



DEMONSTRATION PROJECT

## Selected Measures Towards Integrated Land and Water Management in Upper Tisza, Ukraine

VELYKY BYCHKIV (UKRAINE) – BOCICIOU-MARE (ROMANIA)



FINAL REPORT



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## 1. Abbreviations / acronyms

BM	Bocicoiu Mare
GEF	Global Environmental Facility
ICPDR	International Commission on Danube River basin Protection
RO	Romania
VB	Velyky Bychkiv
UA	Ukraine
UNDP	United Nations Development Programme



## 2. Summary

This project is a part of the UNDP/GEF project “*Integrating multiple benefits of wetlands and floodplains into improved trans-boundary management for the Tisza River Basin*” and it reflects the main goal of UNDP GEF project which is to improve *livelihoods of local communities*. In case of the current project the advantages include better management in times of flood, better waste management techniques including the initialization of separate plastic collection, better wastewater management, better mountainous creek management and improved hydrological prognosis. The results will also be an important step in delivering changes to current policies on floodplains in the Upper Tisza River Basin.

Lead partner: Zakarpattia Oblast organization of All-Ukrainian Ecological League.

Partners:

- Velyky Bychkiv village council, Ukraine
- Bocicoiu Mare village council, Ukraine
- Rakhiv Rayon State Administration, Ukraine
- Association of schools of commune of villages Bocicoiu Mare, Tisa, Crăciunești and Lunca la Tisa, Romania
- Tyachiv rayon water management unit of Zakarpattia Water Management Board, Ukraine
- Zakarpattia Center for Hydrometeorology, Ukraine
- Institute of Hydrobiology of NANU, Ukraine
- Kyiv National University of Taras Shevchenko, Geographic Faculty, Ukraine
- Velyky Bychkiv State Forest Enterprise, Ukraine

Geographic area:



Two villages in Ukraine and Romania, separated by the Tisza river– Velyky Bychkiv village in Rakhiv rayon, Zakarpattia Oblast (UA) and Bocicoiu Mare village in Maramureș County (RO). The part of the Tisza in the project area according to the Analysis of Tisza River Basin 2007 is assessed as *water body at risk*. Therefore the need for actions for this area is stated in the Tisza River Basin Management Plan and the corresponding Program of Measures.

Overall objective: to demonstrate innovative and cost-effective solutions to the typical environmental problems faced in Upper Tisza floodplains with guidelines for their further replication.

Objectives and outputs:

Output 1. *Communal waste management system for Velyky Bychkiv and Bocicoiu Mare is improved*



Objective: to improve communal waste management system in Velykyy Bychkiv and Bocicioiu Mare for preservation of floodplain ecosystems and sustainable use of environmental services:

- to decrease the total amount of garbage of the Tisza floodplain at its source by the means of environmental campaigning and establishing garbage collection facilities (both for VB and BM);
- to introduce separate plastic waste collection in VB.

Results: the project practically showed how to establish sustainable local waste management system and supported first PET bottles recycling unit in Ukrainian part of the Upper Tisza, supporting the decrease of pollution by communal waste of water courses.

- The infrastructure developed includes 383 containers of different size and press PET bottles.
- Number of people signed up for waste take away services in Velyky Bychkiv has increased from 10% to 70%
- 6 posters on waste management behaviour have been installed
- 2,5 tons of PET bottles and packaging are collected, sorted and pressed
- The project supported further follow-up projects on waste management, namely active involvement of Coca-Cola (financing of waste management campaign and 12 containers), EU project “Waste Governance – ENPI East”, where Zakarpattia Oblast was selected as pilot area, further waste management campaigns in downstream villages of Nizhne Selizhe and Baranintsi.

#### Output 2. *Local Flood Risk Management Plan is developed and implemented*

Objective: to improve management of local streams during flood events in order to mitigate risks and damages

Results:

- The project showed and implemented low-cost and simple methods to mitigate local floods consequences in the villages. They include:
  - 2600 m of the Duhnovicha stream was cleaned
  - A pond for floodwaters of size 13 x 45 m was created
  - A catcher for bottom sediments is constructed
  - The stone embankment of the most vulnerable place near the school is done
  - Space under the two bridges is cleanedThe catcher is very positively assessed by the village. It showed efficient during floods in the end of 2010. The village council started to construct the similar things in other parts of the village, so the experience is replicated
- Actions done, including cleaning of the stream from the waste lead to the fact that the stream flow capacity increased in 1,5 times. In addition, Drinking water source “Churiv” is reconstructed
- For the first time in Ukraine flood hazard and flood risk maps following the requirements of EU Flood Directive were established. Later this experience was further disseminated at national and international levels. In total, 26 maps for 3 types of probabilities and two scenarios: closed and opened sluice at Tisza are developed



- Brochure on action plans, specific for citizens, living at different streets how to be prepared, act during and after floods is developed and disseminated



### Output 3. *River and lake habitat in UA and RO are revitalised*

#### Objective:

- to develop methodology of stream (biotope) restoration after unsustainable forest management and practically implement it for selected mountainous streams in UA
- to create ecological path for youth and promote lake restoration in RO

Results: the project took simple and easy actions regarding restoration of the mountains creeks after forest cutting. As a result, we have healthy ecosystem and even fish returned back to the creek. The methodology developed and tested was provided to the State Forestry Committee to become a basic for the relevant legal act.

### Output 4. *Water gauging station in Kobyletska Polyana village is re-opened*

Objective: to establish the only water gauging station for improvement of flood forecast, water balance assessment of Shopurka tributary of Tisza for flood mitigation purposes.

Results: the project created automatic gauging station at Shopurka river, (tributary of Tisza, not covered previously by the monitoring station). The data are visible on-line for Ukrainian and Romanian colleagues at <http://gmc.uzhgorod.ua> This way monitoring system of both countries was strengthened.

### Output 5. *Local waste water facilities for boarding school complex in Velyky Bychkiv are designed and constructed*

Objective: to support the construction of waste water treatment facilities for boarding school in Velyky Bychkiv in order to practically demonstrate possible local and cost-effective biological treatment facilities and to decrease direct inflow of nutrients into transboundary part of Tisza river.

Results: the project supported the installation of a quite cheap and easy in operation local wastewater treatment facilities with biological cleaning, whose application will lead to decrease of untreated wastewaters entering Tisza, which corresponds to the goals of RBM. For e.g. COD concentrations in the end of pipe have reduced from 75,3 mgO<sub>2</sub>/dm<sup>3</sup> to 18,3 mgO<sub>2</sub>/dm<sup>3</sup> (in more than 4 times), BOD – from 59,2 mgO<sub>2</sub>/dm<sup>3</sup> to 12,6 mgO<sub>2</sub>/dm<sup>3</sup> (in more than 4,7 times), N-NH<sub>4</sub> – from 7,4 mg/dm<sup>3</sup> to 1,7 mg/dm<sup>3</sup> (in more than 4,3 times).

Project duration: 1 March 2009 – 30 December 2010

*The project team would like to express the gratitude for the excellent cooperation during the project implementation to*

- Tisza MSP project team (Mr. Peter Whalley, Ms. Diana Heilmann, Mrs. Klara Tothova)
- Velyky Bychkiv village council (Mrs. Odarka Zelenko, Mr. Yosyp Bozhuk)
- Local waste company “Ecobat Shuravi” (Mr. Volodymyr Tkachuk, Mr. Ivan Stefanyuk)
- Bocicaua mare village council (Mr. Iivio Lazarchuk, Mr. Vasyl Grynyuk)

***Without great commitment of all parties this project would not be so successful!***

## 3. Changes (and reasons) to work planned

The project proposal was prepared in times when the consequences of the economic crisis were not clear yet. This crisis heavily influenced the economy of Ukraine and project as well in terms of available co-financing. Some stakeholders were not able to provide co-financing as it was planned.



The co-financing issue especially affects the component related to the wastewater treatment facilities. In our project proposal it was written: *“The project plans to pay for the design of the wastewater facilities, but their construction is within financial responsibility of Velyky Bychkiv council and Rakhiv rayon administration. But such situation has some advantages, namely the project by investing 10% into design can fundraise the rest 90% of needed investments”*. At present such co-funding is not available therefore this component was changed to smaller scale one – planning and construction of wastewater treatment facilities for the local unit – boarding school. This change was already reflected in the Inception report of the project.

## 4. Description of work undertaken

Component 1. Improvement of communal solid waste management system for Velyky Bychkiv and Bocicioiu Mare

Objective: to improve communal waste management system in Velyky Bychkiv and Bocicioiu Mare for floodplain ecological potential preservation:

- to decrease the total amount of garbage of the Tisza floodplain by the means of environmental campaign and garbage containers purchasing (both for VB and BM);
- to introduce separate plastic collection in VB.

Activities:

### *1.1 Review of the present waste management system in VB and MB, identification of the spots for garbage containers and containers for plastic;*

This activity was scheduled for May-June 2009. The actual review took place from 4-8<sup>th</sup> of May. In order to use the best European practices in this field the project has invited the Check expert on waste management Mr. Pavel Novak, who actually led the review. He prepared the relevant report (*See Annex 2.1*), where he described:

- current system of water management and potential amount of wasted plastic in Velyky Bychkiv and Bocicouu Mare;
- strategy for the improvement of waste management system in both villages with concrete identification of the number of garbage pins and other equipment needed and its location;
- further actions for the improvement of waste management system.

The further project activities were based on his report.

#### ***How to create sustainable system of communal solid waste management***

1. *Is there a place where to throw garbage?* – containers
2. *Is there somebody to pick up the collected waste?* – support to local waste management company
3. *Is there a place where to collect recyclables?* – separate containers for PET bottles
4. *Is there a place to sort PET bottles?* – premises within local waste management company
5. *Is there a way to press PET bottles to make out of it a product for sale?* – purchasing of press

### *1.2 Purchasing of containers for general waste and plastic for VB and MB;*

For Velyky Bychkiv the containers for plastic and general waste were obtained. In total, 363 containers of different size were obtained and installed in the sites, namely:



- 300 containers (120 l) for households, located at the main streets of the village. Before the project, the local authorities experience difficulties how to persuade citizens to sign for waste management services, although they are cheap, because people were not considering it as something they need. The project approach was to provide a container free of charge (normally it costs around 30 Euro, which is a quite large sum for local citizens) for the citizens if they sign an agreement for waste management services. It was done with the support of village council, who tried to persuade each of households located in the central streets to follow the project proposal. It worked very successfully and soon public opinion regarding usefulness of waste management services was changed so that it became popular and socially approved to sign for waste management services.
- 20 containers (1100 l) for PET bottles (installed at the central streets)
- 31 containers (240 l) for PET bottles for cafes, shops, restaurants, which mainly use PET bottles.
- Additional 12 containers (1100 l) for PET bottles with the support of Coca-Cola for mountaineer part of the village.



*Installed container for plastic with platform*

It is worth of mentioning that due to active involvement of village council of Velyky Bychkiv and a private enterprises “Shuravi” who provided 50% discount for containers, the project was capable to purchase so many containers of different types.

The Velyky Bychkiv community have invested funds into creating platforms for the plastic containers as it can be seen at the picture. The size of the *platform* is such to locate more containers (for glass and organics), which shows the wiliness of the community to continue the waste management efforts further.

For Bocicaua Mare, just 20 containers (240 l) for sorting of glass, paper and PET bottles were provided for 4 schools in order to prepare and train children in the future separate collection of these materials. The support was limited because in the next year, the village expects a large EU funding for establishment of complete system of waste management.

### ***1.3 Purchasing of press installation to decrease the volume of the plastic and to make it a product for sale; trainings on use of press and additional sorting of plastic before pressing;***

According to the current market analysis and price comparison it was selected to buy the following press Б3118 “МИДИ” directly from the factory specialized in presses in Ukraine (Ovidiopol) <http://www.katran-pako.com.ua/>. The company-seller also installed the press and provided 1 year warranty.

A special training was conducted by specialist of a large Ukrainian Recycling company “Vtorma”, explaining how to differentiate the PET bottles and packaging to increase the costs of pressed plastic.





. Press obtained

#### Box 2 Characteristics of the press Б3118 "МИДИ"

Pressing power – 8 tons

Size of the pressed plastic: 750 x 620 x 900

Weight of the pressed plastic: up to 140 kg

Capacity: 0,45-0,7 tons / hour

Size: 950 x 820 x 2450

### 1.4 Joint Ukrainian-Romanian environmental campaign “Two Banks – One Clean Tisza” aimed at cleaning Tisza floodplain from the garbage

On the 29<sup>th</sup> of September 2009 in two villages Velyky Bychkiv, Ukraine and Bocicoua Mare, Romania the event “*Two banks – one clean Tisza*” took place. These two villages area located opposite to each separated just by Tisza. The main goal of the event was to raise public awareness regarding the pollution of the Tisza banks, first of all by the plastic bottles. The event was organized in frame of the week «Live Positively” in Ukraine, Tisza basin with financial support of UNDP-GEF “Selected Measures towards Integrated Land and Water Resources Management in Upper Tisza, Ukraine - Romania and Coca-Cola, Ukraine.

In the action from both Ukrainian and Romanian side around 300 people took part, including 4 schools of Velyky Bychkiv and 1 school of Bocioua Mare with teachers, the village councils, communal services, NGO “Zakarpattya oblast branch of All-Ukrainian league”, Coca-Cola, Ukraine, media.



View from both sides of the river



The event included joint cleaning of Tisza floodplain from Ukrainian and Romanian sides. As far as the event took part during historical low water in Tisza, the children were split by 20 m of water instead of 60 m and could discuss their achievements in garbage collection. It was the first joint action between Ukraine and Romania for many years in this part of the basin (since they got split by the borders), and people were very emotional about meeting their neighbors and joining efforts. Both teams Ukrainian and Romanian also sang songs together across the river.

In total around 1,5 km of the river was cleaned. In Ukrainian part the children collected around 250 large bags of plastic which was further brought for recycling as support to the project activity on initialization of separate plastic collection and recycling in Velyky Bychkiv.



In this day the jury was announcing the winners of the two other competitions announced: the largest volume of collected plastic among 4 schools and the best performance regarding the public awareness on the garbage collection.

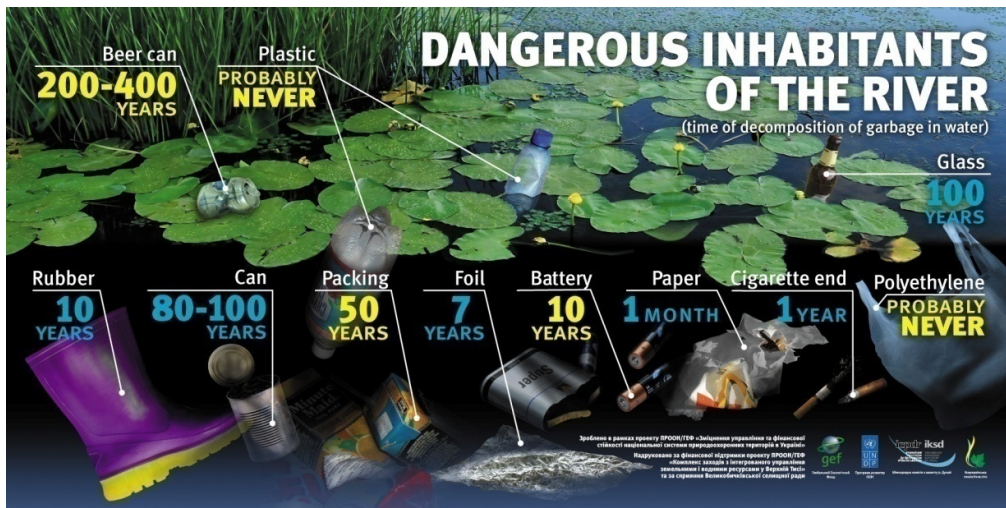
The schools collected the pyramids of plastic (similar to Egyptian ones) – in total around 6 tons of plastic. The winning schools got the musical centers from the UNDP-GEF project, all other schools got books and other presents. All participants got T-shirts and Cola-cola. The event was highlighted in the news in and the media.

### ***1.5 Educational campaign on separate plastic collection in VB***

Besides different competitions on waste collection between schools and theatre performances, the project also developed the following public awareness materials. The posters were prepared in the local language but English versions also available:

- Poster on the time of decomposition of waste





- A series of posters on Great Bull recycling behaviour



On the entrance to the village



On the exit of the village



The concept of the Great Bull came from the names of UA (Velyky Bychkiv) and RO (Bocicaua Mare) villages, which are literally translated as Great Bull. There was a legend how the big bull saved the villages during the plague, creating a deep ditch around the villages, isolating them. The project used this symbol to keep the ideas close to local people. The whole concept was agreed with local village councils, which also helped for its sustainability.

- Appeal to citizens of Bychkiv to use containers for PET bottles and sign for waste management services

This all had very positive affect and draw a lot of attention to the issue of waste management not only in the village but also outside of it, because these posters were established at the main motorway in Zakarpattya.



### *1.6 Selling of plastic*



It is worth to mention that it is profitable for the company to come to pay for the plastic, if 2 tons of plastic is collected. Therefore, this figure was considered like a milestone for the project.

However, during the project lifetime the pressed plastic was not sold. Around 7 tons of pressed PET bottles were collected in the premises of local waste company “Ecobat Shuravi”.

However, at present the market price all too low to sell it. So at present the company waits for better time to sell it.

### *1.7 Production of the TV-programme (30 min) concerning the waste and plastic collection campaign as well as other outputs of the project*

The main goal of the TV-program is to demonstrate existing ecological problems and innovative and economic their solutions. The program was called “Green truth” and was many times broadcasted at Zakarpattya regional TV channel. The duration of the documentary is 30 min.

The documentary highlights the following activities:

- 1<sup>st</sup> stage – showing the baseline situation with all project components (summer 2009)
- 2<sup>nd</sup> stage – showing the activities, done in the frame of the project (construction works, plastic collection process), comments of experts, key stakeholders and local citizens in Velyky Bychkiv and Bociocouau Mare (during life time of the project)
- 3<sup>rd</sup> stage – showing the practical results of the project (September 2010).

## **Component 2. Development and practical implementation of Local Flood Risk Management Plan**

Velyky Bychkiv village is located in mountainous part of Zakarpattya at the hills of Carpathian mountains. As many other settlements in this region, the village covers relatively large area and population distribution within the village is different: most of the houses are located along rivers, but some houses are on the hills far from each other. Velyky Bychkiv is located along Tisza river and its right-side tributary Shopurka. Ukrainian Velyky Bychkiv is located on the right side of Tisza (left side of the village became independent and part of Romania since 1919 just after end of World War I) and divided on two parts by river Shopurka: eastern upper and western lower parts. The catchment area of eastern part of Velyky Bychkiv is about 5 km<sup>2</sup>.

Velyky Bychkiv has long history of floods, caused by Tisza and Shopurka. During many years, the number of engineering constructions was made along rivers: dikes, bank enforcement, sluices. At present, the village is quite safe from the sides of both rivers. However, State Program of Integrated Flood Protection in Zakarpatska oblast 2002-2015 envisages further constructions along Tisza river.





*Mlynivka and Duhnovicha river network and the sluice to Tisza*

Local hydrographic network within eastern part of Velyky Bychkiv includes two streams of length 2-3 km each: Mlynivka and nameless stream flowing along Duhnovicha street (further Duhnovich stream). Two of them merge just 100 m from Tisza and flow under the road and through a newly built sluice (2008) in the dike along Tisza. Construction of the sluice allows avoiding backwaters from Tisza when water level in Tisza is higher than in local streams. Nevertheless, it doesn't solve the problem for all cases. As an example, in the times of extreme high flood (historical flood for this stretch of Tisza) during July 2008, the sluice was closed and water from Tisza didn't flow into the village. However, runoff of the two streams was much bigger than volume of their beds and caused overflowing in the mouth relatively plain part of the catchment. As a result, 29 houses from 37 in whole village affected by flood (officially claimed for reimbursement) were damaged because of these small streams.

Most of the time, the local streams are dry or their water discharge is insignificant. But during heavy rains, frequency of which is increasing according to the monitoring data, they can discharge up to 10 m<sup>3</sup>/s. In average 20 days within 1 year have daily precipitation bigger than 20 mm and lead to floods. In many places, beds of the streams are straightened and backfilled by sediments and domestic waste. Therefore, the flow running capacity is reduced.

After construction of the sluice, there are two scenarios of streams runoff into the Tisza. The first scenario is when water level in Tisza became higher than in streams and the sluice is getting closed (no backwater from Tisza, but flooding because of local runoff). The second scenario is when rain has very local character and streams flow into Tisza via open sluice (their water level is higher than in Tisza).

Objective: to improve management of local streams during flood events in order to mitigate risks and damages

Activities:

### *2.1 Hydrological and hydraulic investigations and spatial analysis of catchment and streams*

- Collection of data on precipitation, water levels and discharge
- Field survey of riverbed inclinations, cross-sections of beds and valley
- Calculation of spatial characteristics: catchment, length, density of population



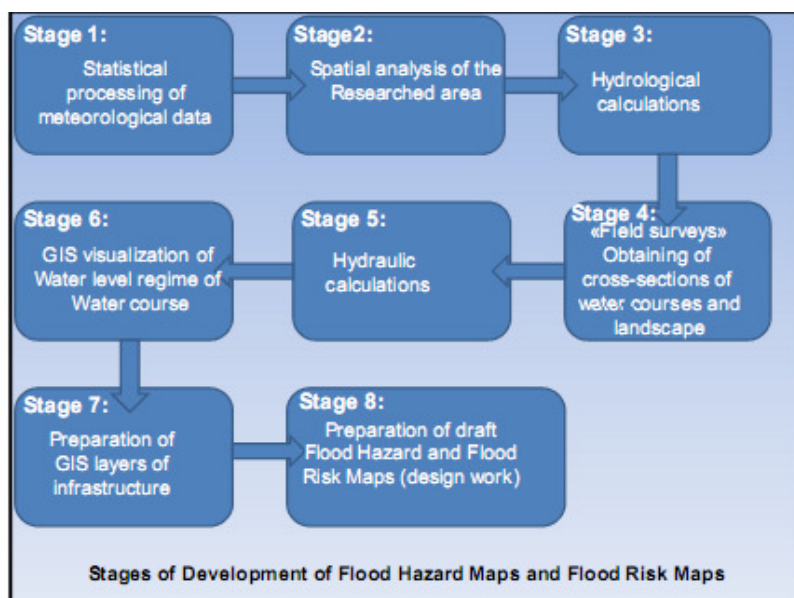
- Calculation of maximum riverbed capacity, water levels during flood of different probability, stream velocities and time of runoff from upstream to the confluence.

*Output:* analysis report on measured and calculated hydrological and hydraulic characteristics of the catchment. *See the relevant report in Annex 2.2.*

The report defines the maximum discharge of rain floods of different probabilities. It proposes the following measures to mitigate the floods: cleaning of riverbeds from garbage (especially under bridges), bank enforcement and catchment trapper. They will be efficient, if kept operational. It is very important to manage flood discharge by its pumping into Tisza. The report provides calculations of discharge and efficiency of its pumping by two pumps.

## 2.2 Flood hazard and flood risk maps development, taking into account the different scenarios

The calculations and stages of development of flood risk and flood hazard maps are presented in the relevant report (*see Annex 2.3.*).



Floods with the following probability were considered (as identified in EU Flood Risk Directive):

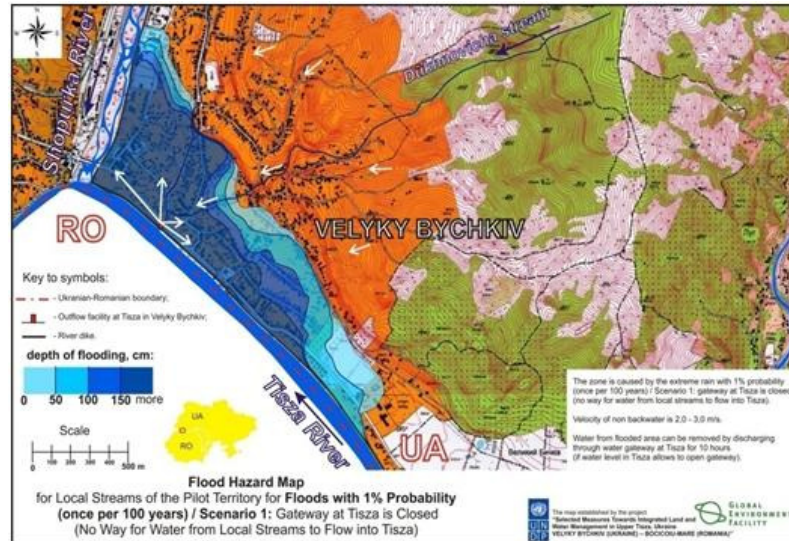
1% (1 time per 100 years);      5% (1 time per 20 years);      20% (1 time per 5 years)

- Development of **flood hazard maps**



**Flood hazard Maps include the following information:**

1. Inundation zone;
2. Depth of inundation;
3. Speed of flow;
4. Time of water standing

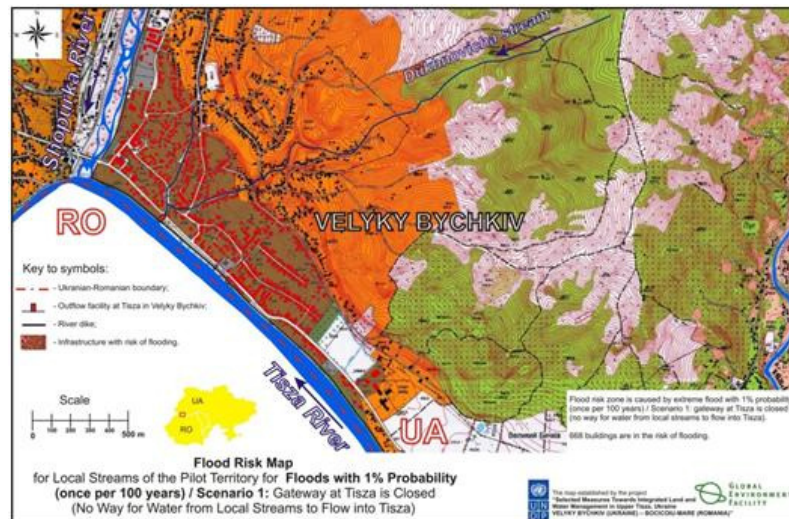


*Example of the flood hazard map*

- Development of **flood risk maps** including social and communal infrastructure

**Flood risk Maps include the following information:**

1. number of population
2. objects of economic and social infrastructure
3. objects, which if flooded can lead to emergency pollution
4. other information:  
bottom sediments, trees fallen etc



*Example of the flood risk map*

- scale of basic map **1 : 10 000**.
- Scenarios:



1. Hydrotechnical construction on Tisza river is closed. Water of local water courses cannot enter Tisza.
2. Hydrotechnical construction on Tisza river is closed. Water of local streams is pumped into Tisza using two pumps of total capacity 1 m<sup>3</sup>/s.
3. Hydrotechnical construction on Tisza river is open.

*Output:* flood hazard and flood risk maps (see Annex 2.3):

- Number of Flood Hazard maps = 3 hydrological conditions x 3 scenario = **9**
- Number of Flood Risk Maps = 3 hydrological conditions x 3 scenario = **9**

### 2.3 Development of measures for flood risk and damage mitigation

- Identification of practical measures, devoted to flood risk and damage mitigation and analysis of measures efficiency

Practical measures are presented in the relevant report (*see Annex 2.4.*).

*Output:* list of measures with their efficiency analysis and implemented measures (works / constructions). The scores were worked out by experts, who using their expert judgment, tried to put a weight for different criteria. Later this table was disseminated to larger number of experts and then also presented at the public hearings. The assessment done in the public hearings was inserted in the column “public opinion”.

Option	Type of engineer activities	Efficiency (1-5)	Cost (1-4)	Social importance (1-3)	Environmental and aesthetical importance (1-4)	Public opinion (1-4)	Total score
«A»	Cleaning of the upstream part of Duhnovicha stream and their tributaries	4	4	2	2	4	16
«Б»	Construction of gabion barrier	3	3	3	4	1	14
«B»	Construction of sediment catcher	3	3	3	4	4	17
«Г»	Riverbed training works, wall -7m <sup>3</sup> .	2	3	2	3	4	14
«Д»	Construction of accumulation polder: 1 – 400m <sup>3</sup> ; 2 – 1500m <sup>3</sup> .	3	2	2	3	4	14
		4	3	3	3	3	16
«Е»	Bank reinforcement: 1 – gabion wall –60m <sup>3</sup> ; 2 – geonet – 120 m <sup>2</sup> (geotextile – 140 m <sup>2</sup> ).	3	3	2	2	3	13
		5	5	3	3	4	20
«Ж»	Cleaning of riverbed under the motorway Uzhgorod - Rakhiv.	4	3	3	3	4	17



## 2.4 Public campaign towards flood risk and damage mitigation

- Conduction of the workshop on flood scenarios and discussion of proposed measures with local inhabitants (March 2010)



In March 2010 the project conducted public hearings on proposed flood mitigation measures. It united people who live upstream the river and downstream. There were hot discussion who is guilty in the present situation (downstream citizens blamed upstream for improper waste behavior which leads to blocking by waste of spaces under the bridges and inundation of their households). In the same time, upstream people explained their problems with lack of waste management infrastructure, drinking and wastewater systems.

The project negotiated with the citizens the proposed actions and supported the dialogue. In the end some of the proposed actions were rejected (gabion construction as far as it will become a barrier for horses) and some added (such as cleaning of spaces under the bridges).

- Printing of leaflets

The special leaflets on actions recommended before, during and after floods for citizens living in flood risk zones were developed (*see Annex 4.1*).

*Output:* public acceptance of the proposed measures and increased public awareness, printed information materials.

## 2.5 Implementation of selected measures

Option	Type of engineer activities	Implementer
«A»	Cleaning of the upstream part of Duhnovicha stream and their tributaries and spaces under the bridges	VB village council
«Б»	Construction of gabion barrier	Cancelled after public hearings
«B»	Construction of sediment catcher	Project
«Г»	Riverbed training works, wall.	Project
«Д»	Construction of accumulation polder	project
«E»	Bank reinforcement:	Not implemented
«Ж»	Cleaning of riverbed under the motorway Uzhgorod -Rakhiv.	Motorway administration

### 1. Construction of sediment catcher

The main purpose of sediment catcher (1,5 m deep with inclined bottom) is to become a place for sediment collection to avoid their entering in the bottlenecks under the bridges and blocking the flow. As far as Dukhnovicha stream is mountainous it leads with it a large number of sediments. The catcher is very easy to clean.



The catcher is very positively assessed by the village. It showed efficient during floods in the end of 2010. The village council started to construct the similar things in other parts of the village, so the experience is replicated.



*Sediment catcher before the first bridge in lowland part of the village*

## **2. Riverbed training works, wall.**

Another construction done with the support of the project is smoothing the angle of the stream near the school and construction of protection wall near the school # 1. This school often suffered during any floods due to waters striking against the angle near the bridge. Now the wall with flattened angle improved the situation.

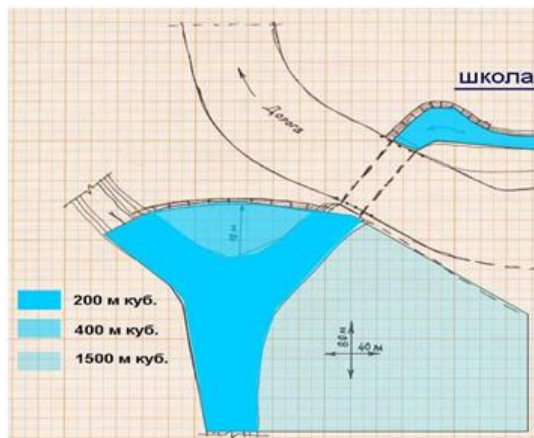


*Bank enforcement and angle smoothing*



### 3. Construction of accumulation polder

The polder of capacity 400 m<sup>3</sup> was established in the place of jointing of Mlinivka and Duhnovicha stream. Although the capacity of the polder is quite small, it can retain floods waters of not very extreme floods and give additional time for water management services to install pumps to transfer water from Duhnovicha to Tisza.



*Scheme of accumulation polder*



### 4. Reconstruction of drinking water source “Churiv”

Additional unplanned action, which project financed, was reconstruction of never drying water source at Duhnovicha stream. It is the only source of water used by local population. The village team with the support of the project has installed several concrete rounds and then shared a well and made a nice wooded draw well on top with memorial board. This drinking source was officially opened during the final project conference (June 2010).



*Official opening of the restored drinking source*



## 5. Measures done by Velyky Bychkiv village council

The village council also implemented some of the proposed by the project actions (which do not require engineer licence), namely

- cleaning of the upstream part of Duhnovicha stream from the waste (more than 15 trucks of garbage were collected)
- cleaned the spaces under the bridges, liquidating the bottom necks
- support in installation of the fence around sediment catcher.

It was a part of co-funding of flood protection measures.



Before

After

### Component 3. Revitalization of a mountainous stream in UA and lake habitat in RO

#### *Ukraine*

Intensive unsustainable forest management in the basins of small rivers in Carpathians leads to destruction of biotic communities in river and stream ecosystems. They cannot survive under conditions of increased acidity of water due to decay of wooden residues, high turbidity and change of the riverbed due to wood transportation.

Skorodny stream was considered as a final demonstration site due to several reasons:

- The general state of the stream is very poor (natural habitats of riverbed are heavily modified due to forest cutting activities; for 2 km it is heavily polluted with wooden residues;
- There is no natural biota typical for this type of mountainous streams. There are just xylophytes – indicators of poor state of the waters and poor hydrochemical and hydrological regimes;
- In the next 10 years, no further forest cutting activities are planned, so project revitalization activities will have long lasting effect.

Skorodny stream is a mountains stream of the 2<sup>nd</sup> order – it enters the stream Bily, which is tributary of Tisza. The total length of the Skorodny is around 4,5 km. The co-ordinates of the stream mouth N 47°55'39.3'' E 024°13'27.6'' H 451m, forest cutting zones N 47°55'55.2'', E 024°13'34.4'', H 549m. In 2005-2007 at Skorodny (forest cutting site # 18), there were forest cutting activities and wood transportation. The trees were cleaned from branches and needles also directly at the stream. The riverbed was stabilized with the wooden construction for equipment transportation.

As a result, the stream habitat has degraded. If for 400 m from the mouth, the stream looks moderately deformed, than for around 1 km, the stream is heavily polluted with the wooden residues. The area of the stream covered by the wood is larger (70%) than area covered by stone (the norm for such type of



rivers is 3-7%). The wooden residues already negatively affected the hydrological regime, which in its turn negatively affected the biota.

Decomposition of wood of coniferous trees takes a long time and lead to phenols entering the stream. Increase of the temperature of water in streams in spring and summer lead to decrease of dissolved oxygen, so rheophil flora and fauna died. The present number of wooden residues in the riverbed show that mentioned above negative processes will develop further for the next 10-15 years. Besides this, wood as a substrate promotes the development of other animal forms – xylophytes, which live and transform wooded residues. Therefore fauna typical for stone and stone is replace with the fauna of xylophytes, which is not typical for mountainous rivers. As a result, habitat of the stream further degrades, and its revitalization is possible only in case of active renaturalization works.

The samples taken in the stream in May 2009 show its pollution: pH - 6,2. Concentration of O<sub>2</sub> is 7,9mg/l – 95% (it should be 140-160%), it shows that oxygen is used to oxidize organics. Exceeded concentrations of phenols were registered < 7, which corresponds to 4<sup>th</sup> class of water quality.

The biotope-friendly restoration methodology will be developed by Institute of Hydrobiology, and implemented by Dilove state forest enterprise under the supervision of the Institute. So this component contains on-job training for the local forest managers, which give additional value for the project sustainability. River habitat restoration will include introduction of invertebrates in the riverbed from the undisturbed rivers. National Academy of Hydrobiology will arrange a special field survey to catch invertebrates and introduce them in the sources of the stream.

#### Objective:

- to develop methodology of stream (biotope) restoration after unsustainable forest management and practically implement it for selected mountainous streams in UA

#### Activities:

##### *3.1 Physical cleaning of wooded residues from the riverbed*

The physical cleaning of the Skorodnyy mountains creek was done by Dilove forest enterprise during summer. The restoration included cleaning of the riverbed from the residues of wood cutting activities and building of water cascades – water falls to create an ecosystem like it was before the forest cutting.

The works were supervised by the Institute of Hydrobiology and done at local level to ensure ownership and local transfer of knowledge. The *unexpected contribution* from the side of Dilove forest enterprises was construction of wooded house and bridge downstream to make the creek comfortable for the visitors.





### 3.2 Development of the methodology and restoration of biotope structure of the river.

- methodology development for mountainous streams

For the relevant report in English please see *Annex 2.5. The relevant article was published in Knowledge and Management of Aquatic Ecosystems*” (KMAE) in English.

<http://www.kmae-journal.org/>

- creating of artificial cascades from local stone (not less than 3 cascades) and increase of sinuosity of the stream by creating of side inlets (not less than 3 side inlets)



Example of the artificial rapids

The second stage of renaturalization include restoration of morphological and biotopical structure of the river on the basis of earlier determined for this case proportion of bottom substrata areas (Afanasyev, 2006) and remainder of natural bends, rapids and hollows. Due to the fact that 8 dams, 7 half-dams and 5 artificial rapids were made of local stones, the riverbed tortuosity was restored, while drops of depths and zones with different stream speeds and turbulization were created. The works were done conducted by Dilove forestry under the guidance of Institute of Hydrobiology, following the developed methodology.

### 3.3 Introduction of invertebrates in the riverbed from the undisturbed rivers.

- Selection of reference conditions for such type of mountaineer rivers

The third stage of the restoration included selection of an undisturbed river and examination of the area which would meet the requirements for reference habitats, being similar to the river in question by its size and geological structure of the riverbed, and situated at the same height above the sea level. The Institute of Hydrobiology selected *Pykhy river*, located within the territory of the Carpathian National Park at the height of more than 600 m above the sea level and which has a similar biotopical structure that is typical for small rivers of this region. After general examination of the bottom communities physiognomy within different biotopes of the pilot area by means of usual standard EU selection method – «kick and sweep» (this method of investigation of aquatic macro-invertebrates in littoral areas is the most effective), the integrated sample was taken aiming at quantitative assessment of bottom fauna, and hydrobiontes was captured for the purpose of their reintroduction into the restored Skorodnyi stream.

The invertebrates for relocation were captured in the pilot area with the help of drift catchers by exhaustion of the bottom and by outwash of surface soil into special nets. The mesh of capturing nets was 25 micrometers in diameter and 25x25 cm in size. Enumeration and primary identification of invertebrates were carried out afield. Besides, capturing of indigenous species of fish was carried out. The whole material collected was placed into specially prepared thermocontainers protected from heating and delivered under constant aeration to the Skorodnyi Potik upper reaches in September, 2009.

- Release of drift invertebrates in the upper part of Skorodny.

9 stream trouts *Salmo trutta morpha fario* (Linnaeus, 1758), 5 gobies *Cotlus poecilopus* (Heckel, 1837) and 4 minnows *Phoxinus phoxinus* (Linnaeus, 1758) were also released directly into the



Skorodniy stream upper reaches. All these fish species are typical representatives of mountaineer rivers in this region.

Introduction of invertebrates was carried out in 5 areas of the riverbed at a distance of 150-200 m one from each other. All in all approximately 5,000 of specimen of Ephemeroptera naides were released, most of which were: *Baeis vernus* Curis 1834; *B. Rhodani* (Pice, 1843); *B. digiaus* Bengsson, 1912; *Epeorus assimilis* Eeon, 1885; *Paralepophlebia werner* Ulmer, 1920; *Ecdionurus venosus* (Fabricius, 1775) etc., approximately 3,000 of specimen of Trichoptera larvae, most of which were: *Rhiacophile dorsalis* (Curtis, 1834); *Hydropsyche instabilis* (Curtis, 1834); *Cheumatopsyche lepida* (Pictet, 1834), approximately 1,500 of Plecoptera naides, most numerous of which were: *Lauctra albida* Kemphy, 1899, *Nemurella pictetii* Klapalek, 1900, *Protenemura intricata* (Ris, 1902); among the biggest species the following species are also worth being mentioned: *Dinocras cephaelotes* (Curtis, 1827); *Perla marginata* (Panzer, 1799) and *Perla burmeisteriana* Claassen, 1936. Besides, approximately 12,000 of specimen of other aquatic invertebrates were released.

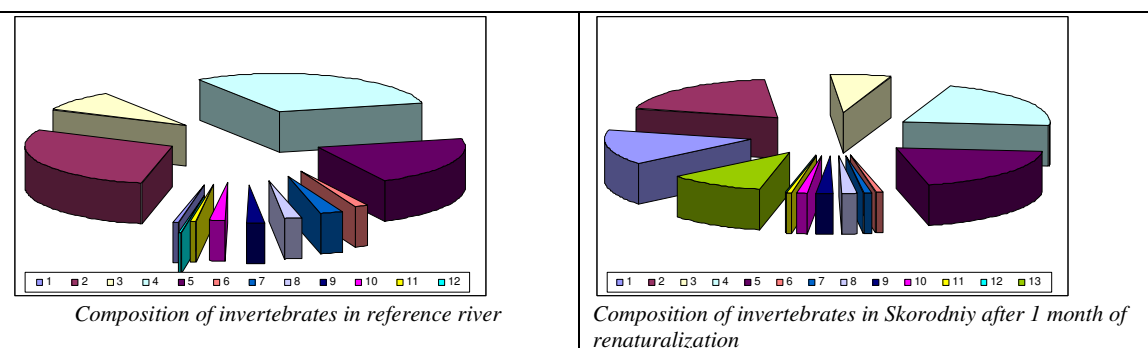


### 3.4 Supervision of the riverbed restoration

- Site visits and sampling analysis of the key invertebrates

Final stage included further control of effectiveness and success of performed works concerning introduction of fauna. Test capturing of bottom fauna aimed at determination of success of performed works in the Skorodniy stream were carried out in May, 2010 within three areas: upstream the introduction place, in the middle of the stream and downstream.

Yet in a month after introduction, the structure of bottom population of the Skorodniy stream, against the background of still low level of total population numbers which made up 200 individuals per m<sup>2</sup>, consisted of bottom communities similar to those in the reference river kC=0.78, while Amphipoda still dominate and Hirudinea are found in large quantities.









#### Component 4. Re-opening of Water gauging station

##### *Deviation from project proposal*

The initial project proposal envisaged re-opening of closed in 1988 gauging station in Dilove village on Tisza by means of obtaining of equipment for the station and conduction of construction works. However, taking into account that another international Ukrainian-Romanian project “*Improvement of Flood Protection and Environmental Rehabilitation at Ukrainian-Romania Border Part of Tisza*” envisaged opening of automatic gauging station exactly in Dilove, we can consider that this activity is implemented already.

As far as there is another closed state gauging station at the project area in village Kobyletska Polyana at Shopurka, it is reasonable to restore its activities.

The reasons for re-opening of the gauging station at Shopurka in Kobyletska Polyana:

- Shopurka river is the right tributary of Tisza with total length of more than 40 km. The mouth of Shupurka river is located within Velyky Bychkiv (Ukraine) and directly influences the hydrological characteristics of Tisza within Bocicouau Mare (Romania).
- There are around 7,000 inhabitants in Shopurka basin. Here also one of the main hot spots of the Upper Tisza basin is located – Velyky Bychkiv saw-mill station.
- Opening of the station at Shopurka will provide the information about the development of flood situation at the basin of total area 286 km<sup>2</sup>.
- It is also important to mention that there is NO other gauging station in Shopurka basin.

The proposed changes **will not influence the initial budget breakdown**. In the same time, the previous project task – to reopen station in Dilove will be implemented (although in frame of another project) as well as another one – to re-open station in Kobyletska Polyana will be implemented.

Objective: to re-open the water gauging station for improvement of flood forecast and flood management with flood mitigation purposes. It will allow to get a new information and to improve the flood preparedness in Shopurka and Tisza basin as well as to define discharge from water levels and other hydrological characteristics in the river.

##### Activities:

##### **4.1 Purchasing of equipment and conduct construction works for its re-opening**

- technical conditions for location of the station (obtaining of the land, agreement with energy experts to connect the station to the energy source and road specialists) were agreed
- construction materials to prepare the place for the station as well as to create conditions for the stations safety (construction of the steps to the river, wall protection etc.) were obtained
- all needed construction works were conducted.





#### ***Automatic gauging station***

The automatic gauging station itself was provided by Zakarpattya Hydromet as a part of co-financing. It measures and provides data on line for

- water level,
- water temperature and air temperature
- moisture of air.

#### ***4.2 Calibration of the equipment to order to use the old database from this station and conduction of trainings for its stuff;***

- the rows of the data from the old station to the new one; it will be done also as in-kind contribution from Zakarpattya hydromet were calibrated
- trainings for personal and to test the equipment was conducted.

#### ***4.3 Official re-opening of the station with data transmission for the Ukrainian and Romanian organizations.***

The station was reopened in May 2010. Now the data from it are in general available in on-line regime at web-site of Zakarpattya Hydromet <http://gmc.uzhgorod.ua> (after December 2010 floods the sensor was ruined and now the station is being reconstructed). It was proposed to reinforce the whole construction taking into account a strong power of floods in this mountaineer region.

### **Component 5. Design and construction of local waste water facilities for boarding school complex in Velyky Bychkiv**

#### ***Deviation from project proposal***

Taking into account the world economic crisis and its heavy impact on Ukraine, decrease in the funds inflow into state and local budgets, including the budget of the Velyky Bychkiv village, it is impossible for the moment to build wastewater treatment facilities for the whole district. Originally it was planned that the project will cover the costs of design of such network and the village council will fund its construction (approximate costs – 100,000 USD), but even in project proposal such risk of lack of co-finding was stated. Absence of the national funds in village council will make useless all project efforts because the design of such wastewater treatment facilities if not built right away will need to be corrected; the cost of materials for the network is different each year; infrastructure of the district is changing each year. Therefore it is not feasible to use the project money for the design of wastewater treatment facilities, which not clear when they will be built.

Therefore we propose to design AND construct local wastewater treatment facilities of just smaller scale, namely for boarding school in Velyky Bychkiv.

This boarding school is the place for orphans, children of the only parents or poor parents. There are 23 children in the school and 100 of them are living there on permanent basis. There are also 53 teachers, out of which 21 are constantly living near the school in teacher's house. The school and its infrastructure is built in 1964 (45 years ago). For the school, wastewater treatment network based on mechanical treatment was built. After catastrophic floods in 1970, 1994, 1998, 2001 and 2008, treatment facilities were heavily damaged.



As a result of ineffective work of the wastewater treatment facilities, each year Tisza receives untreated waters, because they have direct discharge into Tisza. Just downstream of the discharge at the right bank of Tisza there is water in-take for Velyky Bychkiv and a little bit more downstream – the water in-take in Romania for water supply for Sigetu-Marmatseu and surrounding villages.

As a result of this project direct pollution of Tisza river was reduced. For e.g. COD concentrations in the end of pipe have reduced from 75,3 mgO<sub>2</sub>/dm<sup>3</sup> to 18,3 mgO<sub>2</sub>/dm<sup>3</sup> (in more than 4 times), BOD – from 59,2 mgO<sub>2</sub>/dm<sup>3</sup> to 12,6 mgO<sub>2</sub>/dm<sup>3</sup> (in more than 4,7 times), N-NH<sub>4</sub> – from 7,4 mg/dm<sup>3</sup> to 1,7 mg/dm<sup>3</sup> (in more than 4,3 times). For more results please see Table in Chapter 5.3.

The construction of the local wastewater facilities here is also important because the boarding school is social infrastructure which doesn't have enough funding itself. However, it has already constructed canalization network, which can be used.

### *Proposed solution*

It is proposed the use the modern local wastewater treatment facilities with *biological* treatment.

The project has conducted the local tender for the wastewater treatment facilities. The winner of the tender became company “Canal Lux” (Uzhgorod, Ukraine). This company is the first one who applied Biotals (system of full deep treatment of wastewaters) In Ukraine. The wastewater facilities are produced according to the certified technology, developed in Czech Republic. It has a large experience of work in Ukraine (more than 150 installations). The company gives warranty for 3 years and monthly service works. It is planned to conduct monitoring of water quality during each month of work of wastewater facilities to see the effect of the treatment. Besides, as a part of their promo action in the region, the company co-funds of around 5,000 USD into the facilities. The results will be shown in the final report on this component.

Besides, which is the most important, it is one the best modern cost-effective technologies for local wastewater treatment in Ukraine. So this way the project will promote best practices in Ukraine. It corresponds to the decree of the head of Zakarpattya Oblast Administration from 16<sup>th</sup> of August 2005 “*On Use of Modern Systems of Deep Treatment of Wastewaters*”.

The capacity of planned wastewater treatment facilities (type Bioleader -10) is 10m<sup>3</sup> / day or 3650 m<sup>3</sup> per year.

It is worth of mentioning that taking into account the social value of the project the co-finding from the side of the subcontractor's company is 40,000 UAH (5000 USD). It makes such a decision also to popularize these wastewater treatment facilities in this part of the region.

Objective: to design and construct local wastewater treatment facilities for the boarding school in Velyky Bychkiv

Activities:

#### *5.1 Preparatory works for installation of the wastewater treatment facilities*

- Preparation of design documentation
- Works to prepare the place for installation (cleaning the canalization network of the boarding school, preparation of the place for installation, drainage way, outlet in the bank)

The project has conducted the local tender for the wastewater treatment facilities. The winner of the tender became company “Canal Lux” (Uzhgorod, Ukraine).

The positive result, archived during this period, is documented provision of 123,000 UAH (around 15,000 USD) for preparatory works for local wastewater treatment facilities and complete



reconstruction of water canalization pipeline system in the boarding school from budget of Rakhiv rayon administration. This shows that rayon administration is interested in implementation of this component and ready to provide more than 60% of co-finding. The project stimulated the attention of different stakeholders to the school and the problem of wastewaters which makes such a large contribution possible in time of crisis. Also cofunding was provided by “Canal-Lux” itself in form of discount for wastewater treatment installations (81,000 UAH – around 10,000 USD) because it is done for orphan school and because it serves as advertisement for further activities of this company in Rakhiv rayon.



### 5.2 Installation and commencement of wastewater facilities

The wastewater facilities were installed in spring 2010. There were some problems regarding exceedance of the waters coming for treatment for wastewater facilities, but it was successfully overcome. Now the wastewater facilities successfully function.

### 5.3 Monitoring of work of the wastewater facilities

There was diagnostics of the equipment and active sediments analysis, chemical water quality analysis done before and after the installation.

The results are present in the Table below.

№	Parameters	Measuring unit	Wastewater quality analysis before and after		Ukrainian MAC
			before	after	
1	Suspended solids	mg/dm <sup>3</sup>	72,5	14,2	15
2	pH	-	7,3	7,1	6-9
3	N-NH <sub>4</sub>	mg/dm <sup>3</sup>	7,4	1,7	2,0
4	N-NO <sub>3</sub>	mg/dm <sup>3</sup>	1,8	6,3	9,1
5	N-NO <sub>2</sub>	mg/dm <sup>3</sup>	0,02	0,08	1,0
6	Phosphates-ions	mg/dm <sup>3</sup>	1,6	0,45	0,5
7	COD	mgO <sub>2</sub> /dm <sup>3</sup>	75,3	18,3	30
8	BOD	mgO <sub>2</sub> /dm <sup>3</sup>	59,2	12,6	15
9	Mineralization	mg/dm <sup>3</sup>	367	243	1000
10	Surface active substances	mg/dm <sup>3</sup>	0,1	0,05	0,5

Output: Local wastewater treatment facilities are built and effectively function

Benefits:

- Decrease of pollution load on Tisza and especially for the water in-takes located downstream
- Improvement of sanitary and safety conditions in the boarding school
- Demonstration of the best practices in biological wastewater treatment



## 5. Achievements of the project and how these benefit Tisza Countries

Benefits of the works done:

- 1) by involvements of two villages on both side of Tisza the project restored relations and practically supported Ukrainian-Romanian cooperation at local level, which is an important element of successful implementation of the RBM,
- 2) the project practically showed how to establish sustainable local waste management system and supported first PET bottles recycling unit in Ukrainian part of the Upper Tisza, supporting the decrease of pollution by communal waste of water courses;
- 3) the project showed low-cost and simple methods to mitigate local floods consequences in the villages (such as sediments trapper construction and enlargement of the space on bottle-necks under bridges);
- 4) for the first time in Ukraine flood hazard and flood risk maps following the requirements of EU Flood Directive were established. Later this experience was further disseminated at national and international levels.
- 5) the project took simple and easy actions regarding restoration of the mountains creeks after forest cutting. As a result, we have healthy ecosystem and even fish returned back to the creek. The methodology developed and tested was provided to the State Forestry Committee to become a basic for the relevant legal act.
- 6) the project support biodiversity studies on the lakes and gave recommendations how to avoid overgrowing of the lake by plants.
- 7) the project created automatic gauging station at Shopurka river, (tributary of Tisza, not covered previously by the monitoring station). The data are visible on-line for Ukrainian and Romanian colleagues at <http://gmc.uzhgorod.ua> This way monitoring system of both countries was strengthened.
- 8) the project promoted installation quite cheap and easy in operation local wastewater treatment facilities with biological cleaning, whose application will lead to decrease of untreated wastewaters entering Tisza, which corresponds to the goals of RBM.

The key benefit is that such projects really involve local citizens in solution of environmental problems and make applicable heavy and sometimes quite abstract terms “transboundary river basin management”, “ecosystem rehabilitation”, “waste management” of RBM. Our experience showed that many of the problems tackled by the project are at present being further solved with involvement of EU Commission, oblast administration etc, so it raised the priority of environmental problems among all problems of Upper Tisza basin.



## 6. Experiences and examples of Integration (water quantity and quality management)

ICPDR Tisza EG has defined the following priority issues in connection to *integration on water quality and water quantity* is the following: groundwater depletion because of over abstraction, increased irrigation and related surface water abstraction, hydromorphological pressures from flood protection measures, accidental pollution due to flooding, loss of wetlands, impacts on climate change on low water flow and solid waste.

Out of this list, 3 will be addressed in frame of this project:

- namely hydromorphological pressures,
- accidental pollution due to flooding and
- solid waste.

As far as this demonstration project is a part of MSP project, it also assisted with nutrient reduction (which is one of the main goals of the MSP project) by establishment and popularization of local wastewater treatment facilities based on the best available techniques (deep biological treatment). It also promoted reduction of floods by creating for the first time in Ukraine local streams management plan and flood hazard and flood risk mapping.

The integration of waste management, flood risk protection and nutrients reduction was archived when considering management of local creeks in Velyky Bychkiv. Waste problems reinforced flood problems by creating barriers for water throw. When the project with the support of village council started to clean the creeks, it found a lot of illegal wastewater pumps, which were closed and the need of sanitation tanks was reinforced.



## 7. Logframe Indicators and results

Project Objective	Indicator	Baseline	Obtained	Sources of verification
<b>Project Outputs</b>				
<b>Output 1</b> <b>Improved communal waste management system functions</b>	<i>State of Tisza floodplain</i>	Polluted with the garbage	Cleaned and kept cleaned	Site visit to VB and BM
	<i>Containers and press purchased</i>	No	<b>300</b> containers (120 l) for households in Velyky Bychkiv <b>20</b> containers (1100 l) for PET bottles in Velyky Bychkiv <b>31</b> containers (240 l) for hot spots (cafes, restaurants) <b>20</b> containers (240 l) for glass, paper and PET sorting for schools of Bocicaua Mare <b>12</b> containers (750l ) for plastic and general waste	Containers purchase and transfer of ownership documents
	<i>Subscription of local population to waste collection services</i>	10%	70%	Agreements with Ecobat Shuravi waste management company
	<i>Information boards about waste management</i>	no	6 posters installed	Site visit to VB
	<i>Plastic collected, sorted and pressed</i>	no	2,5 tons of PET bottles and packaging are collected, sorted and pressed	Documents, site visit to sorting place



<b>Output 2</b> <b>Management plan of streams elaborated and implemented</b>	<i>Flow and retention capacity of the streams</i>	the flow capacity is decreased	Stream flow capacity increased in 1,5 times	Hydrological and hydraulic data
	<i>Flood risk and flood hazard maps</i>	No	26 maps for 3 types of probabilities and two scenarios: closed and opened sluice at Tisza are developed	maps
	<i>Construction works</i>	No	<ul style="list-style-type: none"> <li>• 2600 m of the Duhnovicha stream was cleaned;</li> <li>• A pond for floodwaters of size 13 x 45 m was created</li> <li>• A catcher for bottom sediments is constructed</li> <li>• The stone embankment of the most vulnerable place near the school is done</li> <li>• Drinking water source "Churiv" is reconstructed</li> <li>• Space under the two bridges is cleaned</li> </ul>	Site visits to the stream
	<i>Public awareness raised on preparedness to floods</i>	Low	High, action plans in times are developed	Brochures
	<b>Last year the bottom sediment catcher already saved the village from the floods and was 4 times cleaned already.</b>			
<b>Output 3</b> <b>Mountainous stream restored (UA) and ecological path created (RO)</b>	<i>Water quality in the stream</i>	4 <sup>th</sup> class of water quality ( high contains of phenols , low oxygen 7,9mg/l. pH - 6,2,	2 <sup>nd</sup> class of water quality	Chemical analysis
	<i>Number of invertebrates species</i>	3 species	1-Plecoptera, 2-Trichoptera, 3-Efemeroptera, 4-Chironomidae, 5-Simuliidae , 6- Gammaridae , 7-Oligochaetae , 8- Coleoptera, 9- Diptera, 10-Ceratopogonidae, 11- Hirudinea	Hydrological sampling
	<i>Presence of the fish</i>	no	<b>River trout returned</b>	
	<i>Cascades</i>	no	At least 3 cascades built	Site visit to the
	<i>Posters and signs</i>	no	put	Site visit to the



<b>Output 4</b> <b>Water gauging station is re-opened</b>	<i>Presence of water gauging station</i>	no	Operational on regular basis	Site visit
	<i>Monitoring data from Kobyletska Polyana</i>	no	Regularly sent to Zakarpattya Hydromet and RO counterparts <a href="http://gmc.uzhgorod.ua">http://gmc.uzhgorod.ua</a>	Zakarpattya Hydromet data
<b>Output 5</b> <b>Sewage water treatment facilities and network are constructed</b>	<i>Presence of sewage water facilities</i>	No	The wastewater treatment facilities of total capacity of 10m <sup>3</sup> /day has been installed	Reports of VB village council
	<i>Water quality of wastewater after treatment</i>	Ammonium-N – 7,4 -P – 1,6 BOD - 59,2 COD – 75,3 Mineralization -367	Ammonium-N – 1,7 P – 0,45 BOD - 12,6 COD – 18,3 Mineralization -243	Chemical water quality analysis



## 8. Reports prepared and meetings attended

The following reports were prepared:

- Component 1: Report “Improvement of Communal waste utilization system for Velyky Bychkiv and Bocicoiu Mare” (in English)
- Component 2. Report “Hydrological and hydraulic investigations in the area of Velyky Bychkiv” (in Russian)
- Component 2. Report “Establishment of Flood Hazard and Flood Risk Maps for floods of different probability and different scenarios” (in Russian)
- Flood Risk and Flood hazard Maps (in English)
- Component 2. Report “Development of the list of practical (engineer, construction) actions, devoted to decrease of risks and consequences of floods and analysis of their efficiency” (in Ukrainian)
- Component 3. Report “River renaturalization after forest cutting” (in English)
- Component 3. Report “Biodiversity of Teplystya lake, Romania” (in Russian).

All these reports are presented in Annexes.

The following meetings were attended:

- 12th Tisza Group meeting and 2nd Workshop of the UNDP/GEF Tisza MSP project (8-9 April 2009, Budapest, Hungary) - Presentation of the demo project and discussion of the contractual issues
- 5th PP Expert Group Meeting (14-15 April, Belgrade, Serbia)- Clarification of the public consultation process to be arranged in Upper Tisza basin and clarification of the requirements to the Danube Day celebration this year
- Inception workshop (11 June 2009, Velyky Bychkiv, Ukraine)
- Danube Day (28 June 2009, Dilove, Ukraine)
- 13th Tisza Group meeting and UNDP/GEF stakeholder meeting (12-13 November 2009, Kosice, Slovakia)
- Public hearings in Velyky Bychkiv (1<sup>st</sup> of March 2010)
- Public participation expert group meeting of ICPDR (22-23th of April, 2010, Lyublyana, Slovenia)
- Tisza EG group and stakeholder workshop (April 2010, Kosice)
- Regional stakeholder workshop and Danube day (24-29 June, Solotvyno, Velyky Bychkiv)
- Study tour for Turkish delegation in frame of EU-funded project “Technical Assistance to mitigating flood risk in flooded areas”, where flood risk and flood hazard maps developed for Velyky Bychkiv were presented.



## 9. Summary of PR activities

Publicity related activities include as follow:

- TV – 30 min documentary “**Green truth**” in frame of very popular program “**Third power**” (NGOs activities) which was three times shown at the regional satellite TV “Tisza 1”. This documentary shows all demo project components and main events during the project cycle. However, the documentary is planned not as project advertisement (the project didn’t pay for its broadcasting), but as documentary for wide public. Taking into account, how popular is Tisza 1 channel is and prime time of the broadcasting, the target area is around 300,000 people living in Zakarpatska Oblast. This documentary was also shown during the regional workshop. *See more in description of Activity 1.7*
- A number of big boards with a specially designed **Great Bull** (angry, happy, seriously putting plastic bottles) and poster with the time of decomposition of garbage in water and information letters for village Velyky Bychkiv. The primary target group was citizens of Velyky Bychkiv – 9,000 people. But as far as the big boards are installed at the main road between Uzhgorod-Ivano-Frankivsk – main state road, also all passing cars got informed (5,000 people per month). After the regional workshop, Zakarpattya water management board said that they want to install the poster with the time for decomposition of garbage (see below) at every large stream in Zakarpattya, using their own funds. It means that the posters are really successful. *See more in detail in description of Activity 1.5*
- newspaper articles: around 20 articles in different regional newspapers and internet were published *See more in detail Annex 4.*
- **Public hearings on flood protection measures** proposed by the project (March 2010) – local citizens of Velyky Bychkiv (around 300 people). It was event conducted according to the requirements of EU Flood Directive, and in frame of this public hearings some of the measures were replaced with the others, like instead of gabion construction, local water supply source was rehabilitated. *See more in detail in description of Activity 2.4*
- Public campaign “**Two banks- one clean Tisza**”. It was an event jointly arranged with Coca-Cola involving UA and RO school children. *See Activity 1.4. for more details.*
- **Regional workshop** , held in Solotvyno, gathering more than 60 people, representing regional and national authorities in UA and RO.
- Number of local, regional and national meetings to present the project results.

## 10. Lessons learnt

At the regional stakeholder workshop, the following list of lessons learned and possible future actions were identified:

1. Solid waste management system: The positive lesson learned was regarding how to persuade people to sign up for waste management services. The project approach was to provide a



container free of charge (normally it costs around 30 Euro, which is a quite large sum for local citizens) for the citizens if they sign an agreement for waste management services. It was done with the support of village council, who tried to persuade each of households located in the central streets to follow the project proposal. It worked very successfully and soon public opinion regarding usefulness of waste management services was changed so that it became popular and socially approved to sign for waste management services.

It was agreed to replicate the positive experience of the project for other mountainous regions. The need of closure of plastic collection and processing cycle was stressed. Now Velyky Bychkiv has a capacity to collect, store and press PET bottles from the whole Rakhiv region. As far as the prices for plastic selling are very low and transport costs are high, it was proposed to suggest equipment for further processing of plastic and its transformation into new products, e.g. boxes, plastic boards etc. Zakarpattia water management board suggested using its own funds to establish posters “Dangerous Inhabitants of the Rivers” – about the time of decomposing of the plastic around all Zakarpatska Oblast. In ***Tisza River Basin Management Plan***, it was stressed to emphasize the issue of communal solid waste management as a key environmental problem.

2. Restoration of the mountainous creeks: this positive pilot experience has been presented at the level of the Vice-Minister of Ukraine, while presenting the modern current achievements of National Academy of Sciences of Ukraine. This experience also should be further replicated for whole Tisza basin, where forest-cutting activities are among the main industrial activities.
3. Development and Implementation of Local Flood Risk Management Plan: in frame of this component for the first time in Ukraine, flood hazard and flood risk maps were developed according to the requirements of EU Flood Directive requirements. Also very useful local flood protection measure is tested – catcher for bottom sediments, which was constructed in Velyky Bychkiv and already showed itself positively during spring and autumn floods 2010, when it caught a lot of sediments and protected village school from flooding.
4. Installation of local wastewater facilities and automatic gauging station: there components are also considered successful and useful for replication. Local wastewater facilities installation are already advertised and replicated by local business (hotel, cafe etc.)
5. It was discussed with representatives of the Delegation of the European Union in Ukraine about possibility of co-funding of the further development of solid waste management system in Rakhiv rayon as well as support for promotion and replication of the experience gained in frame of the project in other Oblast.

NB Success of Velyky Bychkiv project supported EU decision to select Zakarpatska Oblast as pilot region in EU project “Waste Governance – ENPI East” (see more at web-site [www.wastegovernance.org](http://www.wastegovernance.org) )

***General lesson learn regarding key to project success:***

- A good project should have the investment part: without it concepts and plans stay on paper and not visible
- A good project should have its local owner, responsible for its sustainability. In our case, Velyky Bychkiv village council felt the ownership of all project outputs.
- A good project should correspond to local needs (which are more practical, than scientific).



All participants of the regional workshop stressed the importance of such demonstration projects for spreading and testing the approaches stated in the Integrated Tisza River Basin Management Plan and other activities under ICPDR.

## 11. Sustainability of project activities

It is worth of saying that ALL project results are sustainable. After half of year of no interference, we can see how alive are project ideas:

- Solid waste management system: solid waste management infrastructure is being used and is further growing. The garbage and PET bottles now are collected not only in Velyky Bychkiv itself, but also in surrounding villages. The capacity of the waste management company is growing as well as the number of the people signing up for waste management services. The village itself stay very clean and very often is used as example by Zakarpattya Oblast Administration as the best village. The posters draw a lot of attention to the waste. Posters are already many times used by other parties as visible materials.

We have got requests from number of villages to come and to hold them with waste management. For e.g at present village Nizhnye Selishe appealed for grant from Swedish authorities to repeat the experience of Bychkiv at their territory.

### *Plastic melting device???*

It is really important to close the PET bottles collection and recycling cycle in Zakarpattya. As far as the prices for plastic selling are very low and transport costs are high, it was proposed to suggest equipment for further processing of plastic and its transformation into new products, e.g. boxes, plastic boards etc. The project already has an agreement with the number of donors regarding the joint funding of purchasing of such a device.

However, the advice is needed, what kind of device it can be and where to obtain it (quotation).

- Development and Implementation of Local Flood Risk Management Plan: the engineer structures developed in frame of the project have already twice mitigated the floods (in spring and autumn 2010). The village council takes care about regular cleaning of the sediment catcher. It also created a number of small sediment catchers in other parts of the village.
  - Restoration of the mountainous creeks: the creek is restored and its biodiversity is growing. As far as no forest cutting activities are planned at this creek in the next 20 years, we can consider this situation as safe and sustainable.
  - Installation of local wastewater facilities and automatic gauging station: there components are also active. The data from automatic gauging station were received on line and visible at Zakarpattya Hydromet web-site. (Now due to damage done by December flood it is currently not visible due to damage of sensor, but by the end of January will be constructed). The wastewater facilities are included into the balance of the boarding school. They are operational and treat waste waters.
- On the basis of obtained results a number of follow-up projects are developed.



## 12. Potential for replication in Tisza (and wider Danube) region

We would propose for replication for the whole Tisza and even Danube region the following outputs:

- Solid waste management system: the project approach to public awareness campaign (posters, actions planned) can be very useful for other regions in Ukraine and other countries.

Replication of the experience got in frame of solid waste component has already begun. Success of Velyky Bychkiv project supported EU decision to select Zakarpatska Oblast as pilot region in EU project “Waste Governance – ENPI East” (see more at web-site [www.wastegovernance.org](http://www.wastegovernance.org)), Coca-Cola came with additional investments for this mountaineer region, the number of the people signing up for the waste management services has grown, the whole local waste management company business has grown to cover not only Velyky Bychkiv, but other near-by villages. It was selected as the best in the Rakhiv region.

- Development and Implementation of Local Flood Risk Management Plan: the methodology of the flood risk and flood hazard maps development, tested in Velyky Bychkiv, was already successfully replicated for Turkey (EU-funded project “Technical Assistance to mitigating flood risk in flooded areas”), Ukraine and Belarus (Pripyat basin, ENVSEC project). Zakarpattya Water Management Board applied for the project on the development of such maps for the rest of Zakarpattya.
- Restoration of the mountainous creeks: This experience also should be further replicated for whole Tisza basin, where forest-cutting activities are among the main industrial activities.