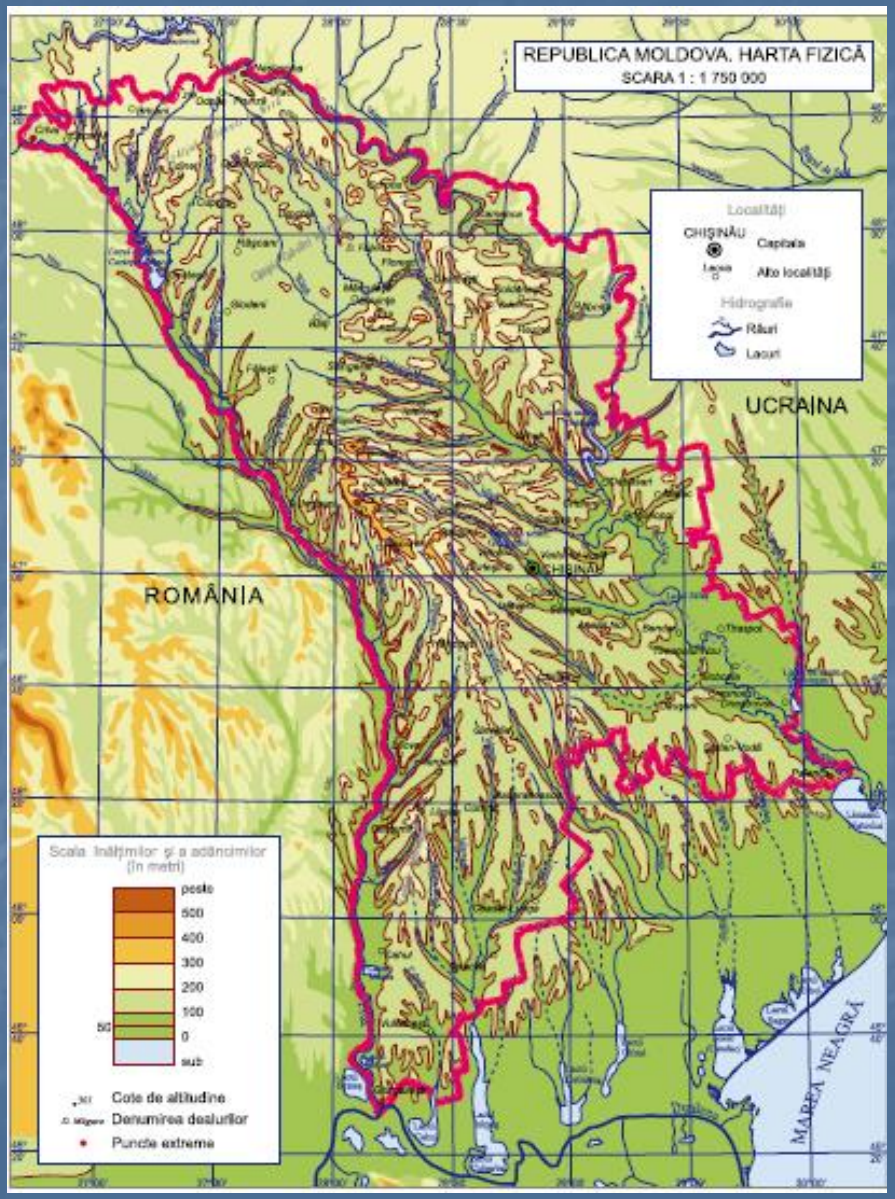
Academy of Sciences
of Moldova

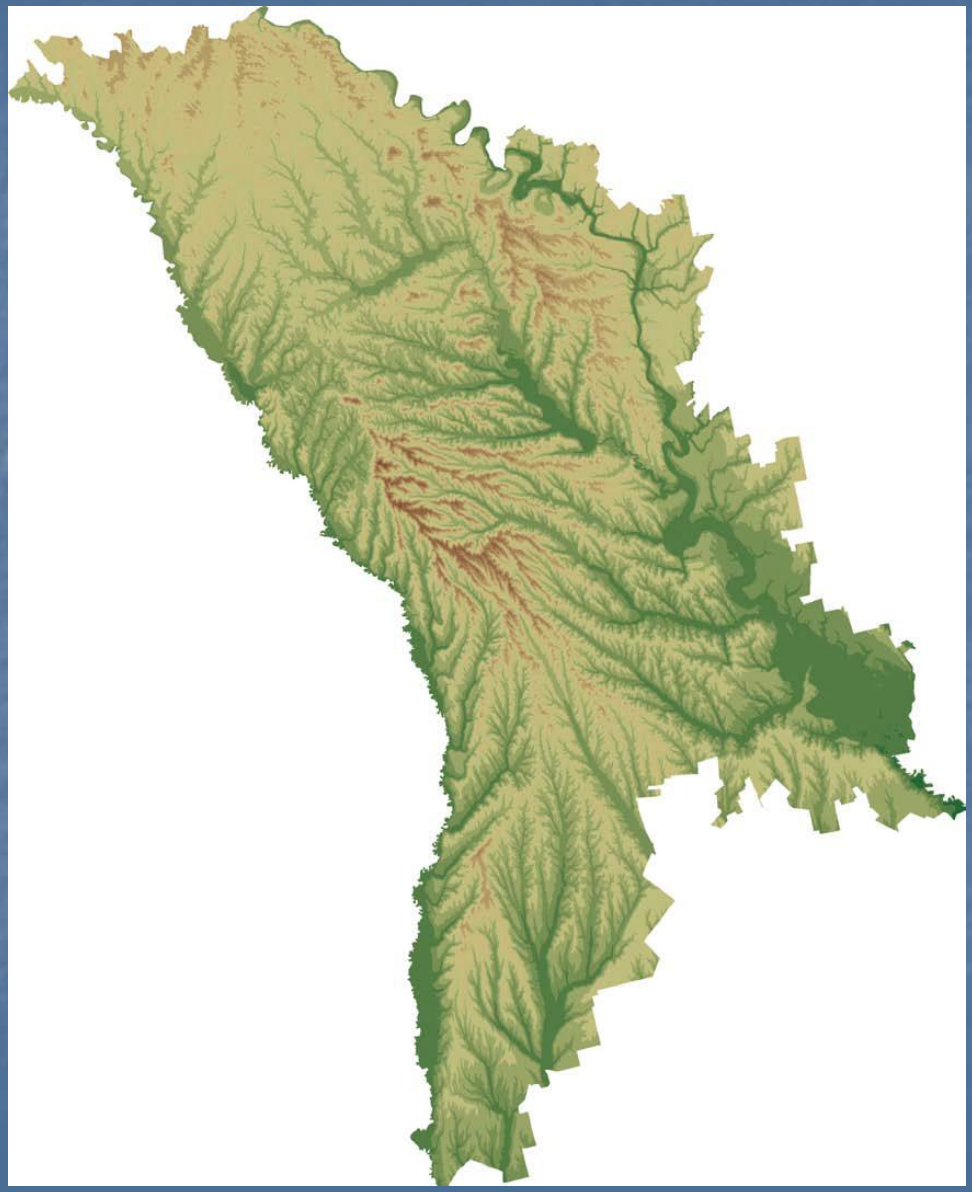
Institute of Geology and
Seismology

Flood hazard study in Moldova

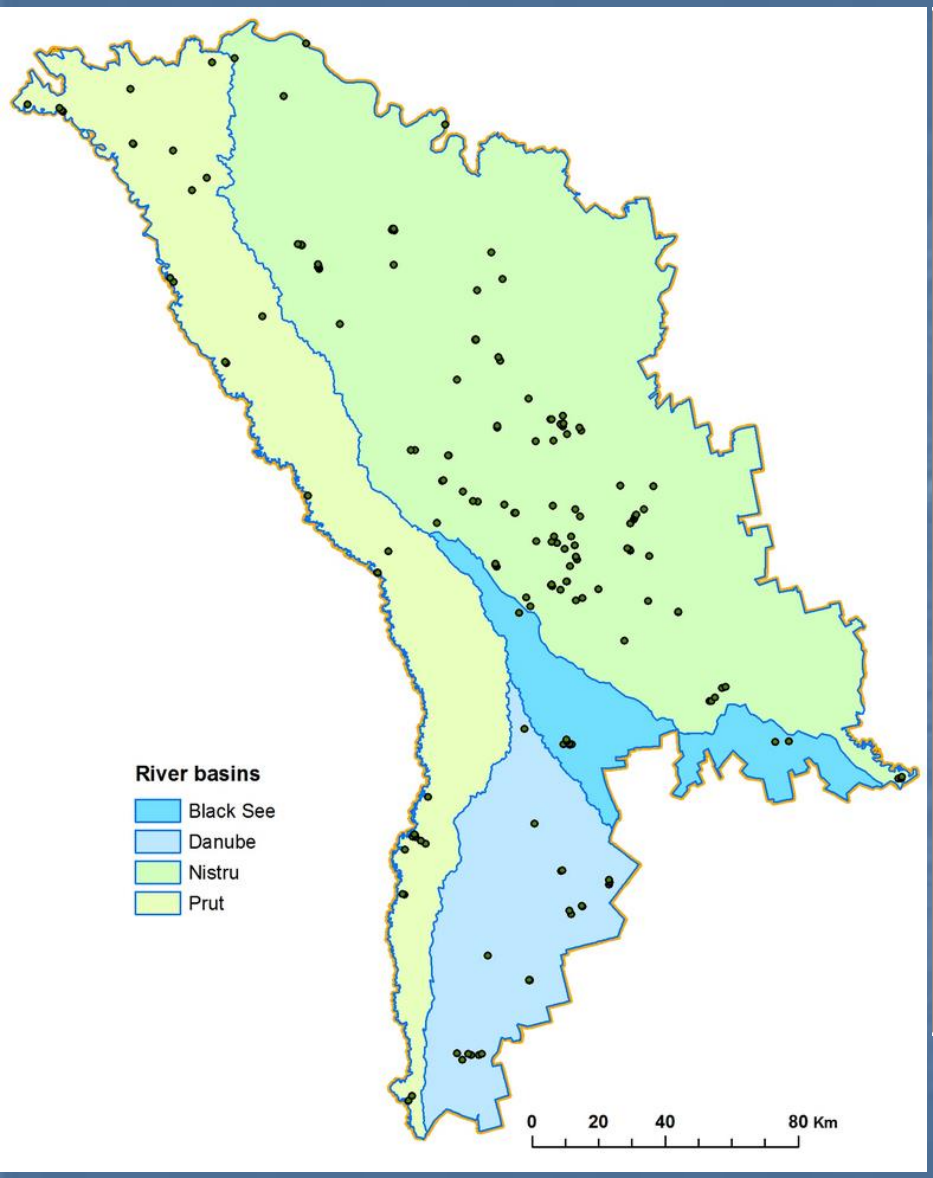
Istanbul, 13 March 2014

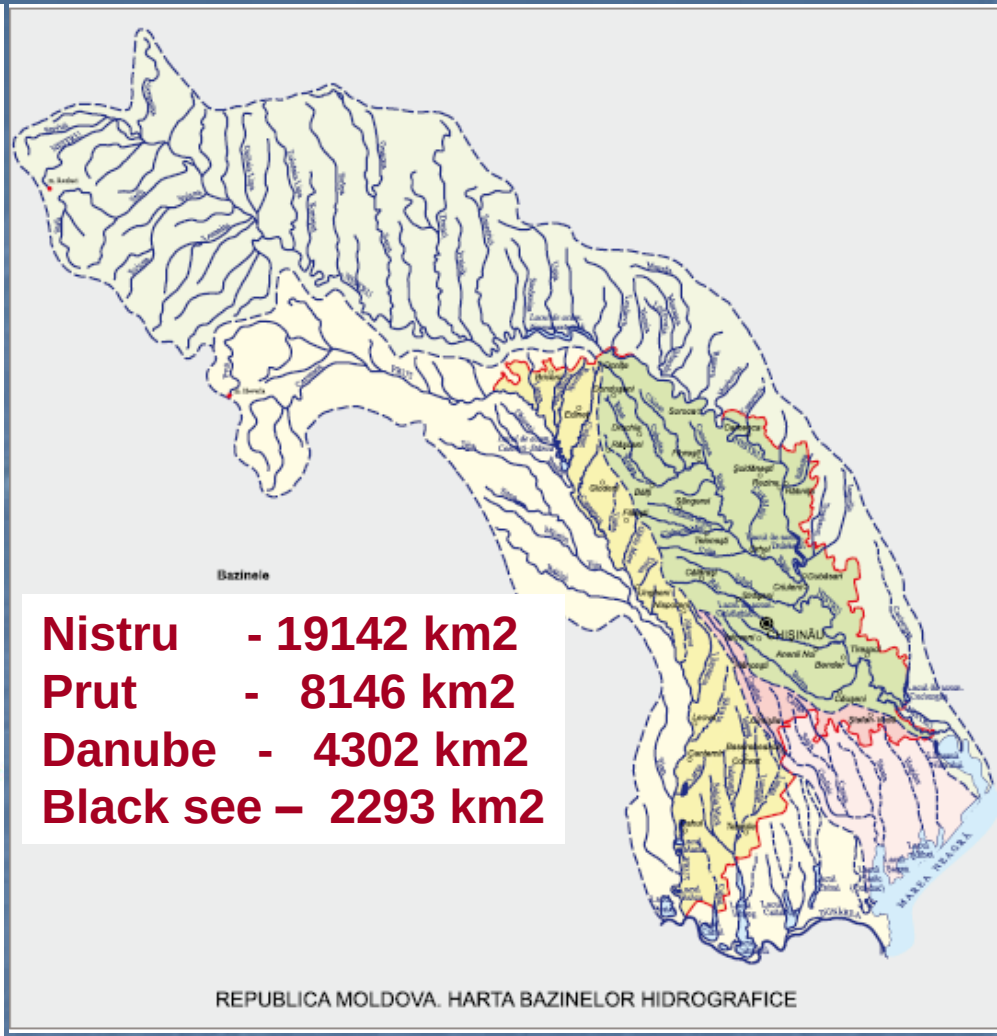
Relief and hypsometric maps





The principal river basins in Republic of Moldova





Nistru - 19142 km2
Prut - 8146 km2
Danube - 4302 km2
Black see – 2293 km2

Two principal basin management authority: Nistru; Prut, Danube and Black See

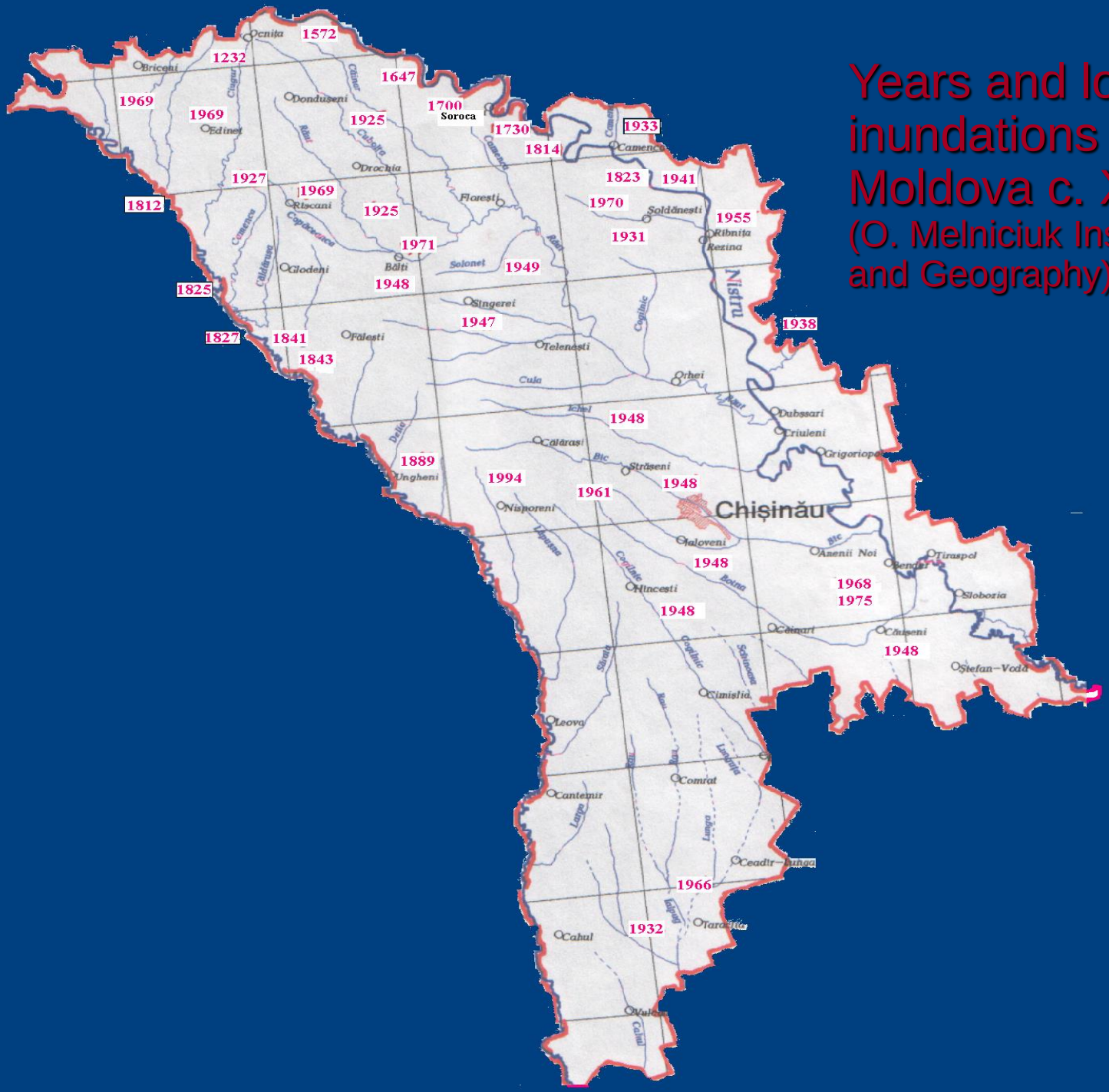
Catastrophic floods in Moldova in the summer of 2008 and 2010

Two principal rivers Nistru (Dniester) and Prut had the most destructive floods in 1941, 1955, 1969, 1974, 1980, 2008, 2010.

Moldova has 57 natural lakes and about 3 400 reservoirs, including 90 with a volume of more then 1 million m^3.

The largest water reservoirs are: Costesti-Stînca (735 million m^3) on the Prut river and Dubasari (277.4 million m^3) on the Nistru river.

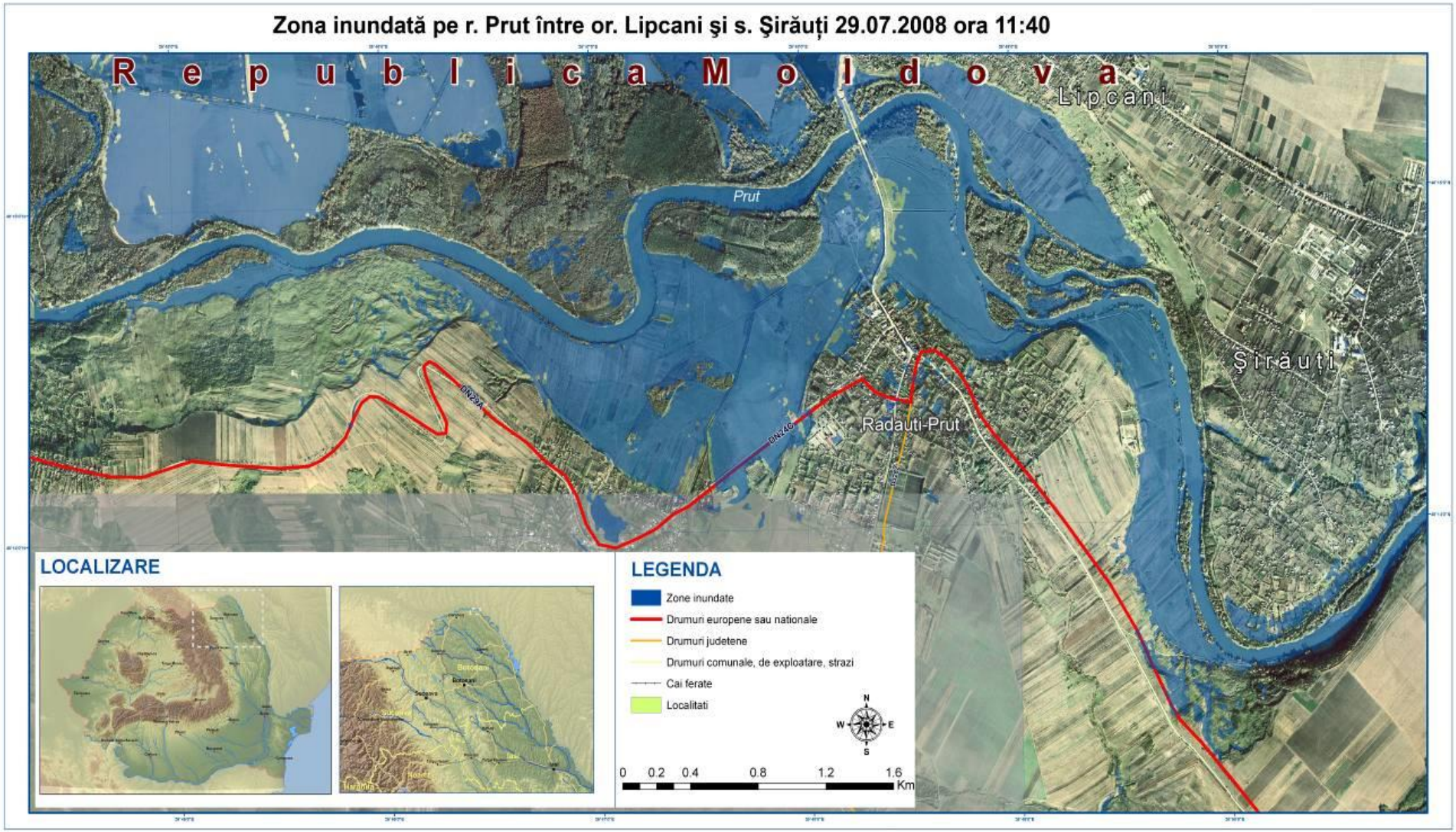
There are two types of natural floods: those caused by spring snowmelt and rain and those by heavy rainfall during the warm period of the year. The dangerous increase of water level of the Nistru and Prut rivers (within Moldova) is caused by high quantities of water from precipitation or rapid snowmelt in the upper river basins (in Ukraine and Romania).



Years and locality of strong inundations in Republic of Moldova c. XII-XX.

(O. Melniciuk Institute of Ecology and Geography)

The example of image of the flood at Prut river 2008



Distribution of hydrological observation points (47 points) Hydrometeorologic Agency of Republic of Moldova

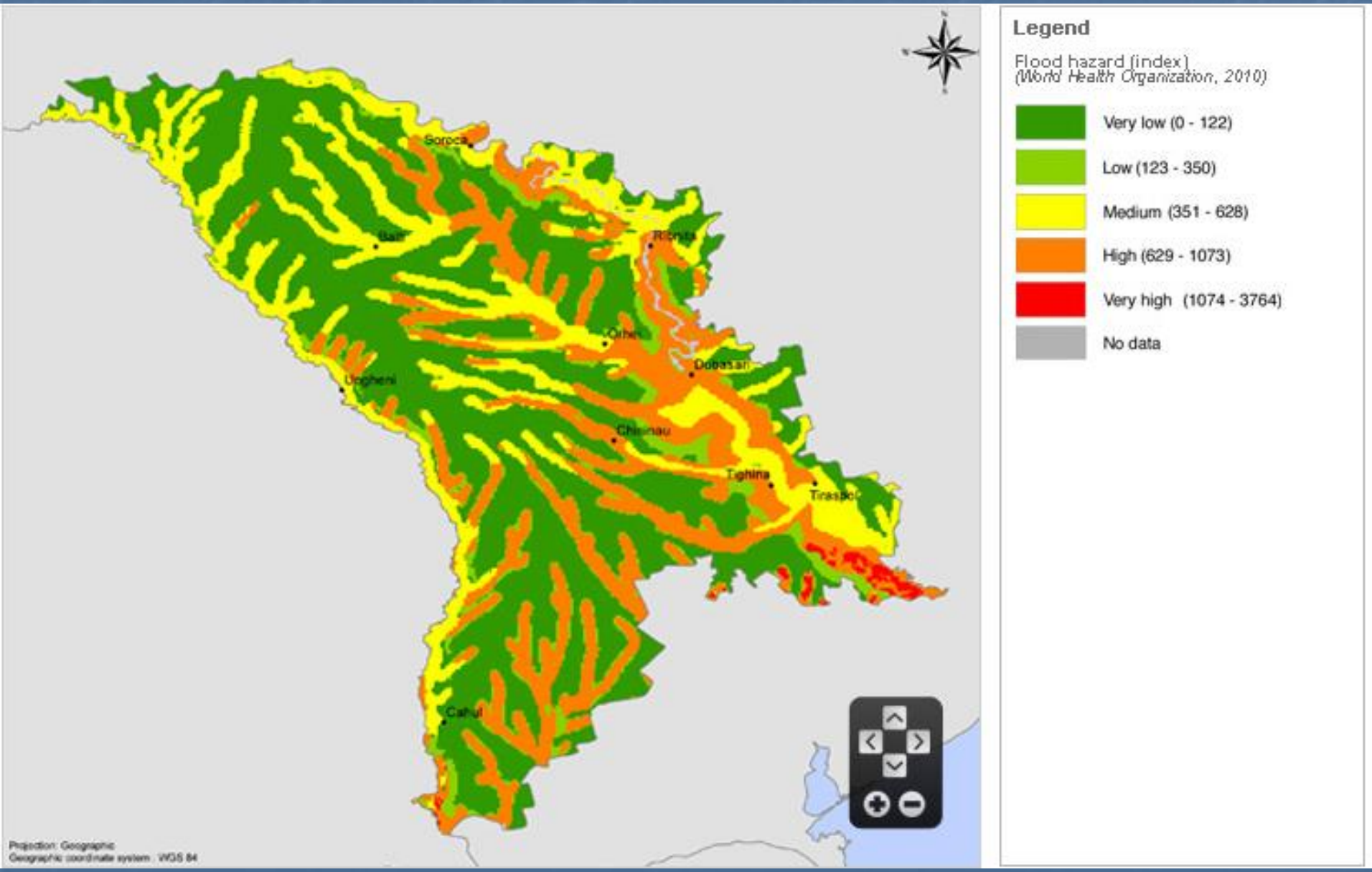
Service continuously provided the local authorities, relevant institutions, economic sectors and the population with operative and qualitative information on hydrological monitoring, including the evolution of the high waters (hydrological informative notes, forecasts, bulletins and warnings).

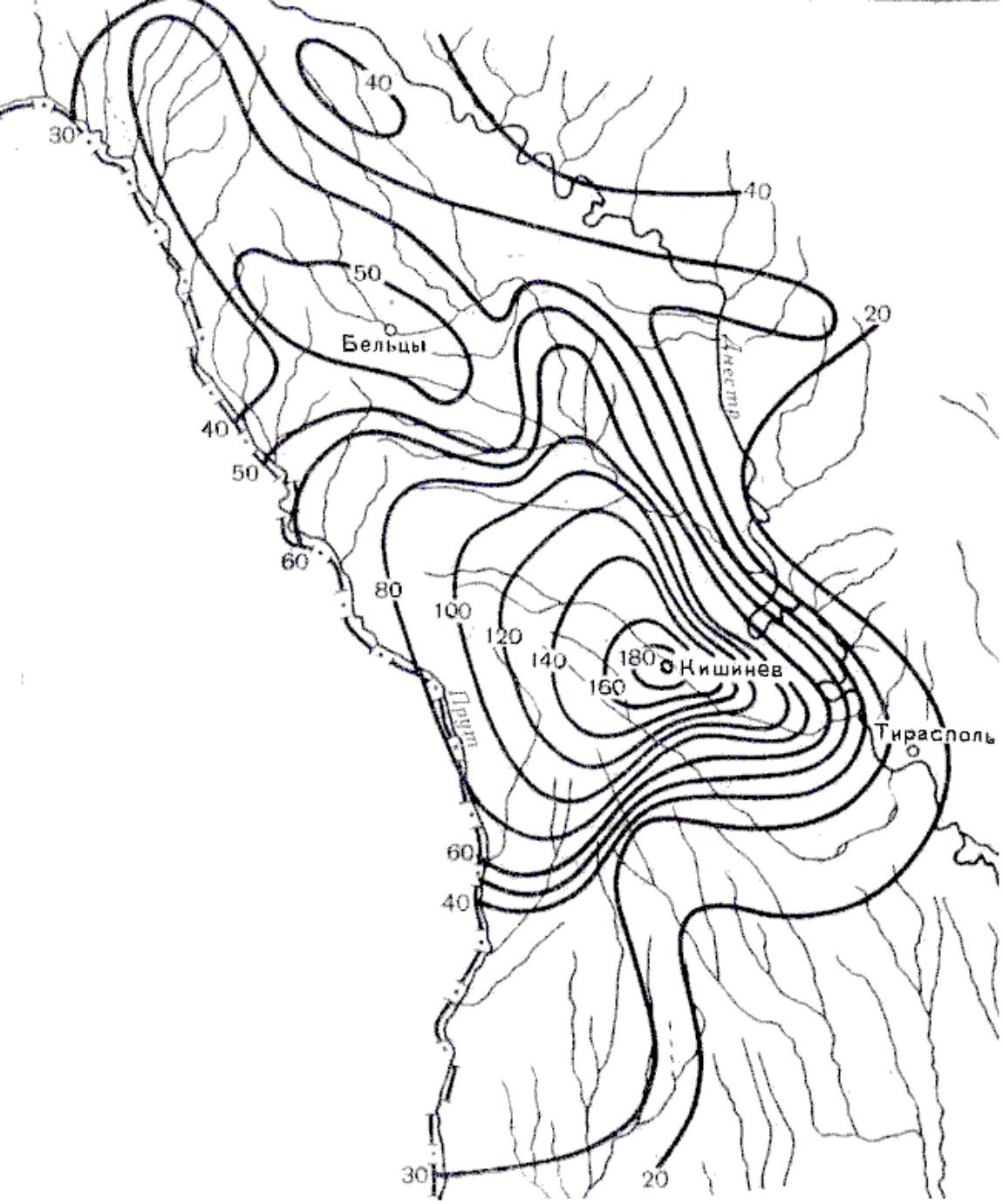
The land surface periodically affected by floods in Moldova is 20 %, i.e. more then 600 000 ha.

Near 10 % of the dams and hydrological constructions are in poor condition and represent a serious danger for the neighbouring localities.

More then 168 localities with a total surface of 1 300 km^2 and about 160 000 residents, of which 625 are rural localities, 31 districts and three towns, are at risk of flooding.

Republic of Moldova: Flood hazard distribution map





The systematization of surface water flow (by O. Melniciuk and others)

The isoline map of the precipitation by strong rains

The actual model equations used for the modeling in hydrographic system of Republic of Moldova.

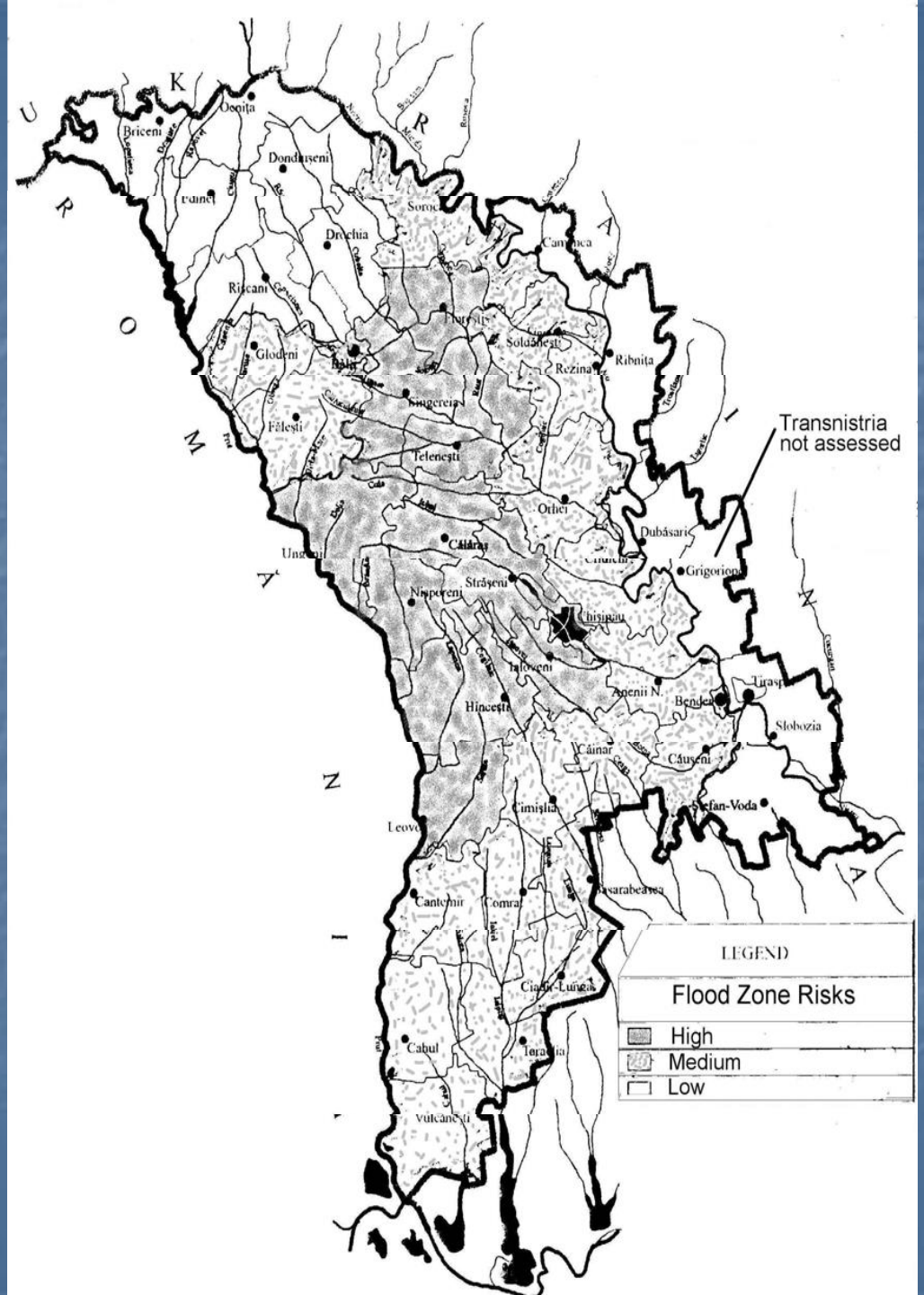
Flood wave equation (Sveridov, Naval, Melniciuc)

$$Q(l,t) = \iint_{\Sigma(l,t)} \vec{v}(\vec{r},t)\,d\vec{\sigma} = \iint_{\Sigma(l,t)} v_n(\vec{r},t)\,d\sigma \approx v(l,t)S(l,t),$$

Water flow duration and dynamic equilibrium

$$V\frac{\partial \omega}{\partial x} + \frac{\partial \omega}{\partial t} + \frac{\partial \omega_n}{\partial t} + \delta_a \frac{\partial \omega_a}{\partial t} = B_{vt} q_t$$

$$Q_t = \int_{t_n}^{t} \varepsilon_B q_{t-t_p} \frac{\partial f}{\partial t_p} dt_p$$

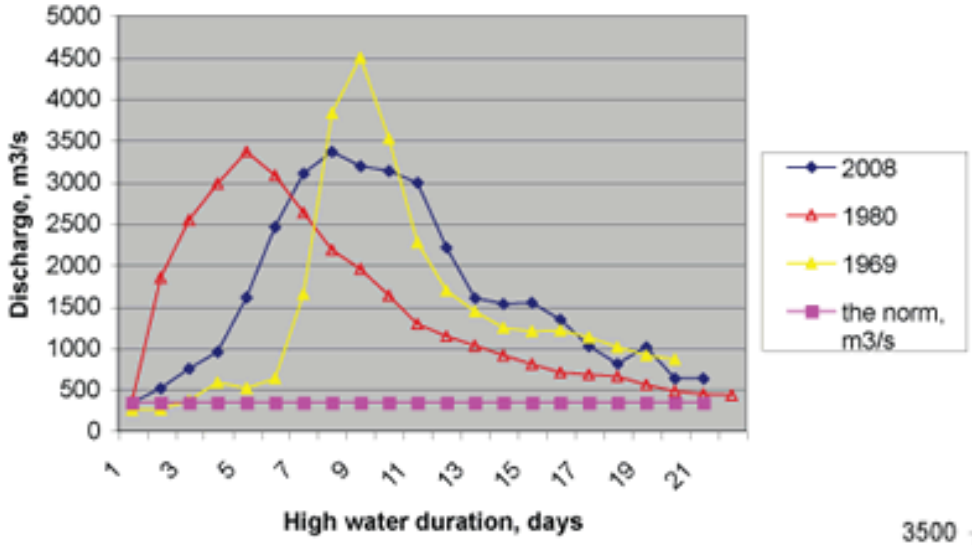


Risk Zones for Floods Caused by Natural Factors

Country Situation Analysis for Risk Assessment in Republic of Moldova 2012
Disaster and Climate Risk Assessment Project of UNDP Moldova

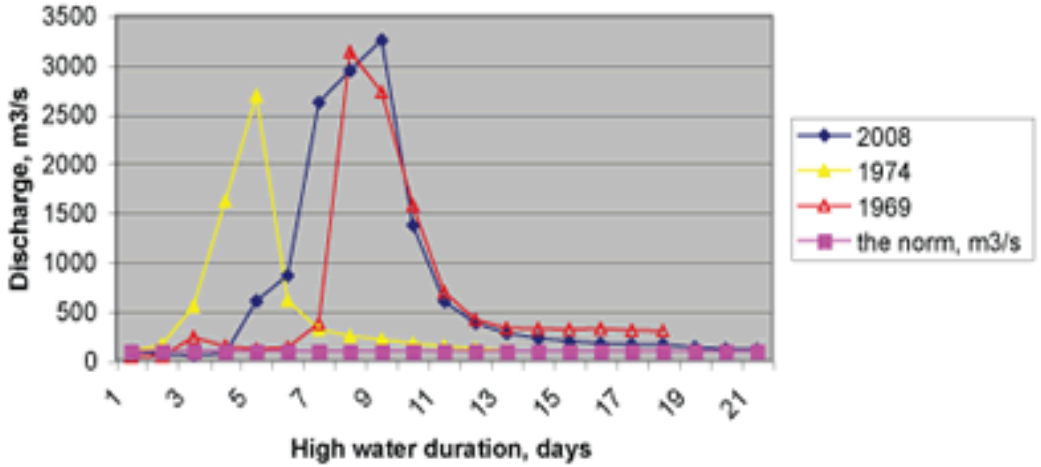
Catastrophic floods in Moldova in the summer of 2008

As a result, the high waters from July to August 2008 on the Nistru and Prut rivers were historic events. The exceptionally high levels of the Nistru and Prut rivers over the last 40 years, compared to the multiannual mean data.



Exceptional high waters in the upper reaches of the Nistru river (Moldova) Hrusca gauging station

Exceptional high waters in the upper reaches of the Prut river (Moldova), Sireuti gauging station



REVIEW OF FLOODS STUDY IN REPUBLIC OF MOLDOVA

Recent projects

1.Model elaboration of kinematical floods wave and assessment of risk areas in case of floods on rivers of Moldova. period 2009-2010. Supported by government State program “Quality of water”. Project manager dr. hab. O. Melniciuc, Institute of Ecology and Geography, ASM.

2.Development of geoinformational support for flood risk assessment in hydrological basin of the Prut river. period 2011-2012. Supported by government State program “Quality of water”. Project manager dr. Iu. Bejan, Institute of Ecology and Geography, ASM.

3.Disaster and Climate Risk Assessment Project of UNDP Moldova. 2011-2012, UNDP.

REVIEW OF FLOODS STUDY IN REPUBLIC OF MOLDOVA

GUEDLINES

Personal guidelines in extreme case: https://www.google.nl/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&ved=0CCsQFjAA&url=http%3A%2F%2Fwww.asm.md%2Fadministrator%2Ffisiere%2Fprotectia_civila%2Fghid.doc&ei=ZgdDUpeHCsHq4gSezoHoCQ&usg=AFQjCNES3AYDsfdgx1EcQJXptzxnOLJUOA&sig2=qr6JGcG2MPNw68XhFlZdLg&bvm=bv.53077864,d.Yms

Strategia naţională de management al riscului la inundaţii. Prevenirea, protecţia şi diminuarea efectelor inundaţiilor. (National strategy of management of flooding risk. prevention, protection and diminution of effects) http://www.mmediu.ro/vechi/departament_ape/gospodarirea_apelor/inundatii/strategie_inundatii.pdf

Plan of medical assistance in extreme case : http://old.ms.md/public/info/situatii/

Rescuire guide: http://redcross.md/ro/ce-facem/primul-ajutor/ghidul-salvatorului

Instructions in extreme cases: http://www.dse.md/node/17

Thank you for the attention!