hydrographic Basin of Danube in this zone there is good developed because of the breaking up increased to the relief (The Carpathian Mountains, The Getic Plateau and The Roumain Plain).

The first tries to know the hydrological regim of Danube between Bazias and Corabia there was tied navigation beginning with the middle of the century 18th at Orsova and one year later at Drencova when there was effected the first measurements concerning to the level of water.

In free regim the flow's Danube on the sector excepting two accumulations (The Gates of Iron I and The Gates of Iron II) the levels are determined by the flows of water. In the whole sector it feels the permanent influence two hydro-electric plants.

A different influence have the phenomenons of winter produced on Danube in most years, phenomenons which have negative effects concerning navigation: the deformation of the bodies of ships, to the plant of powered, to the plant of steer, the security of crew and goods and delays in the baffle of the agreements to carry. At this negatives effects id adds the periods of drought, when the flow of Danube lowers under 1500m³/s (ex. 1380 m³/s in winter of the year 2003) determining the appearance to the obstacles in the navigable river, having as result just break of navigation.

In the present study we propose us to analyse the process of frost/thaw of Danube in critics years, for establish the period of the bridge froze (when the navigation it was paralysed), the moment beginning to the process of the thaw and the establish with exactness to the lots parking for ships in winter (the entrance to the ships in the Places of Hibernare - safes places in point of view's navigation).

The result of this dates we help us to the avoidance of accidents navigation, accidents which have as a result losts humans lives, the make a many materials damages, but the impact concerning to the surroundigs marin there is huge.

T1.25 Flood risk simulation in the Timis - Bega river basin, April 2005

Stanciu P., Amaftiesei R., Corbus C.

National Institute of Hydrology and Water Management, Bucuresti, Romania

The simulation of the flood, which occurred in April 2005 in the Timis - Bega River Basin, was made on the sector between the Lugoj hydrometric station and the border, using the CONSUL-UNDAP software package, which is available within NIHWM.

The CONSUL software allows the simulation of runoff, both of floods and also low and medium runoff, in different sections of the river, which are important for the defense of certain socio-economic objectives or for the coordinated management of reservoirs.

The UNDAP software uses a mathematical model which is based on the digital integration of the equation system with Saint - Venant partial derivatives, which describes the non-permanent movement of free level water.

The input data for the UNDAP software is the discharge hydrographs in entry sections, supplied by the CONSUL software; the rating curve in a unique exit section; geometrical elements of the riverbed (gauge height, width and distances between profiles on the flood channel and low-flow channel) and the irregularities in used transversal profiles.

The UNDAP hydraulic model was calibrated based on hydrological observations from the 2000 flood and riverbed geometrical elements (including hydrotechnical works), raised in 1994.

For the propagation of the flood in the sector downstream Sag hydrometric station, two scenarios were considered. The first simulated scenario corresponds to the real situation when the dyke from the Crai Nou locality collapsed, and through the created gap, the right side of the Timis River was flooded. The second considered scenario was a controlled simulation of a gap made in the dyke.

Based on the obtained results after the simulation of the flood from April 2005 and the adopted scenarios, this paper presents a series of structural measures for flood risk reduction in the Timis - Bega River Basin.

T1.26 Feasible approach of the high waters management in the Timis river low basin

Ion M., Lazar Gh., Nicoara S.V., Girbaciuc C.

"Politehnica" University of Timisoara, Hydrotechnical Faculty, Romania

The Timis River Basin lays in the south-west area of Romania. It springs in the Semenic Mountains at an altitude of 1135 mSL, and after a course of 430 km (from which 241,2 km on Romanian territory) flows into the Danube, in the vicinity of Pancevo Town from Serbia.

Presenting a receiving basin on the Romanian territory of about 5248 km², Timis is the most important river that crosses the low plain of Banat Province. The river course mean altitude is of 390 m and the mean slope across our country is of 0.43%, while right before the border the slope is below 0.02%. As a consequence of the crossed areas morphology (especially on the last part) and of the large discharges (exceeding 1000 m³/s in the high water seasons), a series of water developments where accomplished after the year of 1700 (hydrotechnical plants, derivation canals, dikes, polders). These developments make up the so called Timis - Bega System that aims to eliminate the risk of high floods. Despite that, only along the last century, astonishing high waters determined dike breaches and consequently catastrophic floods as at Lugoj and Cebza (1912), at Graniceri (2000) or as at Crai Nou (two breaches in the right bank dike, 2005, that produced the flood of about 25000 ha when spilling a water volume of about 300-350 million m³). Talking about this last event, the structural components of the various affected water developments where restored at the prior existing parameters by a significant financial, technical and human endeavor.

In these conditions, it arises naturally the question about what measures need to be enterprise so that new coming high waters, of at least the same parameters with the last one, not to produce further damages.

The solutions already advanced by the specialists regard mainly the dikes overtopping, their movement towards course outsides, localities protection by damming in, and development of new polders.

Starting by analyzing the causes that determined the last disaster, the paper proposes conceptual solutions that can be considered in establishing the strategy for avoiding future reiteration of such events. There are taken into account all the intervention ways (structural or of discharges spread management in the receiving basins of Timis and Bega rivers) wishing to find the most efficient solution, both from the financial and safety point of views.

**T1.27 An analysis of the damage structure, the main sources and areas under flood risks in Timis - Bega hydrographic basin.
The main steps to be taken to flood mitigation**

Neicu S.

National Institute of Hydrology and Water Management, Bucuresti, Romania

The paper contains an analysis of the damage values, their time and space distribution from 1997 till 2001, the causes that engendered them, as well as their distribution by population, agriculture, and infrastructure, social and economic projects. It sets also forth the main risk sources of the flood events in Timis - Bega hydrographic basin, by laying the emphasis on matters like: the small, already existing water storages and the peril they are standing for, the gravel pits, the present engineering sites and the way their maintenance is being ensured, as well as the state and condition of the river beds under water flow.

T1.28 Alternative solution at management flood in April - May 2005 in Barzava stream

Badaluta - Minda C., Cretu Gh.

"Politehnica" University of Timisoara, Hydrotechnical Faculty, Romania

In the paper is characterized the Banat catchment area from April–May 2005 by hydrological and pluvial point of view. There are analyzed the causes of the flooding and the particular floods occurred, which in the catchment area overlapped the high soil humidity degree (almost the saturation degree).

Result of heavy precipitation dropped in the catchment area Barzava streams in period 14.04 - 16.04.2005, the precipitations who were registrated the quantity between 35.4 l/mp at Gauging Station Semenic and 53.5 l/mp Pluvial Station Valiug, was formed a flood wave on the Barzava stream who has produced reservoir fill Gozna and Secu also.

It was overposed in the catchment area over high of humidity degree of the soil (almost the saturation degree), a period with positive temperatures, and precipitation with high intensity leading to the snow melting. There is presented a diagnosis of the period before and during floods, taking into consideration the following: prognosis, mainly the warning, the exploitation way of the tree reservoirs placed on the Barzava stream.

T1.29 Aspects regarding the crisis management during the flood period in Banat province, April 14th - July 5th, 2005

Ion M., Nicoara S.V.

"Politehnica" University of Timisoara, Hydrotechnical Faculty, Romania

The Banat hydrographic area comprises the Timis and Caras-Severin Counties, covering a total area of 18320 km². The hydrographic basins that make up this area are those of the Aranca, Timis, Bega, Caras, Nera, Moravita, Cerna, Barzava and partially Danube rivers.

The drying up of some swamps, the cover of industrial and drinking water requirement, the flood protection and the ensure of navigation on Bega River downstream from Timisoara determined, from almost 250 years, the accomplishment in the area of several remarkable hydrotechnical works, such as: the Timis - Bega interconnection system, the water power station from Timisoara Timisoara, the Bega Navigation Channel that includes the two hydrotechnical joints endowed with sluices at SanMihai and SanMartin; the complete dike protection (1085 km) of the plain areas along water courses; permanent reservoirs with water retaining dams in the upper water courses; permanent and temporary reservoirs in the plain areas; polders; irrigation and drainage systems.

Unfortunately, due to some special hydrological and meteorological "harshly" conditions, severe floods are determined from time to time by dikes local breaching in the plain areas. In the year of 2005, the meteorological warnings starting from the 14th of April show the first signal of the disaster following to be produced because of developing of two breaches in the right bank dike of Timis River at about 10 km upstream of Serbian border. The consequence was the flood of an area of about 25000 ha framed by Timis and Bega Rivers between the 20th and 23rd of April. It was estimated that a water volume of 300 – 350 million cubic meters penetrated through the formed gaps.

It was a crisis situation because no one was expected that localities, roads and railways, farm lands and drainage systems pumping stations to be underwater for time periods that in some places overpass even three months.

The paper presents some aspects regarding the measures followed in order to manage the disaster (the way of gathering and using the information regarding the phenomenon evolution, decision alternatives and their fulfillment). Several considered actions are thus revealed: the way in which the two gaps were temporarily closed, the measures considered for water evacuation from the flooded area, the ensure of fresh water in the damaged localities. There are also mentioned the Romanian authorities concerns and the remarkable support offered by different European organizations and agencies.

T1.30 The rehabilitation and modernization of pumping station from land reclamation arrangements (drainage - surface drainage) affected by floodings from April - May 2005

*** Man T.E., Kovacs I., Bedreag V., Halbac - Cotoara R., Lauer I.**

** "Politehnica" University of Timisoara, Hydrotechnical Faculty, Romania*

The paper brings forward synthetically the catastrophic freshets from April - May 2005 and their destructive effect about surface-drainage arrangements, from system of surface-drainage find out at the patrimony Timis - Mures Inferiour Territorial Branch, respectively about afferent pumping stations.

The freshets from April - May 2005 have proven that the fitting-out pumping stations techniques for surface - drainage from zone Teba - Timisat don't complies as constructive solution, through pumping stations existent, with necessity of fast evacuation at condition of out rush, waters from law premises embanked.

Departing from pumping stations technical-functional features, respectively current pumps from their endowment, has been result the necessity of their rehabilitation and modernization.

Are bring forward the engineering solutions, proposed by S.C. ISPIF S.A. Bucharest, of fitting-out with submersible pumps supplementation and their technical-functional features for 4 pumping stations (Cruceni, Rudna, Otelec, Mlaca) which entered at the governmental program of finances for the year 2005, from a total of 18 pumping stations which follow this process.

Initially all these pumping gear were equipped with centrifugal pumps, and abaft their examination of S. C. IPROTIM S. A. Timisoara, has been result their fitting-out with supplementary submersible pumps which assures also the supplementation flows pump, thus they will can comply better to a crisis situation generate of next freshet, imposing finding out of engineering solution for the their assemblage at infrastructure.

For each station at part, ANIF Bucuresti provided the supplementation install flows through using 2 supplementary submersible pumps. The paper brings forward also a constructive scheme of pumping station fitting-out with submersible pumps.

This solution is the result of specific surface drainage flow reevaluation and value computation according with his enlargement (solution proposed by Professor Andrei WEHRY).

The paper brings forward and a proposal of improvement operation units in the pumping station through the constructive engines and pumps modification, which to operate and at condition of pumping stations flooded through the their encapsulation.

T1.31 Floods effects monitorized in the Down Plain of Timis

Grozav A., Rogobete Gh., Nemes I.

"Politehnica" University of Timisoara, Hydrotechnical Faculty, Romania

The down plain between the Timis and Bega Channel rivers, from the Serbian boarder (Graniceri - Cruceni - Foieni) to Timisoara represents the lowest section in the west area of the country and it was included in the agrarian lands after the damming works and swamp drying up started in Banat after year 1718 by Austrian administration.

The area is highly unbalanced due to the numerous meanders, old watercourse and river branch of Timis, Timisul Mort, Bega Veche being recrossed by an extremely compact net of draining channels (highly amplified between the years 1970-1980) poorly maintained and partially clogged, especially after the years 1990.

It is highly remarkable that the phreatic waters have quite a high mineralization degree (0.5 - 1.5 g/l) that caused frequently phenomenon of soils alkalization.

The watercourses that recross the down plain of Timis have extremely changeable flows, for example the Timis river declines in summer at 4.5 m³/s to attain in the spring 1200 m³/s (like in the year 1970 floods). Because the raising quotes of the Timis, Barzava and Bega rivers, important raises of the isophreates are registered, with values between 1.1 m and 1.6 m leading to the stagnation of the water on the field surface, causing floods like those in the year 1970, when the flooded area in the Timis County was 170000 ha (24% of his total) and a disparagement of the agrarian production on 77603 ha.

Between the main causes of the 2005 floods we can enumerate:

- Climate changes at global and areal level, with the induce of precipitation with an pouring character and highly unusual, surpassing 100 mm in 24 hours;
- The forest clearing in the high area of the county, where the sources and the affluents of Bega, Timis and Barzava rivers are;
- The insufficiency preoccupation for the maintenance of the surface drainage systems and pumping station.

The area with the highest result following the floods was in the cities Cruceni, Foieni, Ionel and Otelec, and less in the cities of Crai Nou, Rudna, Giulvaz, Ivanda, Sanmartinul Sarbesc, Sanmartinul Maghiar and Dinias.

We can estimate that is important to specify that the soils from the flooded area influenced the period of stagnation of the water layer, 2 - 3 m thick, differentiate, following:

- I. The permeability soil group: typical salins, cambic Chernozem, Eutricambosols, Alluviosols;
- II. The faint permeability soil group: vertics, gleyics, argic, salins, sodics chernozem. They occupy in the area cca. 9350 ha, respective 34 %;
- III. The practical impermeability soil group: Vertosols and Pelosols, Gleysoils, Solonetz.

T1.32 Flood analysis occurred on the Danube river during April - May 2006

*** Serban P., Galie - Serban A., Buta C.**

** National Administration "Apele Romane", Romania*

In the first part of the paper, the causes and the manner of formation for the most important flood occurred on the Danube river during the period of measurements and observations regularly done meaning 1840-2006 are shown.

The paper goes on with the analysis of the loop rating curves and the relationships between the corresponding water levels recorded in the main gouging stations on the Danube River.

Using the relationships, the maximum water level of the flood produced during April - May 2006 on the Danube was computed considering the situation without breaches in the dikes. The water levels calculated are up to 28 cm higher than the measured water levels, at the main gouging stations on the Danube River.

Finally, different ways of floods' formation on the Danube River are shown and a comparison between the floods and April - May 2006 flood is done.

T2 – Hydrological Droughts

T2.1 Considerations on hydraulic design of the settling basins of the water supply intakes for hydropower plants

*** Boeriu P., Khedhayyer A.T.**

** UNESCO - IHE Delft, The Netherlands*

Sediments carried in the water flowing through turbines increase greatly the wear on these machines lowering their performances. Moreover, sediments accumulated in the front of the water supply intakes may produce partial or complete shutdown of the power production facilities and associated extensive economic and investment losses for the project and all dependent downstream installation may appear. At the same time blocking of the valves due to sediment accumulation represents a serious threat for the entire system. Consequently, the correct design and operation of the sediment trapping devices provided at the intake is of great importance.

The paper presents the analysis of the classical approaches for the design of the settling basins compared with mathematical models developed in the last decade for simulation of the sediment transport and sedimentation process. The results obtained by using the 1 - Dimensional and 2 - Dimensional depth integrated model for suspended transport are compared with the results obtained by using advanced 3 - Dimensional models. Special emphasize is given to the hydraulic design of the transition inlet zone and the criteria established to realize the uniform flow at the beginning of the active zone of the settling basin. Due extension is given in the paper to economical considerations ant to the comparison of the results obtained by design of the settling basins based on mathematical models to field measurements.

T2.2 From administrative to watershed management in Uzbekistan: problems of melioration in transition period

*** Yacubov M.A, Nurtayev B.S.**

** Institute of Water Problems, Uzbek Academy of Sciences, Uzbekistan*

Transition from territorial to hydrological method of water management in watersheds is one of an important phase in irrigation reform of Uzbekistan. At the same time in this structure had not allocated enough attention to reclamation of saline and waterlogged land. In Uzbekistan about 54% of irrigated lands have been saline. Agriculture of these lands is not possible without leaching and drainage. Providing of optimal ameliorative regime is one of the main task in basin management and technical support of existed main, inter-farm and on-farm irrigation drainage network in good technical state demands big financial and technical expenses. At present time in condition when users of irrigated water can not full to provide and exploit of hydro-ameliorative system it is necessary assistance of government. Above mentioned problems must be regulated on basis of elaboration and implementation of corresponded documents.

Water saving in all conveyance and distribution networks up to field level is an important measurement in new water management structure. Water use efficiency can be considerably higher. In accordance with assessment of Uzbekistan scientists 37% from 100% (of common losses) are operational losses and the rest of due to technical reasons (infiltration, water breakthrough, evaporation and *etc*). Understandably, that if diminishing of losses by way of new irrigation and drainage methods introduction is expansive and should be considered as a long-term strategic objective, operational wastes reduction can be achieved of course more easy. Operational approaches towards an improvement even by traditional furrow irrigation, in accordance with expert's calculations, may save 1500 - 2000 cu. meter water per ha. There are such operational approaches as: better coordination of hydraulic operation, realization of even discharges, good land - planning, cultivation of space between rows, autumn tilling. These measures are not expansive and put into practice in advanced farms.

But lack of economical stimulus (irrigation water use is free of charge) constrains their implementation. Low price of agricultural production and respectively low payment ability is an serious obstacle on the way of water price introduction. This question also must be considered in standards.

One of the way of irrigated water efficiency increasing is collector-drainage water reuse, which volume is about 21 - 25 billion m³ in Uzbekistan. More than 8.5 billion m³ of these in the Aral Sea Basin can be reused for irrigation (M.Yacubov, 1997). This action could be prevent intake of polluted water in rivers and support an ecological equilibrium of river systems.

T2.3 The impact of the transition period from dry to rainy years over the phreatic quality

Crisan M., * Romvari A.

** Mures Water Branch, Romania*

The ash storage pit establishment is situated in the northern outskirts of Arad locality, between CFR (Romanian Railways) limits and Oradea. The storage pit spreads on 65 hectares and is composed of three successive compartments.

From the hydrogeological point of view the ash storage pit area is situated in the center of the largest hydrostructure of the country: the Mures river alluvial cone which in that particular area has an average depth thickness of 180-190 meters (185m in the Arad area), the water-bearing bed having a predominant harsh granulation (gravel, stone and sand, gravel and sand) representing cca. 60-65% of the total intercepted deposits depth of the development drillings from the area. For depths under 100-110m harsh alluvial deposits are separated by lenticular argil levels facilitating communication between aquifers by the end of layers.

The thermal power plant slag and ash is composed of two distinct fractions:

- a fine fraction (flying ash), from the electric filter and burned gases channels;
- a harsh fraction (slag) constituted of vitrified material, agglomerated in particles that from the grading point of view represent sand and gravel. It comes directly from below the boiler burner.

The hydroisohips map indicates an irregular underground flow in the ash storage pit area and slag with directions of flow towards west, east, north and south signaling the existence of uncontrolled losses from the ash storage pit area towards the surrounding aquifers.

The pollution of the phreatic situated in the ash storage pit area is determined periodically with the help of the 14 interception and 9 control drillings. The normal levels of SO_4 , Cl and Ca are frequently exceeded. Because of these announcements there is a high risk of medium depth aquifer pollution by the end of layers. In order to keep track of the pollution levels it was proposed the drilling of 4-5 drillings around the CET (thermal power plant) for periodical aquifer test purposes.

The time evolution of the phreatic quality and the observed significant changes at the transition period from dry to rainy years are based on a three years time interval monitoring results.

The main objective of human actions is to protect life and health. This is why the objective of this paper is to present the effects of underground water deterioration in order to avoid it. There are examples for each type of toxic.

T2.4 The solutions for the increase hydro technical builds determinate by the low flow prognosis

Talau M.

Jiu Water Branch, Romania

Hydrological prognosis became in the last 30 - 35 years an modern and efficiently way for hydro technical, hydropower and water improvements planning and for reservoirs exploitation in navigation, irrigation, fish work, as other water consumption uses.

For Jiu river basin reservoirs, National Hydrological and Water Management Institution elaborate hydrological prognosis witch are successfully used by Jiu Water Branch in water management.

The most important reservoir from Jiu river basin which water volumes must be well manage for water requirement satisfy from Jiu Valley is Valea de Pesti reservoir from Valea de Pesti River.

The experience had demonstrate that the hydrological prognosis have an important role in reservoirs exploitation in high water level and in dry time (small water), when the water volumes from lake must assure the water necessary for the water consumption in downstream.

In this moment, we can say that because of a well done exploitation hydrometry, of one exploitation rule and especially for hydrological prognosis in the last years, was satisfy water need from Jiu Valley.

From hydrological prognosis point of view we can establish in any moment the exploitation scripts of this reservoir for a better use of accumulate and the across volumes trough barrage.

Valea de Pesti reservoir has a useful volume almost 3.7 mil. cubic meters, the most important thing is water supply in Jiu Valley and less flood protection.

Another poor in water resources river sector in dry time is Jiu river between Rovinari and Craiova sector.

On this river sector there are the great water consumptions, the following thermal power stations: Rovinari, Turceni, Isalnita and Doljchim Combinat.

In extended dry time, the Jiu flows into the three sections, can't assure water necessary for the above uses.

Hydropower plant Cerna - Motru Tismana, started to function, on phases in 1983, the most important scope being as to assure the supplementary flows on Jiu River, downstream Rovinari and in the same time electric power production.

The experience proved that it can't be assured the supplementary water flows, which would cover the water lack on Jiu River, on the great water consumptions sector.

It is known that the hydropower plants work when the energy consumption is high and therefore the treat flows are removed in Jiu River.

Using the hydrological prognosis and some exploitation scripts both of Cerna -Motru Tismana - hydro energetically system and of Jiu reservoirs, can be assured in any time necessary flows Jiu uses downstream Rovinari. The appropriation of hydrological forecast can grow the efficiency of hydrological fittings out in different stages of trickling, only after the shaping of a new draft over the typical lakes exploitation, after this establishing some kind of political series of exploitation.

On processing of this politicals of exploitation it will be allowance of:

- a) The type of the accumulation lake.
- b) Exploitation restrictions.
- c) Exploitation objectives: to obtain as high as possible electricity quantities; the necessary quantities for different usages; to reduce the damages caused by floods and to reduce alluvia from reservoirs.
- d) Total use for excess volumes in flood.
- e) The modeling for waves in Jiu Water Catchment's.
- f) The level in reservoir at the end of wave will have to up towards normal retention level, taking into consideration the possibility to produce successive waves.

On the hydrological point of view in different phases of rivers drain for each reservoir, must elaborate exploitation scripts witch owners must respect.

Pollution of Water Resources

T3.1 Elements regarding the planning, management and quantifying of the environmental impact of storage lakes

Giurma I., Craciun I., Giurma C.R.

"Gh. Asachi" Technical University of Iasi, Hydrotechnical Faculty, Romania

The researches approach the following fields: analysis of the water resources and water demands; aspects regarding the durable development and the necessity for systemic approach of the aquatic ecosystems; analysis of the influence of the hydrotechnical arrangements on the environment and our social and economical impact; methodologies regarding the evaluation of the impact of the hydrotechnical arrangements on the environment; aspects regarding the monitoring of the meteorological, hydrological and water quality parameters; the safety exploitation of the dams and storage lakes and the impact of the dams damages; the impact of the storage lakes on the water quality; the mathematical modeling of the storage lakes on the environment; optimal solutions for solving the impact problems on the environment and optimal exploitation of the storage lakes for minimizing the impact.

In the paper treat the following aspects: the mathematical modelling of impact of the storage lakes on environment and present a case study regarding the impact of the some Moldova's storage lakes on environment. For impact evaluation we make summarisation of the different meteorological, hydrological and hydraulic parameters between the previous situation (before the building of the hydrotechnical arrangement) and the actual situation. Geomorphologic changes of the environment is make an analysis of the velocity distribution which have more implications regarding the sediment and pollutants transport; is known that the small velocities favour the deposition of the suspended substances, the harsh particles for greater velocities and the smaller particles for lower velocities. In the storage lakes are make in evidence the deposition phenomena of the suspended substances (silting process), more significant in the back limit of the storage lake where appear the deltaic formations; this depositions favour the concentration of the nourishing substances (azotate, phosphate, organically material) and noxious substances (pesticide from agriculture, pollutants from industrial waste etc.). The case studies put in evidence these aspects.

The mathematical modelling used for evaluation of environmental impact follow the next stages: definition of the study domain, generating the three-cornered finite elements mesh for the fixed domain (the mesh is generate automatically in two-dimension field and can be refined for areas with complex geometry); definition of the conditions at the limit of the field, element or node; definition of the initial conditions; definition of the hydrological and hydraulic data (batimetry, flow Manning resistance coefficient etc.); solving the differential equation by Newton - Raphson iteration method. Mathematically the flow is described for aquatic surface ecosystems solving the two-dimensional differential equations by finite element method, considering the morphometric elements of the water body, wind influence, gravity force Coriolis force, dispersion components and complex geometry of the water body. The next approximation is making: rapid mixing of the pollutants with the water resulting a neutral compound with neglected effects on the flow spectre; hydraulic representation basing on the conservative equation for mass and moment.

T3.2 Naval accidents and their role in water pollution

Ghiba M.G.

University of Craiova, Romania

The solution to the decongestion of the roads and railways is to develop inland navigation.

This objective was reached in Western Europe but not in the Eastern Danubian area. The development of industrial zones placed in the Danubian area will be the main factor for the increasing of inland cargo traffic in this euro - region.

It can be observed that new industrial technologies work not just like a quantity cargo increaser, but as an important determinate of various types of materials, too.

Thus, inland ships continue to transport dangerous cargoes increasingly.

In order to control the danger of dropping dangerous cargoes into the Danube after an accident, some rules were voted. These rules are for packing, trimming, stowing and transportation dangerous cargo, also for shipbuilding technologies, and are named ADN-D.

They reduce a part of the risk of transportation but do not control it.

We must consider the fact that every safety action favors the decrease of the risk in each situation, including water pollution.

Statistics show that naval traffic in the section Drobeta Turnu Severin has been continuously growing during the last years.

The repartition of the accidents along the Danubian zone Corabia and Moldova Veche shows that:

- Ship accidents which may generate pollution are the most frequent ones;
- Only some of the accidents are pollution generators;
- The risk is very high in some periods of the year when the navigation is not so safe;
- The causes of the accident vary.

In case we consider the relation between risk and safety a probabilistic base- function equation and that, at the moment of the accident, the risk parameters had maximum values, which is more than the minimum accepted values, we can introduce a mathematical model . This model will have an interesting theoretical presentation but a hard, if not an impossible practical finality. For this reason the study of risk evolution in different cases must be conditioned by constant parameters.

It is necessary to establish the moment when the risk is above the minimum accepted value. Afterwards by using the statistical data, it is important to apply predefined procedures with the purpose of controlling the risk.

The most efficient mode to control the risk is to apply a practical method that is based on statistical data.

The new data base containing the results is the backup connection which makes future actions efficient and safety.

T3.3 Advantaged technologies for wastewater purification

Mirel I.

"Politehnica" University of Timisoara, Hydrotechnical Faculty, Romania

In this paper are emphasized the technologies used for advantaged purification of the wastewaters provided from the localities and even from some economical activities.

The pollution with organic substances, slurries, mineral salts and ammonium ions is caused by wastewater from communal husbandry, agrozootechnical complexes or from food industry.

The pollution with micro-pollutants (cyanides, phenols and detergents) is caused by chemical processing units, metallurgic industry and machines manufacturing industry and extracting industry.

Extracting industry, chemical-processing units, metallurgic industry and machines manufacturing industry cause the pollution with hard metals.

Wastewater purification is a special process determined by the hydraulically, physical, chemical, biological and bacteriological characteristics of the wastewaters, the emissary measure and category; plus the technical and legislative regulations regarding the water resources protection which is an important component of the environment protection.

The communal wastewater purification can be done by mechanical methods, classical and advantaged biological methods.

With the physical-mechanical purification methods can be removed from the wastewater the sedimentations, floating and semi floating materials with the grates, separators, sand clearing basins, skimming tanks and the primary clearing tanks.

By the biological methods can be removed the soluble organic matters in colloidal state or fine slurry which can't be retained with the physical methods.

The classical biological purification is based on the metabolic activity of some micro-organisms groups that assure the organic substances mineralization until this will be transformed in carbon dioxide and water in the presence of some nutritive substances.

By advantaged epuration methods can be assured the perfecting of the epuration processes by removing the nitrogen and phosphorus compounds, elements that contribute to the degradation of the natural aquatic ecosystems.

The activated basins, where take place the nitrification and denitrification processes, with the secondary clearing tanks or the fine membranes can replace, in the advantaged technologies the classic biological epuration step based on reducing the carbon compounds.

The advantaged epuration technologies with activated basins were applied at the wastewater treatment plant in the localities Pitesti, Brasov, Zalau and Bistrita, which were reconditioned. The technological reconditioning scheme included the version through which the secondary cleaning tanks were replaced with fine membranes modules.

T3.4 The analysis of some hydrological models based on ecohydrological correlations

*** Mocanu F.C., Schubert E.**

** "Politehnica" University of Timisoara, Hydrotechnical Faculty, Romania*

Aquatic ecosystems recycle nutrients, purify water, attenuate floods, augment and maintain stream flow and provide habitat for aquatic life.

Modeling these ecosystems depends on the amount of available information useful for the simulation system, which more they are, more adequate will describe the real process.

Hydrological models in which are taking into account the ecological parameters plays an important role for the integrated watershed management.

A model is a system of equations, relationships and observed monitoring data, created for description of the natural system, for demonstration and checking of its behavior under different conditions in time and in suitable type with significant economy of money and time.

There have been developed analytical instruments and models that have potential support in the ecohydrological approach:

- Statistical assessment of the data's to characterize the trends and/or critical conditions (water excess);
- Using the regression models, bi- and multiple-variables, the assessment can be done over the changes in the stream flow, through the climatic variation as a function of temperature, rain-runoff, etc.

Models allow the assessment at different spatial and temporal scales of the concentration of variables, the establishment of the balance equations and the computation of the flux exchange in the studied area.

T3.5 Water courses pollution by soil erosion

Beilicci E.

"Politehnica" University of Timisoara, Hydrotechnical Faculty, Romania

The physical phenomena's representing by erosional processes caused by water includes the following phases: soil particle detachment by hydrodynamic forces (from hillslopes and riverbeds), sediment transport by flow and particles deposition.

The gathering of erosional processes and sediment transport effects in time has as result the modification and the diminution of the chemical and physical features of soils, the appearance of mass movements, especially landslides, the appearance of geomorphological changes of the river courses, while can change their cross and longitudinal profile forms (and also their form in plan), as well as the riverbed characteristics; the reservoir silting, the river bed erosion in the downstream of dams and ecological problems due to the alteration of the original features of the aquatic ecosystems etc.

Beside the most important consequence of soil erosion, which is the decrease of the soil fertility causing the reducing of agricultural production, another important consequence is environmental pollution with chemical substances and soil particles washed from hillslopes and their accumulation in lower areas.

Is approximate that about 50% of chemical fertilizers, products and chemical substances used for chemical treatment of plants (fungistats, herbicide, insects exterminant etc.) are wash through hillslope surface erosion and are store in lower areas or penetrate in phreatic aquifers and in surface waters.

Considering that this waters are used for water supply for population, industries and irrigations, this phenomena's can conduct to impossibility of using this water sources or at excessive increasing of water treatment costs.

This paper present a evaluation model for effects of surface water resources pollution by soil erosion, be considering the interdependence between water quality and sediments must analyzed under following aspects: the sediment particle is one physical entity and have influence on physical, chemical and biological characteristics of water; the sediment particle is a part of water – sediments – dissolved chemicals loading system.

T3.6 The fight against pollution of water

Podaru C.A.

"Politehnica" University of Timisoara, Hydrotechnical Faculty, Romania

The water it is a natural resource limited, but she is essential to life and to health. In 2000, the World Organization of health considered that 1,1 billion persons, on a population of 6 billion be human, had not accesses to the supplying in drinkable water, while 2,4 billion persons had not accesses to satisfactory systems assainissement.

While the world-wide population has more than more trebled since the beginning of the century, the usage of the resources in fresh water were multiplied by six. With the growth of the population, combined with the industrialisation and to the urbanization, the needs in water will be considerable and the repercussions on the multiple environments.

The urbanization and the industrialisation risk damaging seriously the quality of the rivers, lakes and aquifers. This phenomenon amplified itself since the years 1970 with the increase of the human and industrial losses. Surface waters and underground waters risk being unusable for the needs of the human population and ecosystems

The pollution sometime is not visible. The water of a river or of a lake can seem clean, even if she again is polluted. In addition, the effects of pollution are not necessarily immediate; they can take years to show itself.

Being given vital importance of the water for the life on earth, his quality some does a value resource. Often, the quality of water is more important than his quantity. The quality of water influences on the usage that we indeed, but the inverse one is equally true. When we use water, we impair his quality

The method to use to reduce pollution must take account of the following factors: the pollutant type, the source, the effects.

Considering the huge world-wide problems regarding environment, individual every effort regarding to protect the quality of water is essential. All that we do can have and has an effect on the quality of water and the environment in his body.

While we enter into the XXIe century, we some are returned to a point criticizes, and we have very little time - years and no of the generations - to repair the caused damages to the environment and do in to go out that the resources in water can preserve themselves naturally. We now must think according to sustainable development, use and manage the resources and the environment for that the economy remains strong and the healthy environment today and in the years to come.

T3.7 The plan for prevention and mitigation of the accidental pollution events on water resources inside the Somes - Tisa hydrographic area

Sofronie C., Bohus C.

Somes - Tisa Water Branch, Romania

The work is depicting, first of all, the principles and objectives of the plan, the main pollution sources, the water uses, the water supplies, the areas needing protection (both surface and underground waters) and pollution-risk areas, according to the surface and underground water quality monitoring data.

Accordingly, there is a presentation of the water quality survey cross-sections in continuous flux and the intervention cross-sections in case of oil products pollution and floating debris pollutions.

The plan for accidental pollution prevention and mitigation contains also the informational and decisional flux in case of accidental pollution events, including for the cross-border pollutions situations.

The plan for accidental pollution prevention and mitigation of the water resources of the area is correlated with the WATMAN Project, which is aiming to implement the Intervention Centers for water pollution cases; and with the DESWAT Project, which is referring to the location of the alarm & monitoring (station for quality and quantity).

The implementation of this cross-section is encompassing the installations which are needed for intervention in case of intervention cross-sections over the products pollution and floating debris containment (plastic containers and bags, etc). The selection of the intervention cross-sections was done according to the location of the pollution sources, the riverbed morphology, the flow characteristics and the access facilities.

The endowment of the intervention cross-sections for accidental pollution events includes both the communication devices and the basic materials and means for intervention.

T3.8 The influence of the local characteristics upon the distribution of the pollutants in aquifer - Case Study

Pisleaga M.

"Politehnica" University of Timisoara, Hydrotechnical Faculty, Romania

The purpose of this paper, by means of a case study, is the attempt to demonstrate that the local characteristics can influence the pollutants distribution in aquifer.

It is known that sources of pollution for the underground waters are: physical, chemical, biologic and the pollutants can be organic, inorganic and radioactive.

The work refers to sources of chemical pollution and to organic and inorganic pollutants: nitrates, nitrites, ammonium, sodium, chlorine, magnesium, phosphates, iron, manganese, vitriol, which is the underground water chemist character is analysed.

Nowadays, even if there are a means to protect underground, the pollution problem being hard to control, impossible even.

The case study has been achieved on two drillings, located to the South - West of Timis - Bega hydrographical basin: F1 located in an area where the fine sands are predominant and F6 located in an area with clay lens.

The study is made on two drillings, situated in Timis County: Graniceri and Otelec.

The drilling F1 has been chosen in Graniceri having the depth of 13 m and are located in an area with fine sands and the drilling F6 in Otelec having the depth of 30 m and are located in an area with clay lens. The chemical compounds are tolerated in some concentrations but in a great quantity and in certain conditions they become pollutant.

The data of the chemical compounds at the drilling F1 are from April 11th 2005, and those of the drilling F6 from April 12th 2005.

Analysing the concentrations of the main chemical compounds, both for anions and for cations and making the total there can be observed values of concentrations four times grater at the drilling F6 where clay is predominating. The second part of the work studies the floods impact (the floods in April 2005) on the underground waters quality, using the same drillings, following the same chemical compounds.

The concentrations of the chemical indications are from September 13th 2005 for F1 and from September 27th 2005 for F6, during the floods, these drillings being flooded as well.

There can be seen to the both drillings a diminution in concentrations, except of Calcium and Ammonium at F6 drilling and a increase of the F1 drilling

The values, the chemical indicators, obtained in the field are comparable to the admitted values (A) and those admitted in exceptional manner (AE) according to the Law no. 311/2004.

T3.9 Utilization of the agricultural fields like biological treatment step for the zoo technical farms

Carabet A., Staniloiu C., Barabas K., Podoleanu C.

"Politehnica" University of Timisoara, Hydrotechnical Faculty, Romania

The waste water provides from the zoo technical farms have high concentration of nutritive elements such N, P, K which are useful for agricultural cultures. A rational distribution of these on the agricultural fields represent an environmental protection solution and also determinate a increasing of the agricultural production.

In this paper is analyzed the evacuation conditions of waste water according with STAS 9450-88 and also are send in the conditions in which the sludge resulted from waste water treatment plant can be used in agriculture. (The order no. 344/2004 emit by Ministry of Environment and Water Management with Ministry of Agriculture, Forest and Rural Development). All the restrictions impose by legislation have the purpose to protect the environment.

If in the periods when waste waters or sludge on the agricultural fields are used will appear in short time high quantities of precipitations, will be produce an accidental pollution of the water sources.

A rapid movement through surface drainage toward surface water sources will lead at the pollution of these sources and the infiltration in the underground without the possibility to be retain by plants will determinate the over load of the underground water with N,P,K. Because of the meteoritic conditions from Romania these situations will appear seldom. It is showed the effects pollution about aquatic environment and also about human health.

In this paper are presented the pedo - climatically conditions which must be carry out to can use the agricultural fields like treatment biological step for waste water. As well, are analyzed the agricultural plants which can be used on these fields and the periods in which these water and the sludge can be applied.

The study case presents the formation mode of the waste water evacuated from industrial farms of pigs and also the composition of these waters. In this paper are also presented some technologies used to spill the waste water and the sludge on the agricultural field and also some environmental protection measurements which must be imposed. It is presented some technical characteristics of the equipments used to spill on fields the waste waters, the increase of the production and also are presented the negative effects when are used in exceed on soils.

T3.10 Technical - legislative consideration regarding the qualitative protection of the water resources

Mirel I., Damian A.

"Politehnica" University of Timisoara, Hydrotechnical Faculty, Romania

In this paper are emphasized the Romanian and European legislative standards regarding the qualitative protection of the water resources used for water supply of the localities.

The qualitative demands for the drinking water are analyzed by taking in consideration the imposed condition for the treated wastewater when this are discharged in the natural emissary by the Romanian and European legislation.

The water streams are systems that have the ability to dilute and disperse the impurities from water mass, but also the ability to recover naturally.

When the wastewater gets into the surface-streams, natural self-cleaning processes begin and reduce step by step the damaging effects of used waters because of the decomposition of organic substances.

In the self-defence processes, the surface water-streams go back to their initial features, by rebuilding the balance lost when mixed with the wastewater.

The self-defence processes that take place in the surface water-streams are physical, chemical and biological processes, and may contribute to reducing some risk situation determined by accidental pollution or certain exceptional situation.

Also are established the maxim admitted limits for the accidentally discharge of the wastewater in the natural emissary, by taking into consideration the autoepuration capacity of the rivers.

These concentrations, which can be admitted in the situation of accidental pollution, are determined by the size of wastewater discharge in rapport with the emissary capacity, the physical, the chemical and the biological characteristics of the emissary and the distance between the drinking wastewater.

The natural autoepuration of the waters are limited, and when certain limits are over passed, the pollution may induce irreversible changes in the aquatic eco-systems or may affect more than it is allowed to other uses of the water resources.

To prevent the pollution of the emissary, the technologies for the drinking water treatment and the wastewater treatment must be robustes, elastics and secures in exploitation, to be able to face successfully in case of some emergency of accidentally pollution of the rivers.

We may improve the processes of water streams self-cleaning by: creating artificial lakes; increasing the flows: cleaning and airing the riverbeds: introducing nitrites, chlorine or copper sulphate.

The technical measurements are imposed to be correlated with the legislative reglementations which stipulate that "who pollute will pay" all the damages and everything that was affected by discharging the pollutants over the admitted limits by actual norms and normative.

T3.11 Groundwater pollution due to pesticides

Constantinescu L.

"Politehnica" University of Timisoara, Hydrotechnical Faculty, Romania

Pollution is the process of the environmental factors due to the release of pollutants resulted from industrial and agricultural human activities into the environment.

Environmental pollution is concerned problem all around world due to rapid increase of industrialization and urbanization.

The present paper deals with the issue of groundwater pollution with agricultural pollutants, i.e. pesticides.

Pesticides are natural or chemical substances used to destroy diseases and vegetal and animal pests which attack plants. In areas where intensive monoculture is practiced, pesticides were used as a standard method for pest control.

Pesticides can have significant consequences on human health.

While agricultural use of chemicals is restricted to a limited number of compounds, agriculture is one of the few activities where chemicals are intentionally released into the environment because they kill things. In agriculture, this includes herbicides (weeds), insecticides (insects), fungicides (fungi), nematocides (nematodes), and rodenticides (vertebrate poisons).

Pesticides have been found frequently in surface water in the last several years, they have also been found in groundwater. All pesticides are toxic to some degree. Contamination of an underground aquifer cannot be easily corrected. Preventing groundwater contamination is the best solution to what could be a hazardous situation.

Pesticides can move into ground and surface water by both point and non point source pollution. Point source include chemical runoff during improper storage, mixing/loading, disposal or misapplication to water bodies. Non point source pollution is the movement of pesticides from broad areas across watersheds over time into ground and surface water.

The movement of pesticides into water depends upon pesticide properties, climate, soil and geologic properties. Pesticide properties include adsorption, solubility, persistence, and volatilization. These processes determine the pesticide's tendency for movement to ground or surface water. Several climatic factors are important in determining the amount of pesticide loss to surface or ground water. Soil and geologic properties include hydrologic soil group, soil permeability, organic matter, soil erodibility, soil texture, soil pH, flooding potential and geologic conditions and depth to groundwater.

Adjusting pesticide management strategies can be effective in reducing the movement of pesticides to ground or surface water.

The consequences of using pesticides are:

- Infestation having serious effects on the environmental health and on the human population;
- Groundwater infestation by the toxic substances diffusion into the aquiferous layers.

Therefore, water resources must be protected against pollution in order to use them on a long term.

T3.12 The coal and the energy: in game the environment and the landscapes

Riti A.

"Politehnica" University of Timisoara, Hydrotechnical Faculty, Romania

The energy sources which we can utilize today are conventional. The piece of resistance source for produce the electric power in Europe is fossil combustibles between which the highest percent have the coal.

Coal is currently a major energy source in the Europe as well as throughout the world, especially among many developing countries, and will continue to be so for many years. Fossil fuels will continue to be the dominant energy source for fuelling the Europe economy, with coal playing a major role for decades. Coal provides stability in price and availability will continue to be a major source of electricity generation.

In the next 15 years the demand for energy will be double because the number of population will bring and the industry will develop very much. From this reason the role of coal will be very important for the Europe's energy.

The use of the coal for the electric power production has a lot of negative effects above the environment: the city destruction, the landscape destruction, the groundwater pollution, the water surface pollution, the water course modification, the generation of waste from extractives industries.

The transformations of the landscapes produce because of mining exploitation in Europe are among the most important which we can see at the surface of earth.

Through the surfaces affected, through topography modification, they are in any case by e inimitable scope. Is true that after break-up of the coal extraction the mining company will rehabilitate the surfaces affected but this is not the same with initial surfaces.

One solution for the future for the protection of environment will be substitution of traditional electricity with solar energy and wind energy which it is thought that will be the new electric powers.

Renewable energy is important in the overall energy picture, but will play a lesser role in helping us satisfy our energy demands.

Another solution is one collaboration between Europe's country, through development for some international project for the protection of environment and rehabilitate of environment for make one success integration of environment in economy, because ecological problems is not stopped at the frontier of country.

T3.13 Possible sources of surface water pollution by phosphorus in Bistra hydrographic area

Nemes N., Rogobete Gh.

"Politehnica" University of Timisoara, Hydrotechnical Faculty, Romania

Phosphorus is an essential plant and animal nutrient that can impair surface water quality when present in excess. Phosphorus occurs naturally and is commonly found in fertilizers, manure, detergents, municipal and domestic sewage, and industrial waste. Phosphorus must be carefully managed to minimize the impact on surface water quality.

A small amount of phosphorus in water is essential for aquatic life. However, phosphorus can quickly become a problem when present at excessive levels. Such an increase in phosphorus and other nutrients in surface water are called eutrophication. As eutrophication occurs, both plant and algae growth can increase to a harmful level for aquatic life.

Phosphorus can enter surface water from both point sources and non-point sources.

Point sources of pollution by phosphorus are:

- wastewater systems;
- industrial discharges;
- manure piles;
- residential septic systems.

Non-Point Sources of pollution by phosphorus:

- erosion of soil from agricultural land and natural habitat;
- runoff water from agricultural land and natural habitat;
- wildlife access to surface water.

In general, non-point sources of phosphorus can be very difficult to control. Point sources may be more easily identified; however, control measures can be costly.

While phosphorus may enter surface water from a variety of sources, the remainder of this fact sheet will focus on agricultural sources.

A few animals may have little impact when drinking from a river. When a large number of livestock have uncontrolled access to a watercourse for drinking, they may damage the shoreline and leave manure behind. This will increase the amount of phosphorus in the water.

Agricultural soils are often fertilized with phosphorus for crop production. If soil erosion occurs, natural and fertilizer phosphorus may be carried to surface water with the soil particles. Erosion can be reduced by using conservation practices which decrease the amount of time that the soil is left bare. These practices include reduced tillage, leaving crop residue on the soil and establishing cover crops.

Putting too much phosphorus on agricultural land will increase the amount of phosphorus in soil, which can greatly increase the amount of phosphorus in runoff. Too much soil phosphorus can come from heavy or repeated application of fertilizer or manure.

Commercial fertilizer can be formulated to meet the crop's requirements for nitrogen and phosphorus. Manure application rates are usually based on the nitrogen needs of the crop. This can result in the application of more phosphorus than the crop can use and will result in a build-up of phosphorus in soil. This build-up can be managed using soil testing to determine how much phosphorus needs to be applied to grow a particular crop.

T3.14 Nitrogen compounds variation in vulnerable areas during 2002-2004

Guta D., Rosca A.

Banat Water Branch, Romania

These zones comprise the vulnerable zones in accordance to foresee Directive 91/676/EEC - HG 964/2000 concerning the protection of the waters against pollution with nitrates from agricultural sources and the sensitive zones definite in agree with foresee Directive 91/271/EEC - HG 188/2002 concerning the norms of the waste water discharge in aquatic environment.

In accordance with the Standing Document finished between Romania and European Community referring to the chapter of environment, finalized the in December 2004, all the Romania's' territory is considered susceptible area to nitrates.

About the delimitation of vulnerable areas, were analyzed the natural vulnerability, respectively the features pedo-hydro-climatics of the area from the nitrates transit the to the water bodies, point of view. The area was stated vulnerable in the case which in across the natural vulnerability overlapped sources of nitrates from the agricultural activities.

The current nitrates sources from the localities in the Banat hydrographic space mainly came from existing zootechnical farms, and secondary from the contribution brought of the animal husbandry in the individual house-keepings. The deallocated zootechnical farms, or in which the animals effective were reduced they contributed as historic sources of nitrates to the pollution of underground water bodies.

In the stated vulnerable to the pollution with nitrates areas, the management of the agricultural farms - of the stockage and scatter the laystall, the assortment of crops – must be done in agree with the principles of the "Codul Bunelor Practici Agricole" (www.icpa.ro).

Also, the monitoring of accordance of the soil and the water bodies from the vulnerable zones will be realized, concordant with the existing legislation.

Through the state hydrogeological net establishment, in Vest area of country, we obtained important hydrogeological data, about the extending of the phreatic-aquiferous complex and the aquiferous potential.

Analyzing the hydrogeological section obtained on the base of the existing drillings, we can see the lithological variation to different depths and expand on horizontal line and vertical aquiferous layer.

In Banat hydrographic space, the quality of underground water was monitorized also in drillings in the aquiferous phreatic and in depth aquiferous layer drillings used in drinkable aim.

The analyses for NO₂⁻, NO₃⁻, NH₄⁺.of the samples were realized in Laboratories of hydrochemistry from Timisoara and Resita - Frame Water Directorate Banat. In the quality characterization of the water from drillings, we compare the results with the maximums admitted according to Drinking-water Law 458/2002.

The pollution level in most of the drillings in the aquiferous phreatic layer is keeping the same level even in the year 2004, observing overdraws of the admitted limits (according to Drinking-water Law 458/2002) to at least two indicators of characterize the quality of the water (ammonium and organic substances).

The most grave pollute situations – severely areas - of aquiferous phreatic layer, with overdraws of the maxims limit admitted to several compliant according to Drinking-water Law 458/2002, are in the ex-Comtim areas, as well in areas with intensive agribusiness Against this situation, we need to monitorize, permanent and continuously, the quality of underground water for the adhibition of measures for the decrease and cease the pollution.

T3.15 Erosion hazard and surface runoff in the agricultural and forest soils from hydrographical basin Barzava, Caras - Severin County

Rogobete Gh., Nemes I., Grozav A., Covaci C.

"Politehnica" University of Timisoara, Hydrotechnical Faculty, Romania

With a total area of 851976 ha, Caras-Severin County has agricultural land of 397598 ha (46,7%) and silvic land on 386096 ha (45.32%).

The main risk element in the land degradation are represented of relief and climate. Single and complex slopes with diverse inclination (10.1 - 35.1%) and agricultural land use represents 265541 ha (about 66%). Since the slopes are in the mountainous zone with an average precipitations of about 600 - 1000 mm/year and torrents, in summer are favoured the erosion of the soils with a great quantities of surface runoff because the agricultural technologies of the most areas hasn't an antierosional nature.

It is well-known the beneficial role of the forest in the diminution of surface runoff in the mountain zone but this required to apply some intensive treatments in silviculture. In the last year (2004) in Caras - Severin County was applied gardening – cutting on 5859.6 ha, jardining – cutting on 2473.4 ha and transformation - cutting on 5786.2 ha, therefore a total area of 14157.2 ha and this point out for the last 15th years a great decrease, with about 30%. If we added a three times overfulfilment for the gap-felling it will be pleant that the quantity of soil last is increasing.

The main types of soils in this region are Cambisols and Luvisols and this type of soils are characterized from a great erosion hazard:

- On the uncovered field with a slope >35%, the soil last 210 to/ha/year;
- On a forest soil covered with beech in which were made intensive treatments, the soil lost only 2.73 to/ha/year.

It is confirmed that surface runoff reached maximum values on the uncovered field, with an average of 66.6 % and a minimum values (0.5 - 3.4%) in an afforested field. If in a land in crop saturated with water, the runoff appears concomitantly with the rain in the forest the time for runoff is greater.

In the case of agricultural land use one of the significant differences between soil types erosion by rainfall is the influence of infiltration on surface flow. Under rainfall increased infiltration is always accompanied by a corresponding decrease in rate of runoff. On this land use, practices such as rotation and incorporation of organic matter generally increase infiltration.

Because under rainfall conditions they decrease runoff, they decrease erosion and the values of suspensions in the river Barzava decrease similarly with the situation in the silvicultural land use.

The study showed that in Caras - Severin County the average value of the suspensions is 1773.1 to/year. The measurements effectuated for a long time interval point out for Crivaia hydrometric post (1968 - 2004) 74400to and for Secu hydrometric post a value of 55218 to, in an between 1989 - 2004.

Runoff from agricultural and silvicultural land is one of the major sources of nonpoint pollution responsible for accelerated eutrophication of surface waters. Noxious aquatic weed and algal growth can result from the addition of excessive amounts of nutrients like nitrogen (N) and phosphorus (P) to bodies of water.

T3.16 The evaluation of the surface waters quality in the hydrographic basin of the river Bega, an important component for an integrated water management

Costescu A., Rogobete Gh.

"Politehnica" University of Timisoara, Hydrotechnical Faculty, Romania

The central objective of the European Community Water Frame Work is to obtain a "good state" of the water bodies (surface and deep water bodies), excepting the bodies highly modified and artificial who must achieve a "good ecological potential".

Romania's purpose is to accomplish these objectives through the definition and implementation of the adequate measures, considering also the requirements of the European Community.

The integrated water management has an important role of combining environmental, social and technical aspects. His concerns contents: coordinating land and water resources management, recognizing the linkages between water resources and water quality, protecting and restoring natural systems, educating and communicating, uniting technology and public policy and emphasizing preventive measures.

The integrated water management is the instrument that assures a sustainable development to society, taking care of the present generation needs and also allowing the next generation to satisfy their own. For an effective integrated water management the regenerative but limitative character of the water resources must be considered and the principles of water resources management should be applied.

In the hydrographic basin of the Bega River are numerous pollution sources that have modified the original condition of the river's quality. The most important pollution sources are the punctiform sources that include domestically, industrial and agrarian sources. Another important form of pollution comes from the diffused sources of pollution that includes the use of fertilizers and pesticides. And last but not least are the hydro morphological pressures like: the barrier lake of Surduc, the navigable channel of Bega and the Timis - Bega derivation.

Regarding the water quality of the Bega River we can define two distinct period of time: before the year 1990 when the Bega River has suffered a severe degradation due to the massive discharging of residual water from the local industry; and after the year 1990, when several industrial units were closed, conserved or improved and simultaneously a local authority interest in improving the situation in accordance to European Community legislation had manifested.

T4 – Policies and Strategies

T4.1 The Safety Chain, an important approach in flood management programmes – The Dutch policy

A.W. de Haas, W.B. ten Brinke

Flood Safety Department / RWS RIZA, The Netherlands

Between 1998 and 2005, Europe suffered over 100 major damaging floods, including the catastrophic floods along the Danube. Since 1998, floods have caused more 700 fatalities, the displacement of about half a million people and at least € 25 billion in insured economic losses.

The assets at risk of flooding can be enormous. In addition to economic and social damage, floods may have severe environmental damage.

Many nations are already taking flood protection measures. A reason for The Netherlands and France to strive to a more concerted and co-ordinated action at the level of the European Union, since this would bring a considerable added value and improve the overall level of flood protection. These countries started the so-called High Water Initiative to reach this goal.

The root causes of floods (rainfall and sea levels) are natural phenomena and essentially uncontrollable. However, results in flood damage are very much influenced by human actions.

Two trends point to an increase of flood risk in Europe. Firstly, the magnitude and frequency of floods are likely to increase in the future. Secondly, there has been a marked increase in the number of people and economic assets located in flood risk zones.

The risk of floods will continue to be present in the European countries and may increase considerably during the coming decades.

The challenge is to anticipate these changes now and to protect society and the environment from the negative effects of floods. One of the components for this is the EU Flood Directive that is nearly accepted now in the EU.

In this presentation attention will be paid to European action programme and as part of this, the "safety chain", as a flood risk management programme, which has shown to be a most effective approach. The safety chain, as it is used in The Netherlands water management policy contains:

- Pro-action: remove structural causes of accidents and disasters (like floods), in order to prevent that they could occur at all;
- Prevention: taking measures in advantage, both structural and non-structural, to reduce the likelihood of accidents and disasters (like floods) and/or the impact of floods in a specific location;
- Preparedness: to take the necessary measures to provide that everyone involved, is prepared on fighting against and dealing with accidents and disasters (like floods), in case of occurrence;
- Response: the actual fight of accidents and disasters (like floods);
- Follow up: all activities which lead to returning to normal conditions as soon as possible and mitigating both the social and economic impacts on the affected population and location.

The message is to pay good attention to ALL the links of the chain in the flood prevention programmes. That means plans and considerations related to every link.

In this presentation an explanation will be presented of the different parts, the Dutch policy and some examples of using the chain.

T4.2 Strategies for flood prediction in large urban zones

Brena Naranjo J. A

Swiss Federal Institute of Technology, Lausanne, Switzerland

The design storm rainfall is the basic hydrologic concept for designing collector sewers in urban catchments and in order to define it with accuracy, it is therefore necessary to calculate the variables related to its magnitude, duration, probability of occurrence, the total surface involved during the rainfall event and the design hyetograph. However, there exist just a few detailed analysis whose main objective is to determine the design hyetographs distribution for convective storms occurred in urban zones. Thus, given the constant occurrence of this type of rainfall events in the Metropolitan Area of Mexico City, which is the largest urban agglomeration in Latin America but which is also considered as one of the largest cities in the world, it will be important to have accurate methods for the design of sewage systems. The previous concepts are used to estimate the design hyetographs of convective storms, from a network of 47 rainfall gauging stations located in the Basin of Mexico. Furthermore, it is believed that the procedures followed in this paper can be applied for more urban catchments located in the rest of the country as well they could be considered and proposed as a national strategy for urban flood management since there is a lack of consensus among the cities affected by convective and/or non - convective storms.

T4.3 Water prices and households' available income: key indicators for the assessment of potential disproportionate costs – Illustration from the Artois - Picardie Basin (France)

Courtecuisse A.

*Economic and Environment Assessment Department
Agence de l'Eau Artois-Picardie, France*

The WFD's implementation in the Artois - Picardie French basin is carried out by several working groups involving water stakeholders. One of these groups deals with "Economic" and "pressures & impacts" assessment. The main objective of this group is to carry out the characterisation and the baseline scenario combining economic and Pressures and Impacts information i.e. identify the pressures caused by main uses and provide socio-economic indicators on these uses.

The investigations carried out for the characterisation have undertaken a specific analysis of the weight of the water services bill for the households of the Artois - Picardie. In this basin of 5000000 inhabitants, the mean price for a cubic meter of water is 3,28 euros in 2004 (inc. water distribution, collection and treatment of waste waters and environmental taxes) but this price can reach 5 euros and more in some specific areas of the basin. Unfortunately in some areas of the basin, these high prices can be combined with low mean available income per inhabitant (the ratio for Artois - Picardie basin is 20% lower than the national ratio).

This paper give a short presentation of the method used for collecting both water prices and indicators on mean available income at the municipality level (2500 municipalities for the whole Artois - Picardie River basin).

Then it presents the main results from this study and for example the ratio comparing the weight of the water invoice and the available income can overcome 2%¹ in many municipalities.

The last part of the paper draws out some conclusions on ho, in the context of the implementation of the Water Framework Directive, these results can be used for developing a water pricing policy that will be both incentive and sustainable for households

T4.4 GIS in policy making

Balica S.F., Gonzalez F.

UNESCO - IHE Delft, The Netherlands

Geographic Information Systems have become one of the most important tools for decision makers in recent years; for private companies, public institutions, researchers, among others, GIS has become a basic element of work in many countries around the world. Similarly in recent years policy makers are more in touch with this kind of technology to develop different scenarios of future decisions. Taking account the relevance of this work, the need for reliable information is getting more important as time passes; in many countries policy makers are trusting more and more on this kind of technology as a decision making complement.

For this purpose, many governments in the world are stressing the need for capacity building and training of professionals, so that software development and progress increases can be achieved in different institutions who implement laws; also policy maker stress the need for reliable information and education for the population. Even now more than ever policy making has the main purpose of improving public safety, and with a more efficient policy making there is an insurance that policies regarding environmental threats or people's safety against disasters will improve with the use of geographic information systems.

In this text we will analyze the different characteristics of GIS which makes them so important for law developers, also describe some uses that have been done to the technology in different countries with the purpose of policy development. Based on different examples gathered we will discuss its importance and relevance; for example the use that has been made to develop tools against floods, that policy makers have used for disaster prevention laws, also on environment protection policies, from geo information developed on the species protection and environmental dangers in certain areas, among many other examples of the use of GIS software.

T4.5 Banat hydrographical area management plan – 2004 Report – River basin characterization

Serban P., Nagy C.

National Administration "Apele Romane", Romania

River Basin Management Plan is the most important tool for the implementation of the Water Framework Directive 2000/60/EU. The plan for Banat hydrographical area, whose goal is the achievement of the "good status" for water until 2015 in order to bring the same conditions of life from the water resources point of view for all the citizens, had fitted into the Romanian national management plan, which was included into Danube District Management Plan developed under International Commission for Protection of Danube River umbrella.

The 2004 Report of the Banat Hydrographical Area Management Plan accomplishes the obligations of reporting to the European Commission according to Water Framework Directive Article 5, Annex II and Annex III, concerning the first assessment and characterisation of Banat hydrographical area. Also, information about the progress realised for the implementation of the Article 6 and Annex IV, concerning the register of the protected areas, and progress connected with Article 14, concerning the public information and consultation are provided.

This paper presents the steps and the results obtained in the Banat Hydrographical Area Management Plan development. Using the new European approach in the field of water resources management the 2004 Report of the Banat Hydrographical Area Management Plan has accomplished the main issues requested by the Water Framework Directive 2000/60/EU: general characterisation of the Banat hydrographical area, river and lakes typology and reference conditions, identification of significant pressures (point source & diffuse pollution and hydro-morphological alterations), surface & ground water bodies delineation and the heavy modified and artificial water body identification, risk of failure to reach a good status assessment for surface & ground water bodies, identification and mapping of the protected areas, economic analysis of water uses and public information and consultation in Banat hydrographical area.

T4.6 Decision support systems for Romanian water sector: a project description

Popescu I., Jonoski A., Lobbrecht A.

UNESCO - IHE Delft, The Netherlands

Geographic Information Systems have become one of the most important tools for decision makers in recent years; for private companies, public institutions, researchers, among others, GIS has become a basic element of work in many countries around the world. Similarly in recent years policy makers are more in touch with this kind of technology to develop different scenarios of future decisions. Taking account the relevance of this work, the need for reliable information is getting more important as time passes; in many countries policy makers are trusting more and more on this kind of technology as a decision making complement.

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T4.7 Transboundary river basins management in south western part of Romania

Madar M., Bojin T.

Banat Water Branch, Romania

Economic developments, increasing water scarcity, deteriorating water quality, rapid population growth, unilateral water management and development, and the ensuing increased tension between supply and demand are all around the globe disruptive factors in co-riparian relations.

Therefore for the management of the transboundary water resources it is required a joint cooperation between the countries that share the same water resources. In 1955 an agreement of crossborder cooperation on hydrotechnical issues was signed between Romania and former Yugoslavian Republic and a joint commission was set.

This paper is referring mainly to the activities connected to flood and ice protection in the frame of the crossborder cooperation whose goal is to ensure a coordinated approach to river basin management in order to protect the people and their goods from being flooded in both countries.

Both countries are seeking to modernise water legislation and management and have adopted the concept of management at a river basin scale. The Joint Commission on Hydrotechnics needs to work on adapting instruments and creating relevant and competent bodies at basin level.

Then the paper is focusing on several joint projects which are being developed in this period. Most of them are referring to the improvement of the flood forecasting system, which can support operational water management in particular under excessive conditions where actions have to be taken quickly. A special interest is the practical use of a flood forecasting system which can be used to forecast rising and high river water levels in order to be able to predict when dike burst will happen as to take mitigation measures in time, mainly considering that the river basins are shared by two countries.

The last part of the paper draws out some conclusions on the future of the crossborder cooperation for a sustainable water resource in the frame of the official position concerning transboundary river basins management.

T4.8 Natural and economic effects of soil management for sustainability in the morphological unit Beli Potok

Zlatic M., Dragovic N., Todosijevic M.

Belgrade University, Faculty of Forestry, Serbia

Morphological unit Beli Potok is characteristic for occurrence of all the erosion phenomena in the agricultural areas of the Vozdovac community, which constitutes the part of the hilly region of the wider Belgrade area. The existing structure of agricultural production indicates that erosion processes in this region have narrowed and also decelerated the yield increase rate which would be possible on natural and economic conditions. This situation favours flood processes in this area. In this paper the establishment is discussed of the production model taking into account the conservation of land and water resources, the needs of the population and profitability in the case of the hilly morphological unit Beli Potok. In this sense, agricultural, fruit and forest productions are anticipated from the aspect of soil management for sustainability and the possibilities are given for the improvements of the production model giving better long term economic effects. The improvements of the offered production model have been performed by establishment of the bee-keeping production in two variants (I variant – production of honey as the chief product and wax, propolis, flower powder as by – products; II variant – production of royal jelly as the chief product without by – products) and by medicinal herbs collection. The assessment of the long term effects of the planned and improved models has been performed in terms of the internal rate of return (IRR), pay back period, (PBP), benefit cost ratio (B/C) and net present value (NPV). The assessment of risk and uncertainty has been performed by sensitivity analyses of IRR and PBP. The improved production models with respect to the planned ones have given the considerable improvement of the economic efficiency especially with PBP. Model also took into account necessities of the population as well as conservation of the land and water resources. According to USLE equation soil loss is under the tolerant level which also contributes to the flood decreasing in the area. It is the additional reason for people to remain and survive in this area.

T4.9 WATMAN Project strategy for integrated water management and support for water crisis abatement and control

*** Adler M.J., McKinney D., Drobot R., Nicolau C.**

** WATMAN Project Director, Romania*

WATMAN is a project through which Romanian national strategy elaborated by MoEWM for water management in case of disasters will be implemented. This project will integrate the results of SIMIN and DESWAT projects, creating the possibility of finalizing the integrated information system in case of water disasters. The two projects, through the modernized meteorological and hydrological information systems, will provide real time data and forecasts, which will represent entry data for the WATMAN project infrastructure in order to optimize the water management system.

Through this project, several things will be accomplished:

- Optimal usage of water resources at basin and national level;
- Optimal assurance/ allocation of water resources at basin and national level from quantitative and qualitative point of view;
- Optimal management of water management infrastructure in case of disasters;
- Optimal exploitation of hydro-technical works;
- Harmonization of hydro-technical works and water resources in conformity with the EU Water Framework Directive;
- Implementation of a rapid population warning system in case of disasters;
- Rapid evaluation of material damages and human lives in case of disasters;
- Improving of bilateral relationships of Romania through respecting bilateral accords in water domain.

From the project design view point, WATMAN is structured in 6 chapters:

1. Implementation of the monitoring system for the water management infrastructure (water balance monitoring in reservoirs and in-time behavior of dams, inter-basins derived water volumes measurement, most important catchments monitoring, with influence over natural runoff regime.
2. Implementation of a warning system in floodable areas, through population announcing in case of catastrophic floods producing, or in case of accidents at the dams. To design this system, we collaborated with the National Committee of Protection Against Disasters; they provided the list of localities from the high flooding risk exposed areas which have not an alarming system already implemented. Supplementary sirens will be installed at the most important 96 dams of order I and II from ANAR, as well as downstream, in case in which Local Commission of Defense against Disasters doesn't have enough reaction time in case of accidents at the dams for population warning. The system is designed to be integrated with HydroElectrica's system, at the data base level of local/ county commission. Electric legacy sirens will be integrated into the electronic warning system that is subject to implementation.
3. Conception of a rapid intervention system during floods and pollutions period, built to reinforce the existing dikes being in danger of destruction. This system will have mobile dikes which will be able to be installed in flooding areas. The rapid intervention units will have special equipment for water treatment and will provide the necessary quantities in case of infected drinking water sources, because of floods or pollutions. They will have intervention equipments in case of accidental pollution, first of all, with oil products.
4. Updating communication system in water domain, through adopting of modern solutions, as meteor burst, VPNs, wireless, etc. linked to classic UHF and GSM radio communications, already used in the hydro-meteorological and water management information system

5. Data collected and primary processed, stored at meteorological, hydrological and water management databases will be the basis of a Decision Support System usage. This will include under the Water Dispatcher' software application a complex package of models for flood management, as well as for water resource allocation in drought periods, and long term or monthly restrictions.

6. Integration of meteorological, hydrological and water management systems will be facilitated by „Interoperate” component implementation, which will make complete the meteorological and agro-meteorological information system (providing data for soil moisture and radiations), and on the other hand, will bring a performing super-computer for meteorological models application on a detailed scale, necessary for rain forecast to a convenient scale for the hydrologic models inputs.

The paper will present the design of WATMAN Project and what is the adequate policy of investment for water disaster abatement and control as well as solving issues regarding EC WFD demands.

T4.10 The strategies on defense against floods on hydrographical basin of the Arges river basin

Moldovan S., Neacsu A.M., Postelnicescu M.

Arges - Vedea Water Branch, Romania

The new strategy on flood defense developed at European level has the following principles and concepts:

- More space for rivers;
- Live with floodings;
- Man's intervention on natural processes must be limited;
- Flood defense is never entirely absolute;
- People must adapt water use and the other activities according to flood risks.

The target of this theme is analyzing of flooding administration measures on the Arges river basin in 2005, it shows:

- Natural features of the Arges river basin;
- The present situation of the defense system on the Arges river basin:
 - structural measures;
 - nonstructural measures;
- The best practices for prevention, protection and reduction of flood effects – examples applied in 2005;
- Necessary measures for reduction of negative effects floods on the Arges river basin;
- Conclusions concerning implementation of new strategy of prevent, preparation and action plan in case of floods.

This paper highlight many aspects concerning administration of the emergency situations generated by floods, recorded during 2005 on Arges river basin, such as:

- The influence of hydrotechnical works on the high flood conditions;
- The influence of attenuating freshet and impermanent storage;
- The impact of polder storage;
- The way in which operated on dams regarding stipulations of the rules exploitation;
- Hydrotechnical work's situation affected by floods;
- The situation of some category of affected objectives in those 7 counties who belong to Arges river basin (physique and value);
- The comparative situation of maximum and minimum water volume in the main storage established in 2000 - 2005 period;
- The comparative situation of maximum and minimum flow transported on derivations;

T4.11 The Danube Delta. Past and present

Ion M.

"Politehnica" University of Timisoara, Hydrotechnical Faculty, Romania

As an ecosystem, the Danube Delta is the beneficiary of regional conditions regarding both water and alluvia quality transported by the Danube, alluvia provided from nine European riverside countries and by Romania itself. Social evolution of the human communities living within the Danube hydrographic basin, as well as the wish to exploit the natural resources of the Delta, deteriorated, in the last 50 years, the existing natural conditions, giving thus birth to important modifications of the fauna and flora structure, having as result alarming consequences upon the ecological equilibrium. Since these consequences can be called 'historical', with unexpected influences for an undetermined future period, the present paper gives the general actual frame, the causes that led to the present situation and the measures that had been taken up till now, as a beginning for creating a sustainable ecosystem.

What the Danube Delta means, can be supposed based on the following information, given by the Mayers Konversations Lexicon in the year 1887: "At 7 km upstream of Tulcea, the river divides into branches, creating thus its own delta, a 2600 sqkm of wildness, resembling to an immense green sea, made out of 3m high rush waves, separated by the branches of the river, lakes and pools, where immense communities of birds, wolfs and buffaloes live together".

The Delta can not be separated from the Danube River and so the paper also brings up information about the river, from its springs at the Black Wood Mountains in Germany to the entering in the delta, emphasizing the importance regarding the European navigable network in which the Rhine - Main - Danube Channel is the key.

The Delta is described from morphological and hydrological point of view, several aspects concerning the dynamic of changes in time being mentioned.

The Danube Delta is an interactive system, where an impressive number of plants, invertebrates, insects, fish, birds and animals live together. Man manages this system and plays an increasingly important role.

The plant field covers about 1150 species, from microscopic plants to poplars. There are about 110 sorts of fish, some 20 species living in the rush area.

The Danube Delta is the crossing place of five migration ways, European, Mediterranean, Chinese, Arctic and Siberian species meeting here. There are also many animals; and all over, the nature and the man.

The nowadays Delta is not the Delta from 200 years ago, because the interests of the communities which managed this territory are often not ecological.

Some aspects are mentioned in the paper. Only the future can probably answer the question about what can be done.

T4.12 Forecast and public protection in the Banat watershed using ArcGIS 9.1

*** Balica S.F., Balla E.G.**

** UNESCO - IHE Delft, The Netherlands*

GIS have been utilized for disaster management throughout the world. Local authorities in many countries of the world are benefiting from the use of geographic information system applications and mapping technology for developing information on natural disaster threats and measures.

Floods are becoming a common threat all over the world, causing millions of dollars in material losses, not counting the lives of the people; other damages include commercial, industrial and agricultural losses because of non productive. Despite of many preparations and measures taken, developed countries from Europe have confronted severe floods which had high impacts on ecosystems and economical level.

An extreme flood had occurred in Romania in 2005. Because of the climatic changes, the floods become more expansive and the consequences are more critical to society. Every regions of Romania has experienced floods and all of its population has some risk of flooding. It is the Romanian Water Authority's job to minimize public and private losses due to flooding.

The Banat County has suffered many floods in recent years; most of them have been caused by heavy rains and massive snowmelts. We want to speak in this article about the Information Management for Flood Control, how can we protect and educate the population in case of natural disasters, how can we preserve human safety, health and, consistent with these flood risk reduction goals, how can we determine the people to have flood insurance.

With the use of GIS software, we can develop maps that can contribute to this purpose, helping the population to understand in an easier way the threats that they are in, and the measures they can do to minimize them. In this article we will develop a map showing the safest places to take refuge in case of emergencies

T4.13 The risk assessment of failure to reach the environmental objectives until the year 2015 for surface waters from the Banat hydrographical area

Nagy C.

Banat Water Branch, Romania

The risk assessment of failure to reach the environmental objectives until the year 2015 for surface waters from the Banat hydrographical area is one of the most important actions that have to be completed in order to accomplish the Management Plan of the Banat Hydrographical Area. The action of evaluating the risk of not reaching the environmental objectives until the year 2015 for the water bodies is a request of the Water Framework Directive 2000/60/UE and makes reference at the evaluation on different categories of pressure which are manifesting on water bodies.

The economic and social importance of a more accurate evaluation of this risk is given by the fact that based on this water bodies' classification, depending of the risk of failure to reach the environmental objectives, it follows the choosing of the basic and special measures for each water body in order to reach the targets imposed by Water Framework Directive 2000/60/UE on water resources, objectives depending of present pressures exert on water bodies.

For a good risk assessment of failure to reach the environmental objectives until the year 2015 for surface water bodies from the Banat hydrographical area it was necessary at the beginning to build up a data base of all the pressures – historical, present and potential; punctual (discreet) and diffused – that exert on water resources and also a data base with the evolution of the physical-chemical and biological qualities of the water resources for a period as long as possible in order to identify the effects of the above-mentioned pressures.

In the Banat hydrographical area and also at the national level and at the level of the entire Hydrographical District of the Danube River it has been taken into account four categories of pressures: the pollution with organic substances, the pollution with nutrients (nitrogen and phosphorus), the pollution with priority/dangerous substances and the hydro-morphological alterations.

For each surface water body it has been tried a very detailed evaluation of the presence of these types of pressures and also of the effects that these pressures have on physical-chemical and biological qualities of the water resources of that water body, in another order of ideas it has been adopted an approaching pressure (cause) – effect and also an approaching effect – pressure (cause). This double approaching of the risk assessment of failure to reach the environmental objectives was necessary for a better evaluation of the risk with the data and the existent data bases structure.

T4.14 Technologies and advantaged systems in hydrology

Titan G., Barabas K., Achim C.

"Politehnica" University of Timisoara, Hydrotechnical Faculty, Romania

The social-economical development is in tight correlation with the hydrological cycles, which impose the application of the modern technologies to evaluate all the elements of the technological cycles.

In this paper will be aborted new geoinformational technologies which include the satellites communication, Data Base Management System SGBD and Geographical Informational System GIS and this will be used vis-à-vis by the hydrological cycles.

The global climate changes have affected the quality and the quantity of the waters, and this were one of the causes of the floods from Romania in 2005.

In this context is very important the implementation of the new geoinformational technologies based on the data and information transmitted by the satellites, Data Base Management Systems Technologies, software to transmit the data and dynamic maps on the Internet.

This paper's scope is to emphasize the evaluation and analyzing instruments for the climate process and the existent water resources, offering in this way a modern, performing and accessible informational system to all the users.

We will present a study regarding the development of one integrate system of geographic and hydrologic analysis that use the hydrological data measured by the meteorological stations of the National Meteorological and Hydrological Institutes from Romania (INMH).

The system is made by some components, each of this is an integrate part of the system:

- The hydrological component: describe all the events and phases of water and ear movements;
- The technical component is composed by the Data Base Management System (SGBD), Geographic Informational Systems (GIS) and technological IT systems;
- The space geoinformational - modelling component, which supply to the public and private centres the hydrological data and information's like digital maps etc.

T4.15 The legislation from Romanian space regarding water from roman law to Framework Directive and Law 310/2004

Halbac - Cotoara R.

"Politehnica" University of Timisoara, Hydrotechnical Faculty, Romania

During the history water resources represented particularly through the big watercourses big civilizations seesaw's. Indispensable factor of life, water brought the enlargement but and decline the peoples from antiquity. Resource find out at quantities reduced, not in a few cases represented an element causing conflicts. Was created in time an inseparably relation between humanity and waters management, a primal function at this connection having the legislation.

Although anciently a well organized management of waters contributes substantially to the first efflorescence advanced civilizations as Egypt and Mesopotamia, the Roman people have been the one who do up the first water legislation prevalent and implemented first in Rome and then, more or less, at all imperial space.

Vitruvius and Frontinus are two among ancient author s which distinguished at waters problematic, in particularly regarding the supply with water. In the VIII book of "De Arhitectura", Vitruvius occupies more attentive of this subject. From his descriptions, and not only, resulting that Romans dispose of a complex of rules, one from them being in a way a simplistic stipulate of today's Framework Directive.

The road up to the appearance of Framework Directive and application of his stipulates in Romanian legislation, was long inhering in the course of history multitudinous period of legislative blankness regarding this subject.

Period of after Aurelian retires and up to the first appearance of Romanian state formations is relatively penurious in information's regarding waters problem. Still there are known some element. It deserves to be mentioned in the first instance the fact that, on the river courses come into existence the notion of little placements union and the first state appearance. In the zones, which don't known Roman occupation, was kept the use in common of waters, the private property not being extent about their.

Middle Age reflect through the regnant check about resources, the legislation in this area being incident to beneficence's, laws of us, free of the reigns chancellery. An important role at this period plays the wells during the invasions, whichever often were poisoned, but also the chateau's water source which were vital during the sieges.

Toward the century XVIII, important information's connected to the waters legislation appear in particular on the Banat territory, find out after 1716 below Hapsburg administration. In Tara Romaneasca, Urban Legislation (1765 - 1782) does mentions to problem regarding water supply and sewerage, especially through Urban Cod Project of Mihai Fotino at 1777.

Organic Regulation introduced, by Russian Empire, in the Romanian countries outside of Carpați Mountains contain as well obviate regarding waters problem.

First waters law in Romania appeared at 1924 and was connected with an energies law. At 1953 is give Decree no. 143 about rational consumptions and waters protection.

Although in Roman period and then starting with XVIII century are do mentions to the waters quality in the legislative area, the essence was put on quantitative management.

The law no. 8 from 1974 forecast at the item 1: In Republica Socialista Romania appeasing aquatic population and economies requirements, the capitalization of new water source, rational waters use and their protection against exhausting and pollution, as well as complex water courses arrangements will achieve united and concordantly with social and economic country development.

Thus it was open a new chapter in Romanian legislation through approaching quantitative and qualitative waters management.

T4.16 Water resources management in condition of ecological disaster

Nurtayev B.S., Shermatov E.

Institute of Water Problems, Tashkent, Uzbekistan

This paper focuses on the situation in the Amudarya River Basin, where irrigation has resulted significant change of natural hydrologic and the ecologic equilibrium in this region. It has been undertaken an attempt to create a new approach for water-land resources management. The multi-stage management include such components as following: helio-geophysical data, prediction of the Amudarya River discharge, control of irrigated agriculture and environmental standards. The investigation shows that management model must be adjusted on the basis of water resources predicting (input) and establishing of ecological standards (output) for low reaches of the Amudarya River.

T4.17 Preservation of humidity excess areas in order with European laws. Case study of "Satchinez Swamps" natural reservation, Timis County

Man T.E., Kiss A., Halbac - Cotoara R., Costescu A., Modra C.

"Politehnica" University of Timisoara, Hydrotechnical Faculty, Romania

The durable conservation and use of natural patrimony constitutes a major public interest objective and the fundamental component of the national strategy for the durable development. At present, the National Network of Protected Areas from Romania includes a number of 844 protected areas, that count over 1,1 million ha and represents 4, 8% from national territory.

The network represents only "a network on paper" because of an inadequate legislative framework. The small and isolated protected areas are most affected from this point of view, because they are not administrated. In such a situation is "Mlastinile Satchinez" Reservation, the last biocenosis of the archaic swamps that covered the Western part of Romania, from two centuries ago.

In 1942, the swamp from Satchinez was declared natural reservation.

During the last century, in the reservation were performed some hydro technical works which had a negative impact on the habitats. The anthropic interventions cause damages to the ecosystem, disturbed the trophic chain and provoked disappearance of some micro habitats and the decrease of aquatic birds' population.

The opportunity offered by the LIFE Program of the European Union for the recovery of the natural wet habitat was benefic for the Satchinez reservation.

For the conservation and sustainable use of natural patrimony, respectively of the habitats from humidity excess areas, the paper presents general problems, evolution and actual stage of international and Romanian legislative framework for this domain.

The paper tries to emphasize the needs of European and Romanian legislation, respectively their harmonization in time. It's emphasizing their requests and tampon areas role belong to humidity excess areas.

The paper presents random events and negative examples of anthropic impact in time, with major effects on habitats and biodiversity from natural Reservation "Satchinez Swamp" and proposes conservation in time.

For the hydro deficit correction consisted in last period, as much in inside area but also in tampon zone are bring forward some proposal for solution this situation.

The paper brings forward synthetically the works projected by SC BINNOVA SA Timisoara and executed in 2005 by SC. SOCOT SA Timisoara branch office, for the wet habitats natural reservation "Mlastinile Satchinez".

Paper exemplifies these modifications with concrete examples concerning the modifications intervened at ultimate years concerning flora and fauna oh these natural reserve.

T4.18 The study of floods included to the integrated management of Banat catchment area

Cretu Gh., Rosu C., Mocanu F.C., Badaluta - Minda C.

"Politehnica" University of Timisoara, Hydrotechnical Faculty, Romania

The study is necessary in the condition in which the frequency of the extreme events (floods) shows an increased vulnerability with all scientifically, technological, financial and management efforts and results obtained. This has imposed in 2005, on national and international level, the elaboration of some project such as: National Strategy of flood risk management, Prefect and mayor Manual for the management of flood crisis situations, Flood Directive and the International Strategy for diminishing disasters respectively.

The steps followed are:

- identification, understanding and simulation of the flood-wave mechanisms with changes of natural and human changed environment;
- assimilation of new concepts to protect against floods (e.g. "living with the floods" and "free way to water");
- high water management through optimum rapport of structural and non-structural measures;
- economical analysis of the catchment area, stimulating tariffs / green costs;
- solid flow analysis during floods and the impact on the environment;
- method and models elaboration to simulate and optimize the arrangement schemes of the catchment area in the concept of integrated management which includes high water and has to take into consideration the social and environmental criteria;
- realization of integrated management plans for a catchment area.

As objectives for the integrated management plan were accepted:

- estimation of the flood wave characteristics, being defined the flood wave for computation (discharges / maximum volume with different occurrence probabilities, correlated with the risk degree and certitude);
- natural flood characteristics estimation through selecting the risk computational models and maps for the risk of flooding;
- the study of flood wave propagation, taking into account the modeling programs to be implemented 1, 2 and 3D;
- the study of accidental floods through computational models realization (Rosu, Cretu, calculus of the flood wave hydrograph, and the propagation, estimating the flooded areas. Regarding the natural / accidental floods are approached the analyze and implementation of computational models as RASP, calculus of the breach length, the risk of flood occurrence, taking into account the shape of the flooded area and assessment of the floods impact through damages;
- economical analysis at floods (costs/damages) through a computational model elaboration (Cretu et al., 2005);
- European principles implementation in the study elaboration.