Developing a transboundary vulnerability assessment and adaptation strategy in the Dniester River basin

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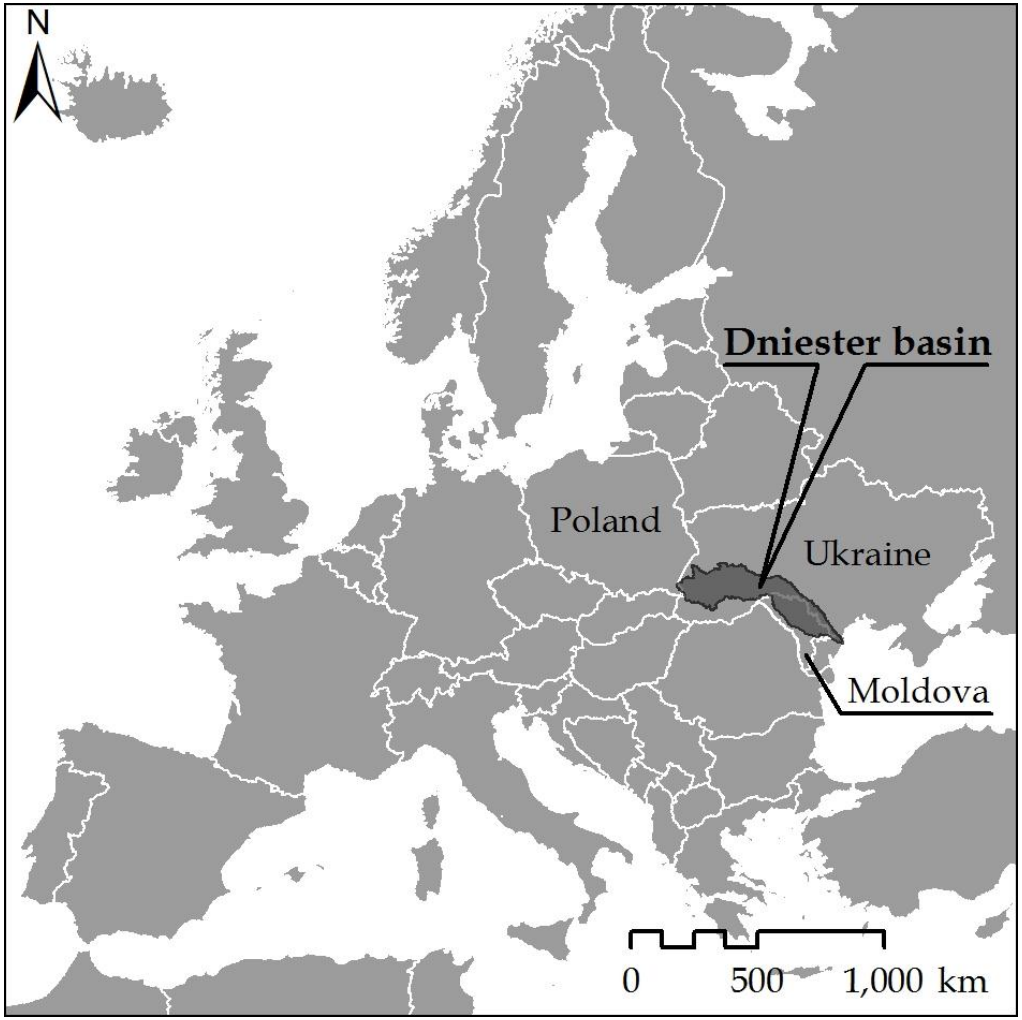
Location of the Dniester River basin in Europe



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PHYSIC-GEOGRAPHICAL MAP OF THE DNIESTER RIVER BASIN

The River's length – 1352 км, transboundary part – 200 km; area – 72,100 km²; shared by Moldova and Ukraine

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Project's title: Reducing vulnerability to extreme floods and climate change in the Dniester River basin

Aims of the project:

• to reduce risks from climate change - and specifically from flooding - by mitigating vulnerability and improving adaptive capacity of both riparian countries

•to expand and further strengthen cooperative management in addressing cross-border management of floods, taking into account the long-term impacts on flood risks of both current climate variability and climate change

The project is implemented by UNEP, UNECE and OSCE under ENVSEC in cooperation with local stakeholders (MoEs, academics, NGOs)

THE MOST IMPORTANT CHALLENGES REGARDING DNIESTER WATER MANAGEMENT IN THE FACE OF CLIMATE CHANGE IMPACTS

1. ***Uncertainty in the estimates of possible changes in the river stream flow and its extremes***

2. ***Disregard of the Dniester's reservoirs operating rules in the interests of individual users that results in impairing the downstream ecosystems***

3. ***Strengthening transboundary cooperation in adjusting water use in accordance with changing available water resources***

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THE MOST IMPORTANT CHALLENGES IN THE TROUNSBOUNDARY CONTEXT

- ***Development of common understanding of the concept of climate change vulnerability for a transboundary river basin***
- ***Development of basin-level scenarios of likely climate change***
- ***Transforming the projections of key climatic variables in the parameters of future Dniester river flow and floods intensity***
- ***Harmonization of two countries' socio-economic information needed for the vulnerability assessment that a priori differs by its content and administrative scales***

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Methodology of the vulnerability assessment: *Combination of two approaches*

- ***Start-point approach*** – the assessment of current Dniester water vulnerability based on today's environmental and social situation in the transboundary basin
- ***End-point approach*** – the assessment of future Dniester water vulnerability based on the results of modeling activities of likely future regional climate and river streamflow

In the project a combination of these both approaches was used

Evaluation scheme of assessment of current vulnerability to climate change

Sector	Indicator		Functional relationships	Individual and average weights			
Exposure							
Climate	Temperature change in a warm season		Temperature↑ exposure↑	0.25		**0.5**	
	Humidity index in a warm season		Humidity index↓ exposure↑	0.25			
	Temperature change in a cold season		Temperature↑ exposure↓			**0.5**	
Sensitivity							
Physiographical sensitivity							
Land use (%)	Arable land		Area↑ sensitivity↑	2.0	**0.25**	*0.33*	**-0.5**
	Perennial plants		Area↑ sensitivity↓	1.0			
	Grasslands			1.5			
	Forests			2.0			
	Surface water			2.0			
Soils	Soil quality		Quality↓ sensitivity↑		**0.25**	*0.33*	
	Geomorphologic processes	Surface erosion	Area↑ sensitivity↑		**0.25**		
		Ravines		1.0	**0.25**		
		Landslides		2.0			
Construction	Built-up areas					*0.33*	
Social-economic sensitivity							
Population	Population density (no. of inhabitants per sq. km)		Density↑ sensitivity↑		**0.20**	**0.25**	**0.5**
	Urban population (%)		Share↑ sensitivity↑		**0.20**		
	Women (%)				**0.20**		
	Natural growth		Growth↓ sensitivity↑		**0.20**		
	Demographic load		Load↑ sensitivity↑		**0.20**		
Agriculture	Ratio of unprofitable vs. profitable enterprises		Ratio↑ sensitivity↑		**0.17**	**0.25**	
	Annual average yield of milk		Yield↓ sensitivity↑		**0.17**		
	Yields	potatoes			**0.17**		
		vegetables			**0.17**		
		fruits			**0.17**		
		cereals			**0.17**		
Labor force	Unemployment rate		Rate↑ sensitivity↑			**0.25**	
Crime rate	Total crime rate			0.5		**0.25**	
	Grave crimes			0.5			
Adaptive capacity							
Economics	Road density		Density↑ capacity↑		**0.20**	**0.25**	**0.5**
	Share of industrial workers		Share↑ capacity↑		**0.20**		
	Mobility of employees		Mobility↑ capacity↑		**0.20**		
	Investments in capital asset		Investments↑ capacity↑		**0.20**		
	Average monthly wage		Wage↑ capacity↑		**0.20**		
Agriculture	Milk production		Production↑ capacity↑		**0.33**	**0.25**	
	Slaughter of cattle and poultry				**0.33**		
	Use of mineral fertilizers (per 1 ha)		Optimal use↑ capacity↑		**0.33**		
Medical provision	No. of physicians per 10 thou. inhabitants		Number↑ capacity↑		**0.33**	**0.25**	
	No. of middle medical staff per. 10 thou. inhabitants				**0.33**		
	No. of beds in hospitals per 10 thou. inhabitants				**0.33**		
Housing	Building of new houses		Housing↑ capacity↑		**0.5**	**0.25**	
	Housing provision rate				**0.5**		

Note: ↑, ↓ - increase or decrease of an indicator

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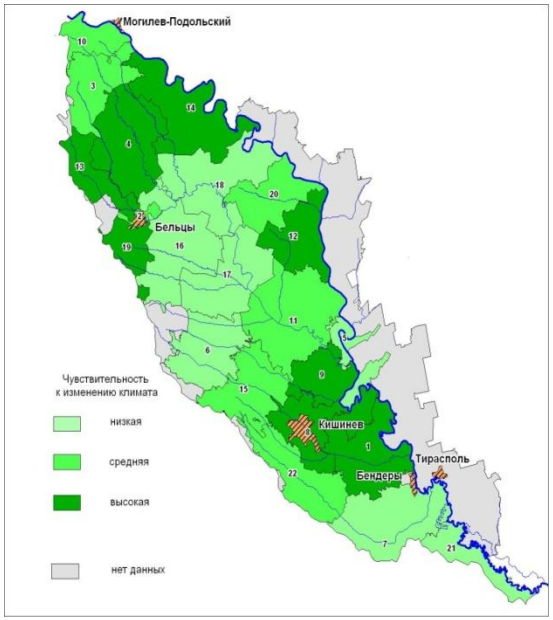
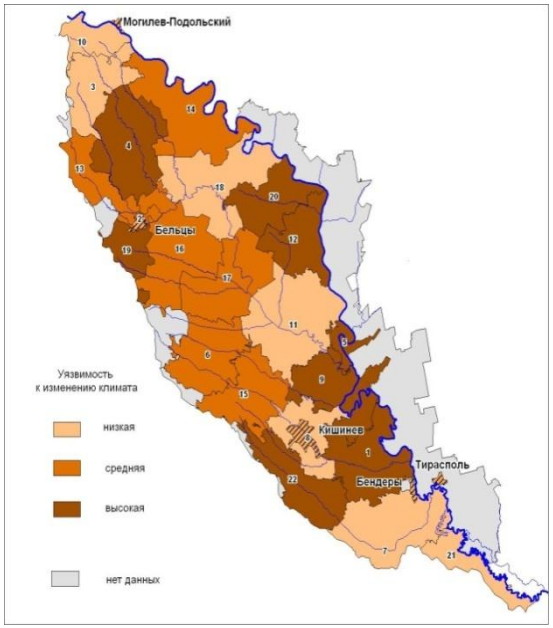
TODAY'S VULNERABILITY OF THE DNIESTER BASIN'S MOLDAVIAN PART TO CLIMATE CHANGE

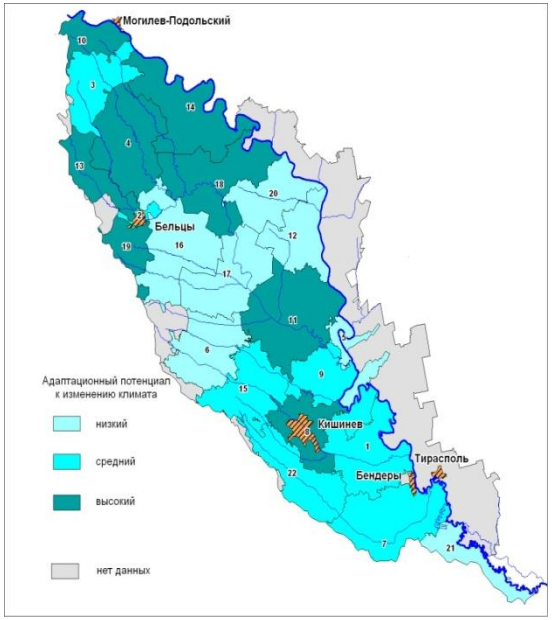
Sensitivity



Vulnerability index



Adaptive capacity



Ranging by vulnerability the Ukrainian part of the basin

Oblast	S	AP	∑	Range
Vinnitsa	2	6	8	*3*
Ivano-Frankovsk	3	2	5	*1*
Lviv	5	5	10	*6*
Odessa	4	1	5	*2*
Ternopol	1	7	8	*4*
Khmelnitsk	7	4	11	*5*
Chernovtsi	6	3	9	*5*

Future water vulnerability: *principal indicators*

- ***water availability*** (future runoff and groundwater levels)
- intensity and frequency of strong stream and low flow conditions
- ***water demand*** (especially peak demands during drought periods)
- ***water quality*** (change in water temperature, nutrient and other contaminants' content)
- ***aquatic ecosystems*** **(**change in composition and biodiversity, etc.)

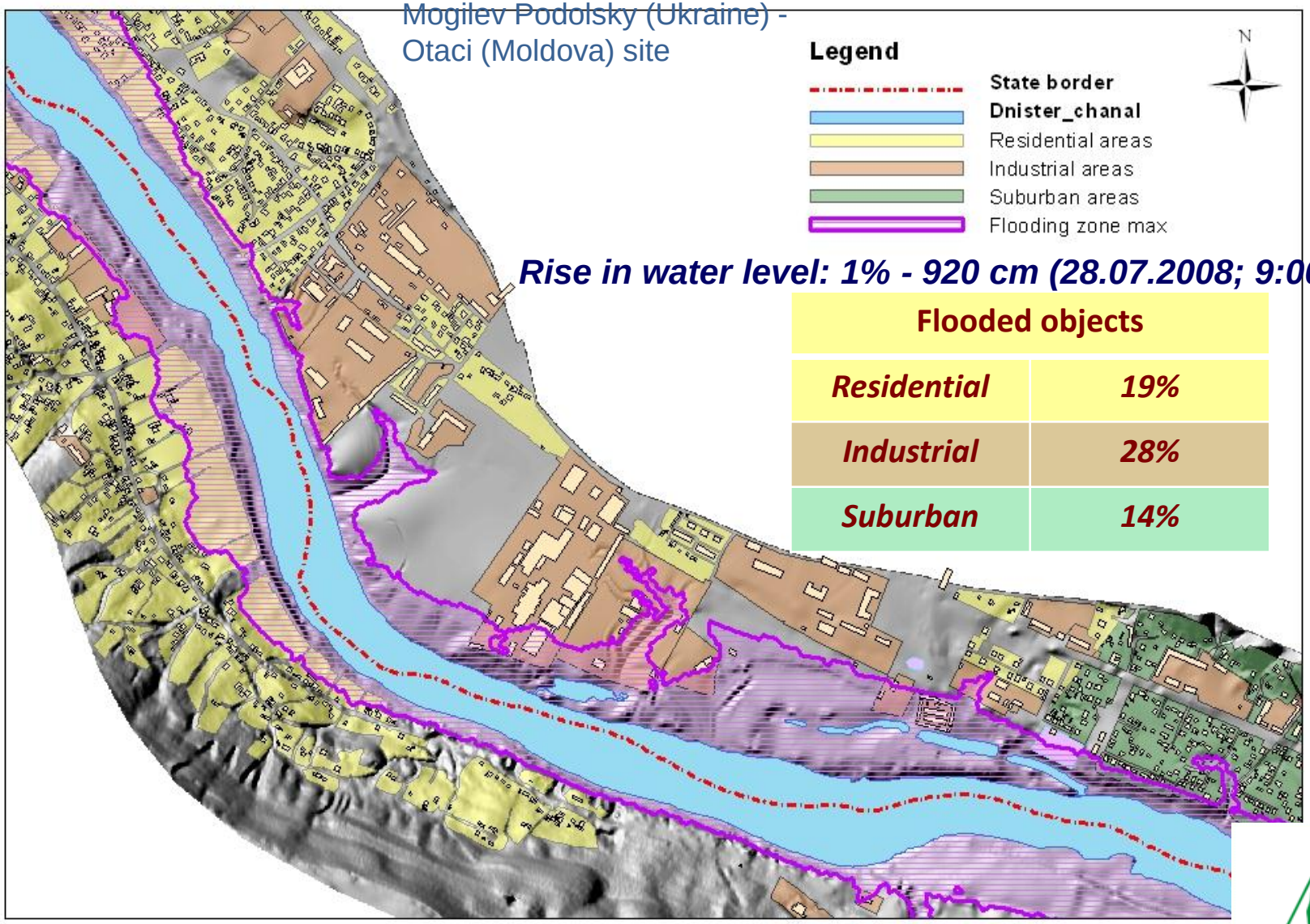
Principal outputs of the Dniester project

- Scenario- and modelling-based study of climate change impacts
- The first basin-wide vulnerability assessment
- Production of flood hazard and risk/vulnerability maps for two sectors in the basin
- 2 Improved/new automated flow monitoring stations and data exchange infrastructure
- Enhanced capacities and plans for flood risk communication on the sub-basin /local level
- Agreement and planning of further measures for flood risk reduction in the framework of the new project: ‘Development of a full transboundary adaptation strategy and implementation of some adaptation measures (monitoring, ecosystem-based nature restoration etc.)

Some examples of the project outputs concerning floods vulnerability: *two approaches to floods modeling*

SPATIAL 2-D ANALYSIS OF THE FLOODED ZONE

Mogilev Podolsky (Ukraine) - Otaci (Moldova) site



Rise in water level: 1% - 920 cm (28.07.2008; 9:00)

Flooded objects	
Residential	*19%*
Industrial	*28%*
Suburban	*14%*

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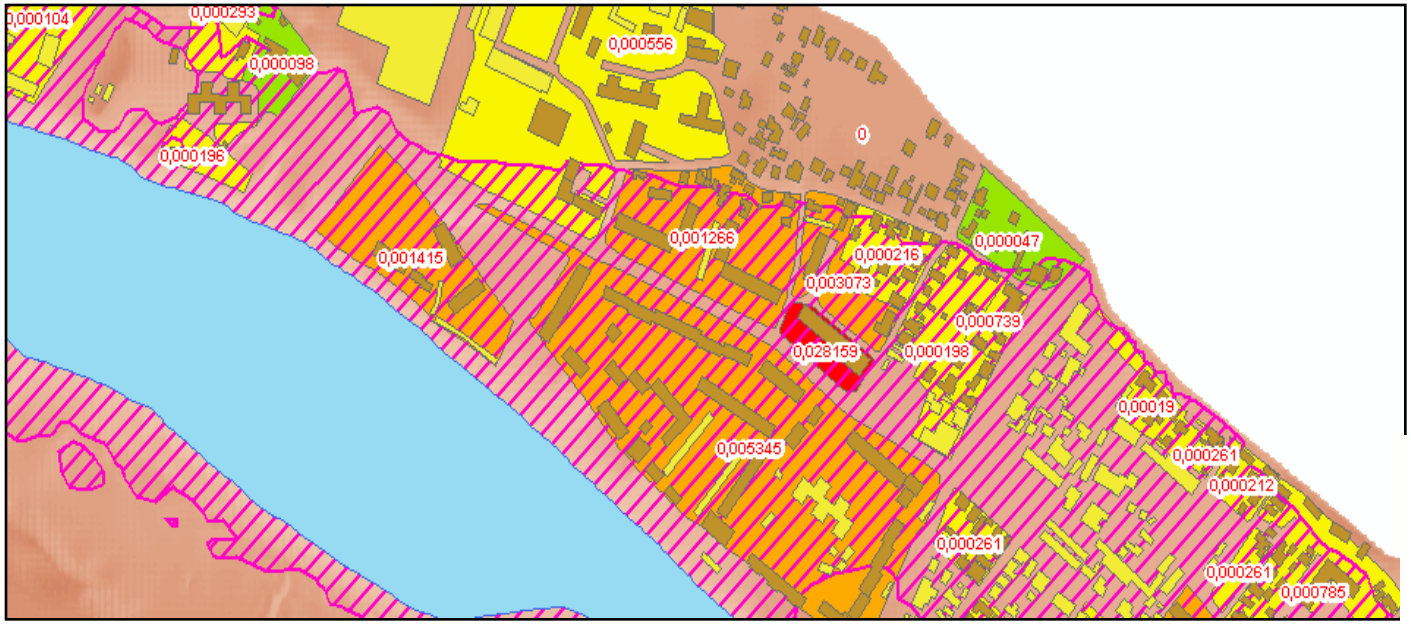
FLOODS RISK ASSESSMENT: *POTENTIAL ANNUAL INDIVIDUAL RISKS FOR HUMAN BEINGS*

P - average likelihood of flooding due to flood or hydraulic failure;
Nsf - population in the settlements that can get in the zone of flooding;
Tf - the total time during which keeps flooding;
Ns - number of the region population where the risk assessment;
Vtf - vulnerability of the population depending on time of wave approach;
Vsf - vulnerability of the population depending on age;
Vsd - vulnerability of the population depending on the depth of flooding;
Ris (af> 2) - a potential individual risk of life from potentially dangerous objects that were flooding into the area> 2 m

$$Ris\ (f) = P\cdot((Nsf\ /\ Tf)\cdot Vtf\cdot Vsf\cdot Vsd\cdot(1\ /\ Ns) + Ris(af_{>2}))^{*}$$

*** Parameters defined , using GIS**



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Examples of the flood zones description

Участок 5 *Вадул-луй-Водэ*

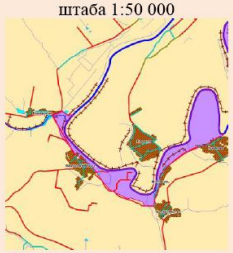
Участок расположен в 23 км ниже Дубоссарского водохранилища. Ожидаемая зона затопления расположена на правом берегу Днестра, охватывая 5 населенных пунктов – *Кошерница, Вадул-луй Водэ, Бэлэбэнешть, Мэлэешть, Коржова*. Общая длина затопляемой зоны при Сценарии 1 составляет 18 км, максимальная ширина – 3 км. По Сценарию 2 размеры увеличиваются на 20%.

Космический снимок

Зона отдыха Ваду-луй-Водэ, исключающая защиту в виде заградительных дамб. Защита от наводнений и паводков обеспечивается адаптационными мероприятиями.

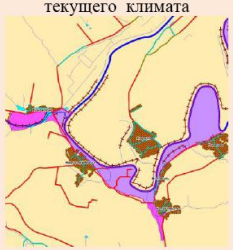
Топографическая карта масштаба 1:50 000

Высота подъема воды (светлая полоса) при наводнении 2008 г на удалении 200 м от меженного уреза воды



Зона 1%-го наводнения текущего климата

Новые коттеджи в зоне отдыха, построенные на сваях с учетом возможного наводнения (высота над уровнем земли 1,5-2,м)



Зона 1%-го наводнения ожидаемого климата

Участок 11 *Рэскэець – Тудора*

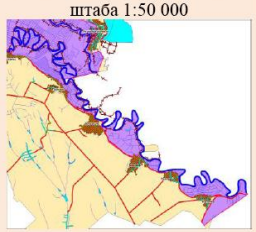
Участок расположен в 210 км ниже Дубоссарского водохранилища. Ожидаемая зона затопления расположена на правом берегу Днестра, охватывая 6 населенных пунктов – *Рэскэець, Пуркарь, Олэнешть, Крокмаз, Тудора, Паланка.* Общая длина затапливаемой зоны при Сценарии 1 составляет 87 км, максимальная ширина – 4 км. Прорыв левобережной дамбы в 2008 г привел к затоплению 15 тыс. га с.-х. угодий Украины. По Сценарию 2 размеры увеличиваются на 10 % и зона затопления соединится с Кицканской.

Космический снимок

Наращивание дамбы мешками с песком в 2008 г., т.к. она «расплылась» (не покрыта уплотняющим материалом). Необходим капитальный ремонт и наращивание до Олонешты.

Топографическая карта масштаба 1:50 000

Пример «индивидуальной» защиты от наводнения частного дома в 2008 г.



Зона 1%-го наводнения текущего климата

Приусадебный участок в паводкоопасной зоне. Экономически целесообразен вынос строений из зоны затопления и освобождение земель для заливных лугов и пастбищ

Зона 1%-го наводнения ожидаемого климата

THE MOST IMPORTANT OUTCOMES AS REGARD TO TRANSBOUNDARY COOPERATION

For the first time:

- ***A joint teamwork*** **of Ukrainian and Moldavian experts on the very important environmental issues - climate change and floods - was actually realised**
- ***Problems of floods*****, linked to climate change and its impacts on Dniester water resources, were considered as a** ***common transboundary concern***
- ***A good basis*** **was created for** ***future transboundary cooperation*** **in the efforts on climate change adaptation of the Dniester basin's natural and social systems.**

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Lessons learned

- Importance of thorough baseline study to identify completed or ongoing projects and relevant partners to be involved
- Crucial to coordinate between different governance levels (local – national - transboundary)
- Special attention is needed for connecting research with policy making (e.g. creation of the working group on the Dniester)
- A joint group needed for joint assessment of problems, priorities, solutions, of developing joint scenarios, modeling and vulnerability assessment: many practical problems will arise
- Importance of involvement of local stakeholders: MoEs, academics, NGOs, water users

Dniester treaty as an epilogue

On November 29, 2012, in Rome in frames of the Water Convention MOP6, the Dniester Basin treaty on cooperation in protection and sustainable use of the Dniester River basin was signed by governments of Moldova and Ukraine. This treaty is a unique such document on post-Soviet space, it unites forces of all stakeholders to manage natural resources of the basin in a sustainable way. As NGO I can say that this treaty would never appear without permanent involvement of the civil society organizations of two riparians.

But pan-basin association of eco-NGOs could be a good example of eco-NGOs self-organization on transboundary level.

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