



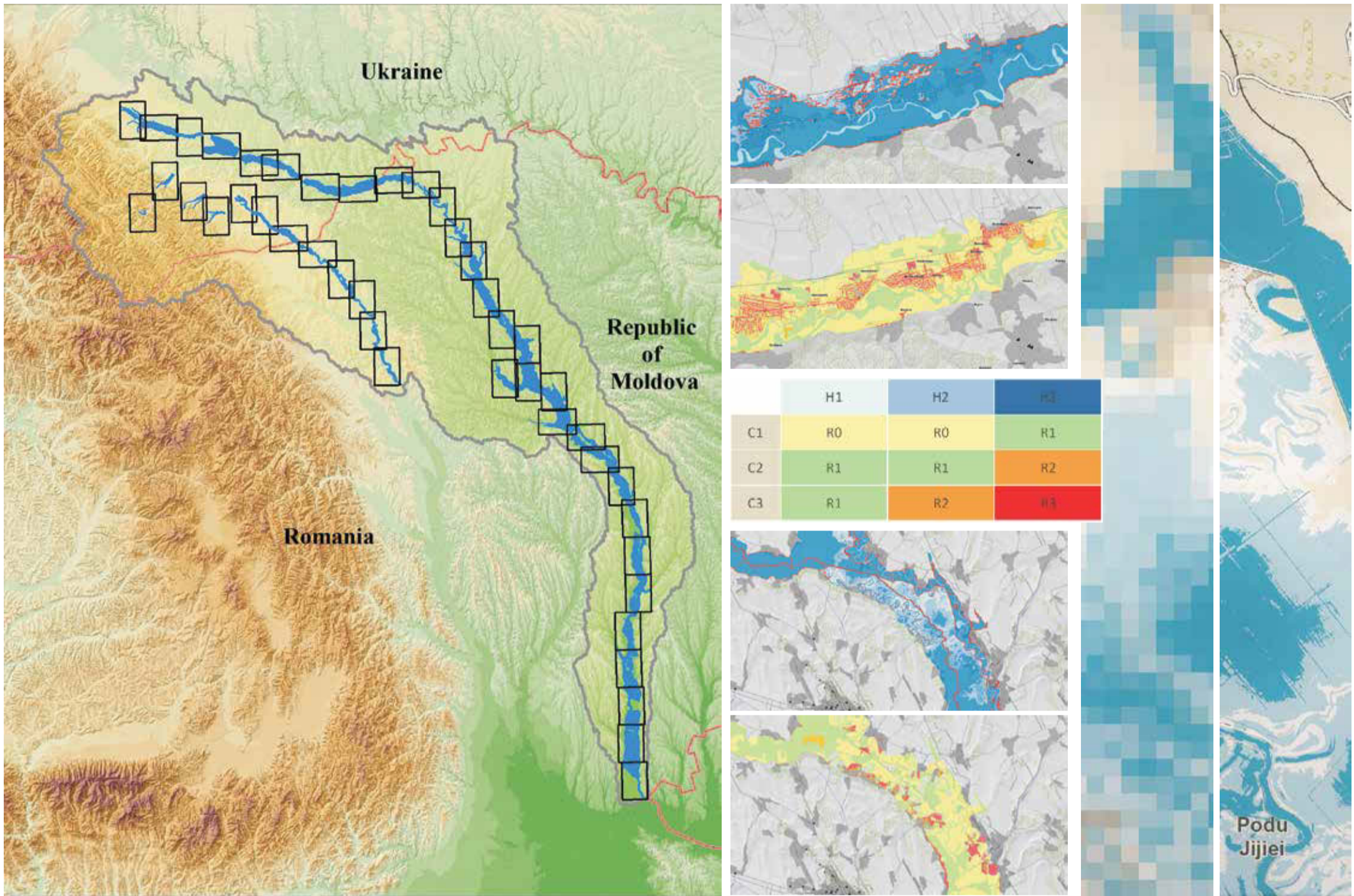
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MINISTRY OF ENVIRONMENT



Romania-Ukraine-Republic of Moldova  
CROSS BORDER COOPERATION



# EAST AVERT PROJECT (MIS ETC 966) ATLAS FLOOD HAZARD AND RISK MAPS

PROIECT EAST AVERT (MIS ETC 966)  
ATLAS  
HĂRȚI DE HAZARD ȘI RISC LA INUNDAȚII

Bucharest - 2017

Common borders. Common solutions





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Ediția a 2-a revizuită și completată  
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## INTRODUCTION

Floods can be considered natural or quasi-natural phenomena. Instead, their consequences are often amplified by humans by placing socio-economic objectives (human settlements, economic objectives and agricultural activities, roads, railways, bridges, etc.) in floodplains in close connection with water sources, soil quality and topography, but increasing the risk of exposure.



In many European countries, floods are one of the most important natural hazards, sometimes having, through the loss of human lives and the effects they produce on the health of the population, natural and environmental resources, severe economic and social consequences, which can lead us to consider them as natural disasters.

The Siret and Prut hydrographic basins, situated in the eastern part of Romania, south-west of Ukraine and the western part of Moldova, constitute a cross-border area characterized by severe and frequent floods, significant at European level, especially in the last 10 years. As outlined in Directive 2007/60 / EC on Flood Risk Assessment and Management (Floods Directive), effective prevention and mitigation of the effects of these extreme phenomena requires cooperation between the three countries. This is in line with the international flood risk management principles, which can only be achieved if parties located in a transnational river basin cooperate.

The assessment of the flood prone potential is based on two main elements: hazard and risk. They describe the magnitude of the phenomenon and the potential negative effects. Unlike hazard, which only indicates the possibility of occurring a dangerous hydrological phenomenon (floodplains expanding, water depth, etc.), the flood risk indicates the potential assets and human damages in floodplains as well as the extent to which they can be affected. The maps follow the risk assessment according to the Floods Directive specifications, which it details by including complementary information to those reported at European level through the database dedicated to this purpose.

The purpose of flood hazard and flood risk maps is to identify and geographically illustrate areas with varying risk levels due to flood hazard. The two types of maps are useful tools for national and local authorities to establish common measures to protect against flood risk the border areas in the upper basins of the Siret and Prut rivers and to reduce the ecological, economic and social vulnerability of the localities of this area. Flood risk mapping highlights areas where significant damage can be recorded for housing, socio-economic objectives, roads, agricultural land, etc. and can be used to develop regional and local flood risk management plans, other national strategies or local plans and cost-benefit analyzes for future hydrotechnical works, prioritization of measures, etc. The hazard maps can also be used for the assessments for hydrological warnings.

## INTRODUCERE

Inundațiile pot fi considerate fenomene naturale sau cuasi-naturale. În schimb, consecințele produse de acestea sunt frecvent amplificate de către om prin amplasarea obiectivelor socio-economice (așezări umane, obiective economice și activități agricole, drumuri, căi ferate, poduri etc.) în luncile inundabile ale râurilor în strânsă legătură cu sursele de apă, calitatea solului și topografia plană a terenurilor, însă cu prețul creșterii expunerii la risc.

În numeroase țări europene, inundațiile reprezintă unul din cele mai importante hazarduri naturale, având uneori, prin pierderile de vieți omenești și efectele pe care le produc asupra sănătății populației, resurselor naturale și de mediu, consecințe economice și sociale severe, ce pot conduce la încadrarea acestora ca dezastre naturale.

Bazinele hidrografice Siret și Prut, situate în partea de est a României, sud-vestul Ucrainei și vestul republicii Moldova, constituie un areal transfrontalier caracterizat de producerea unor inundații severe și frecvente, semnificative la nivel european, în special în ultimii 10 ani. După cum se arată în Directiva 2007/60/CE privind evaluarea și gestionarea riscurilor la inundații (Directiva Inundații), o prevenire eficientă și o atenuare a efectelor acestor fenomene extreme necesită o cooperare între cele trei țări. Acest lucru este în conformitate cu principiile internaționale de gestionare a riscurilor la inundații, care pot fi realizate numai dacă părțile situate într-un bazin hidrografic transnațional cooperează.



Evaluarea potențialului de producere a inundațiilor se realizează pe baza a două elemente principale: hazard și risc. Acestea descriu magnitudinea fenomenului și efectele negative potențiale. Spre deosebire de hazard, care indică doar posibilitatea apariției unui fenomen hidrologic periculos (extinderea zonelor inundabile, adâncimea apei etc.), riscul la inundații indică potențialele bunuri și daune umane în zonele inundabile, precum și gradul în care acestea pot fi afectate. Hărțile succed evaluarea riscului conform specificațiilor Directivei Inundații, pe care o detaliază prin includerea unor informații complementare față de cele raportate la nivel european prin baza de date dedicată acestui scop.

Scopul hărților de hazard și risc la inundații este identificarea și ilustrarea zonelor cu niveluri diferite de risc induse de hazardul inundațiilor. Cele două tipuri de hărți sunt instrumente utile pentru autoritățile naționale și locale în vederea stabilirii de măsuri comune pentru protejarea împotriva riscului la inundații a zonelor de frontieră din bazinele superioare Siret și Prut și reducerea vulnerabilității ecologice, economice și sociale a localităților din această regiune. Cartografierea riscului la inundații evidențiază zonele în care pot fi înregistrate daune importante asupra locuințelor, obiectivelor socio-economice, drumurilor, terenurilor agricole etc. și poate fi utilizată pentru elaborarea planurilor regionale și locale de management al riscului la inundații, a altor strategii naționale sau planuri locale și a analizelor cost-beneficiu pentru viitoarele lucrări hidrotehnice, prioritizarea măsurilor etc. De asemenea, hărțile de hazard pot servi la efectuarea evaluărilor în cazul avertizărilor hidrologice.

There are many methodological approaches for flood risk with varying degrees of complexity. The methodology developed and used in the EAST AVERT project takes into consideration the types of available data, being based on the qualitative risk assessment method proposed in one of the FAME reports (The Flood risk and damage Assessment using Modelling and Earth observation techniques) related to the levels of hazard and exposure.

According to the European flood risk mapping document developed by the JRC under the 2005 Weather Driven Natural Hazards program, flood risk is defined as the product of three components:

- Hazard: the occurrence of a threatening natural event, including the its probability of exceedings;
- Exposure: the value of goods and the number of population that is present in the affected area;
- Vulnerability: lack or loss of resistance to destructive forces or damage.

Given the cross-border nature of the Siret and Prut rivers, the mathematical (hydrological and hydraulic) modeling, designed to delineate potentially floodprone areas, requested a close cooperation between Romania, Ukraine and the Republic of Moldova. In this respect, an important activity within the EAST AVERT project consisted of the harmonization of hydrological and geospatial information in the two hydrographic basins and especially along the two main water courses. Thus, the rivers were conceived as a system that does not respect any border. The common database, including hazard and flood risk maps, supports all project activities.

This collaboration should be maintained in the future, in order to establish measures to prevent and mitigate the effects of floods.

Flood hazard maps illustrate their magnitude for the reduced scenario (with a probability of 0.1%, respectively 1/1000 return time) and the expansion of the floodprone areas specific for the medium scenario (probability of 1%, respectively 1/100 years return time). The magnitude is expressed by the water depth quantified in 3 classes (<0.5 m, 0.5-1 m > 1.5 m).

According to the requirements of the Floods Directive, there have been modeled three different scenarios: floods with a low probability of exceedings, or in extreme cases, for which a mean return period of once every 1000 years (HQ1000) was adopted; floods with medium probability (once every 100 years - HQ100) and floods with high probability (the maximum discharge is exceeding once every 10 years - HQ10).

Flood risk maps express qualitatively the potential flood damage and are based on a matrix. For each combination of the types of consequences and the depth classes, a certain degree of risk was assigned, resulting in a risk matrix.

Există numeroase abordări metodologice privind riscul la inundații, cu diferite grade de complexitate. Metodologia dezvoltată și utilizată în cadrul proiectului EAST AVERT ia în considerare tipurile de date disponibile și are la bază modul de evaluare calitativă a riscului propus în unul dintre rapoartele FAME (The Flood risk and damage Assessment using Modelling and Earth observation techniques), ca funcție de nivelul hazardului și expunere.

Conform documentului "European flood risk mapping", elaborat de JRC în cadrul programului Weather Driven Natural Hazards în anul 2005, riscul la inundații este definit ca fiind produsul a 3 componente:

- Hazardul: producerea unui eveniment natural având caracter de amenințare, incluzând și probabilitatea de apariție a acestuia;
- Expunerea: valoarea bunurilor materiale și numărul populației care este prezentă în arealul afectat;
- Vulnerabilitatea: lipsa sau pierderea rezistenței la forțele destructive sau pagubele produse.

Având în vedere caracterul transfrontalier al râurilor Siret și Prut, modelarea matematică (hidrologică și hidraulică) realizată în scopul delimitării zonelor potențial inundabile, a necesitat o strânsă cooperare între România, Ucraina și Republica Moldova. În acest sens, o activitate importantă din cadrul proiectului EAST AVERT a constat din armonizarea informațiilor hidrologice și geospațiale în cele două bazine hidrografice și mai ales în lungul celor două cursuri de apă. Astfel, râurile au fost concepute ca un sistem care nu respectă nici o frontieră. Baza de date comună, care include și hărțile de hazard și risc la inundații, constituie suport pentru toate activitățile proiectului.

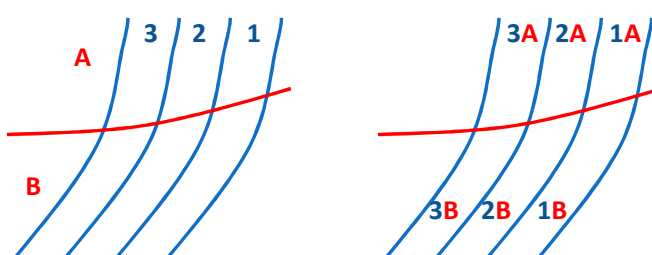
Această colaborare trebuie menținută și în viitor, în vederea stabilirii măsurilor de prevenire și de reducere a efectelor inundațiilor.

Hărțile de hazard la inundații ilustrează magnitudinea acestora pentru scenariul redus (cu probabilitate de 0,1%, respective timp de revenire de 1/1000 ani), precum și extinderea zonelor inundabile specifice scenariului mediu (cu probabilitate de 1%, respective timp de revenire de 1/100 ani). Magnitudinea este exprimată prin adâncimea apei cuantificată în 3 clase (<0,5 m, 0,5-1 m > 1,5 m).

Conform cerințelor Directivei Inundații, au fost modelate 3 scenarii diferite: inundații cu probabilitate mică de depășire sau în cazuri extreme, pentru care a fost adoptată perioada de depășire de o dată la 1000 de ani (notat cu HQ1000); inundații cu probabilitate medie (o dată la 100 de ani - HQ100) și inundații cu probabilitate mare (al căror debit maxim este depășit o dată la 10 ani - HQ10).

Hărțile de risc la inundații exprimă, calitativ, potențialele daune ale inundațiilor și sunt realizate pe baza unei matrici. Fiecărei combinații dintre tipurile de consecințe și clasele de adâncime i s-a atribuit un grad de risc, rezultând o matrice.

RISK / RISC			Hazard magnitudine (water depth) / Magnitudinea hazardului (adâncime apă)		
			H1	H2	H3
			Low / Mică (<0.5)	Medium / Medie (0.5-1.5)	High / Mare (>1.5)
Consequences / Consecințe	C1	Mic	R0	R0	R1
	C2	Mediu	R1	R1	R2
	C3	Mare	R1	R2	R3



Schema de realizare a matricii riscului / Risk matrix scheme



Continuous improvement of land use information and risk receptors is a project's sustainability activity / Îmbunătățirea continuă a informațiilor legate de utilizarea terenului și elementele aflate la risc reprezintă o activitate de sustenabilitate a proiectului

This association was made through an expert-based analysis and decision, based on experience and expertise previously accumulated. For the decision to assign a certain risk degree, the hazard / consequences combinations have been assessed by considering two different aspects: the value of goods and their resilience, defined as the ability to cope with floods, and the ability to recover from these phenomena (resistance and the behaviour of different goods in the case of a flood event of a certain severity).

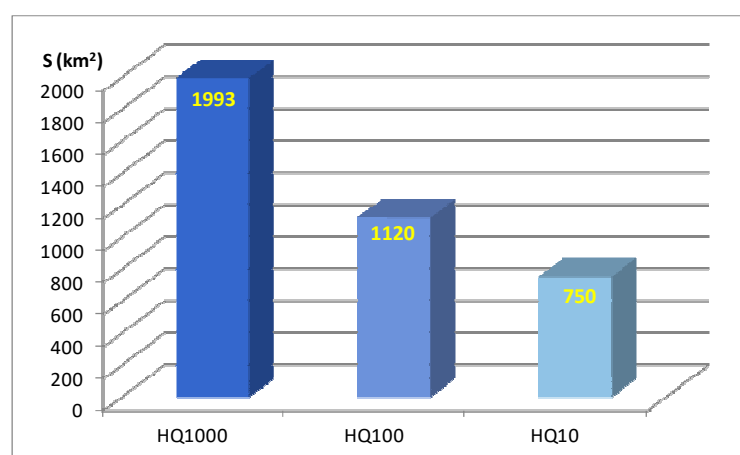
Four flood risk degrees were established:

- 0 – insignificant residual risk;
- 1 – low risk ;
- 2 – medium risk;
- 3 – high risk.

In addition, they provide information about items at risk. Relevant objects outside the areas with flood potential that may be indirectly affected (e.g. access to these areas) are also presented. The information on maps is based, in addition to its own database (developed in the framework of EAST AVERT project), on the NAVTEQ points of interest, the OpenStreetMap (OSM) database, the EU database of the IPPC website, etc.

In the study areas of the project, the floodprone areas for the HQ1000 scenario cover 1992.7 km<sup>2</sup>, reducing to 1120.5 km<sup>2</sup> for the levels corresponding to the discharge with the probability of 1% (HQ100), and about 750.4 km<sup>2</sup> for the high frequency scenario 10% - HQ10).

The largest flood-prone area is located along the Prut River in Romania (38%), followed by the Republic of Moldova, on the left bank of the same river (30%).



**Potential flooded areas in different scenarios [km<sup>2</sup>] /  
Zona potențial inundabilă în diferite scenarii [km<sup>2</sup>]**

**Distribution of floodplains for scenario HQ 1000 /  
Distribuția zonelor inundabile în cazul scenariului HQ1000**

In the floodplains there is a large area of arable land, representing over 40% of the area identified as being at risk in the HQ1000 scenario. There are also large areas occupied by marshes and wetlands, which are typical to the lower Prut.

The most important element at risk is the built space, respectively the area of the localities, avoiding the direct or indirect consequences on the population being the most important objective of the flood risk management. Therefore, the area of nearly 7% (136.3 km<sup>2</sup>) of the flooded area occupied by human settlements presents the greatest risk, in the event of such extreme phenomena. One of the main objectives of this Atlas, is to raise the awareness of the inhabitants of the Siret and Prut rivers on their exposure to floods, and the inherent risks of these floods.

Această asociere s-a realizat printr-o analiză de tip expert, pe baza experienței și expertizei anterioare. Pentru atribuirea unui grad de risc, combinațiile hazard / consecințe au fost evaluate prin luarea în considerare a două aspecte diferite: valoarea bunurilor și reziliența acestora, definită ca abilitatea de a face față inundațiilor și capacitatea de recuperare după aceste fenomene (rezistența și comportamentul diferitelor bunuri în cazul unei inundații de o anumită severitate).

S-au stabilit 4 grade de risc la inundații:

- 0 – risc rezidual nesemnificativ;
- 1 – risc mic;
- 2 – risc mediu;
- 3 – risc mare.

În plus, acestea oferă informații despre elemente aflate în situații de risc. Sunt de asemenea prezentate obiectele relevante din afara zonelor potențial inundabile care ar putea fi afectate indirect (de ex., accesul la aceste zone). Informațiile au la bază, pe lângă baza de date proprie, creată în cadrul proiectului, punctele de interes NAVTEQ, cele din baza de date OpenStreetMap (OSM), baza de date UE de pe website IPPC, etc.

În arealele analizate în cadrul proiectului, zonele inundabile în cazul scenariului HQ1000 acoperă o suprafață de 1992.7 km<sup>2</sup>, acestea reducându-se la 1120.5 km<sup>2</sup> pentru nivele corespunzătoare debitului cu probabilitatea de 1% (HQ100) și la circa 750.4 km<sup>2</sup> pentru scenariul cu frecvență mare (10% - HQ10).

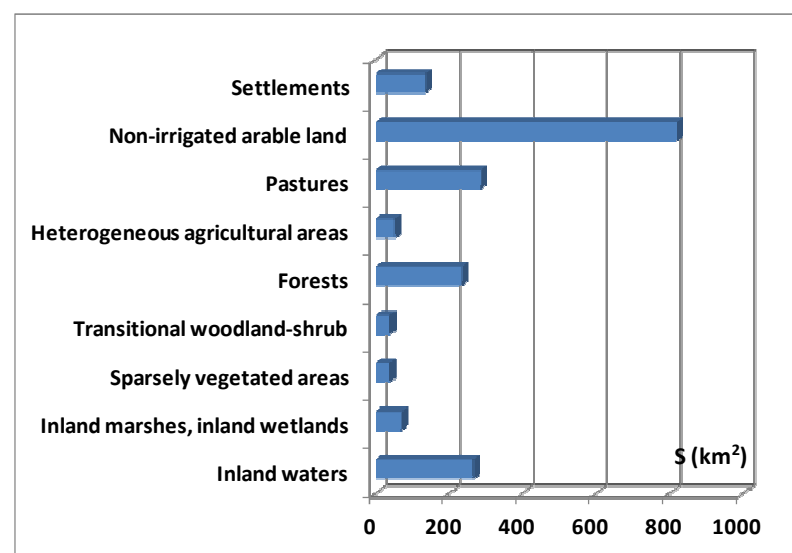
Cea mai mare suprafață inundabilă este localizată în lungul râului Prut în România (38%), dar și în Republica Moldova, pe malul stâng al aceluiași râu (30%).

Arealul / Area	Zona inundabilă / Flooded area HQ1000 (S - km <sup>2</sup> )
Ukraine / Prut and tributaries Ucraina / Prut și afluenți	463.8
Ukraine / Siret and tributaries Ucraina / Siret și afluenți	71.5
Romania / Prut România / Prut	763.1
Romania / Siret România / Siret	91.0
Republic of Moldova / Prut Rep. Moldova / Prut	603.3
<b>Total</b>	<b>1992.7</b>

În zona inundabilă se remarcă suprafețele mari ocupate de terenuri arabile, acestea reprezentând peste 40% din suprafața identificată cu risc în scenariul HQ1000. Se remarcă suprafețele destul de mari ocupate de mlaștini și zone umede, acestea fiind tipice mai ales Prutului inferior.

Cel mai important element expus riscului este spațiul construit, respectiv arealul localităților, evitarea consecințelor directe sau indirecte asupra populației fiind cel mai important obiectiv al managementului riscului la inundații. Prin urmare, suprafața de aproape 7% (136.3 km<sup>2</sup>) din zona inundabilă, ocupată de așezări umane, prezintă cel mai mare risc în cazul producerii unor astfel de fenomene extreme. Unul dintre obiectivele principale al acestui Atlas constă în creșterea nivelului de conștientizare al locuitorilor riverani cursurilor de apă Siret și Prut cu privire la expunerea lor la inundații și riscurile inerente ale acestor inundații.

Land use	Utilizarea terenului	S (km <sup>2</sup> )	% from total % din total
Settlements	Localitati	136.34	6.8
Industrial or commercial units	Unitati industriale sau comerciale	13.81	0.7
Road and rail networks and associated land	Retea de cai de comunicatie si terenuri asociate	16.43	0.8
Mine, dump or construction sites	Zone de extractie a minereurilor, gropi de gunoi sau zone in constructie	0.51	0.0
Green urban areas, sport and leisure facilities	Zone urbane verzi, zone de agrement	8.15	0.4
Non-irrigated arable land	Terenuri arabile neirigate	817.20	41.0
Fruit trees, vineyards	Vii sau livezi	16.69	0.8
Pastures	Pasuni secundare	284.59	14.3
Heterogeneous agricultural areas	Zone agricole eterogene	51.89	2.6
Forests	Paduri	234.17	11.8
Transitional woodland-shrub	Zone de tranzitie cu arbusti	38.50	1.9
Sparsely vegetated areas	Areale cu vegetatie rara	38.31	1.9
Inland marshes, inland wetlands	Mlastini, zone umede	70.22	3.5
Inland waters	Corpuri de apa	265.95	13.3
Total		1992.74	100.0






























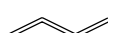


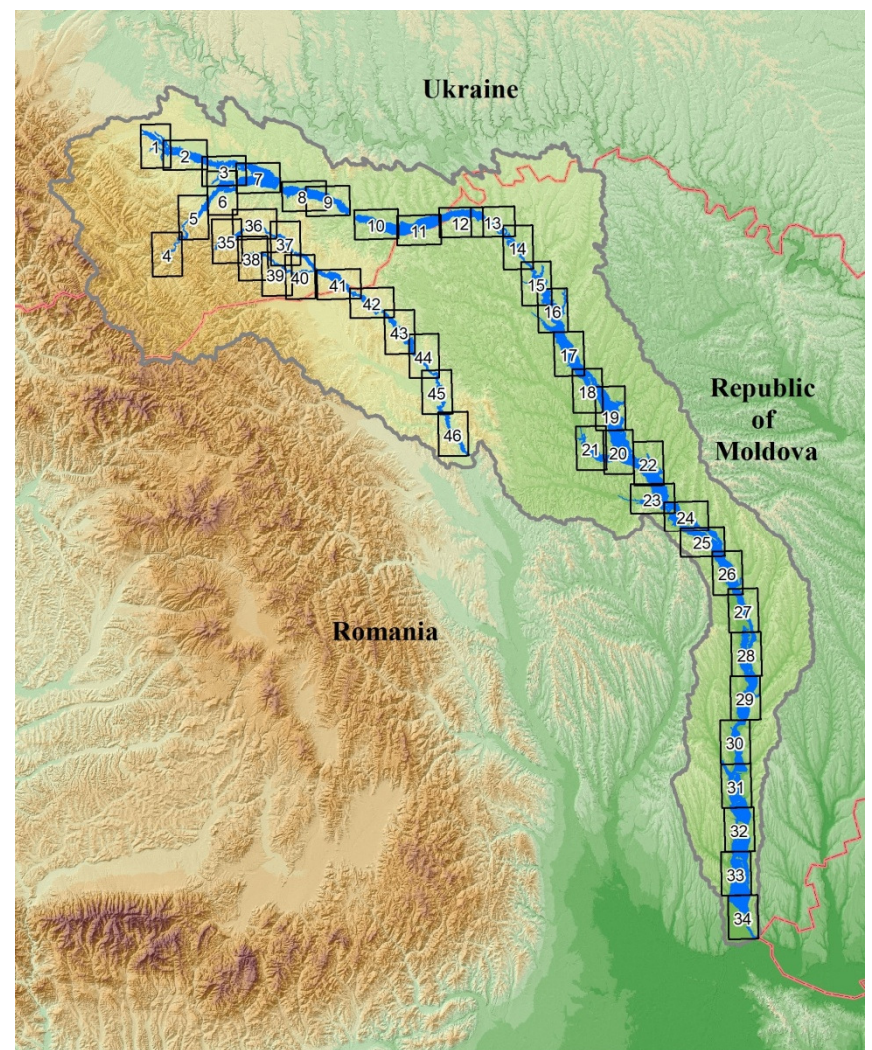
*The main types of land use in the floodplain area HQ1000 /  
Principalele tipuri de utilizare a terenului din zona inundabilă HQ1000*

Publicly disseminated flood risk maps, along with the hazard maps available in this Atlas, sum up essential flood information along the main watercourses. This can be an important tool for working out different national or local plans and strategies in areas such as land use planning, urban planning, flood risk management, informing the general public, etc. The data presented is of general interest, but for activities that promote investments, design, etc. local in-depth studies are required.

Hărțile de risc la inundații diseminate public, alături de hărțile de hazard disponibile în acest Atlas, însumează informații esențiale privind inundabilitatea în lungul principalelor cursuri de apă. Acestea pot constitui un important instrument de lucru pentru realizarea diferitelor planuri și strategii naționale sau locale, în domenii precum planificarea utilizării terenurilor, urbanism, gestionarea riscului la inundații, informarea publicului larg etc. Datele prezentate sunt de interes general, însă pentru activități de promovare a investițiilor, proiectare, etc. sunt necesare studii aprofundate la nivel local.

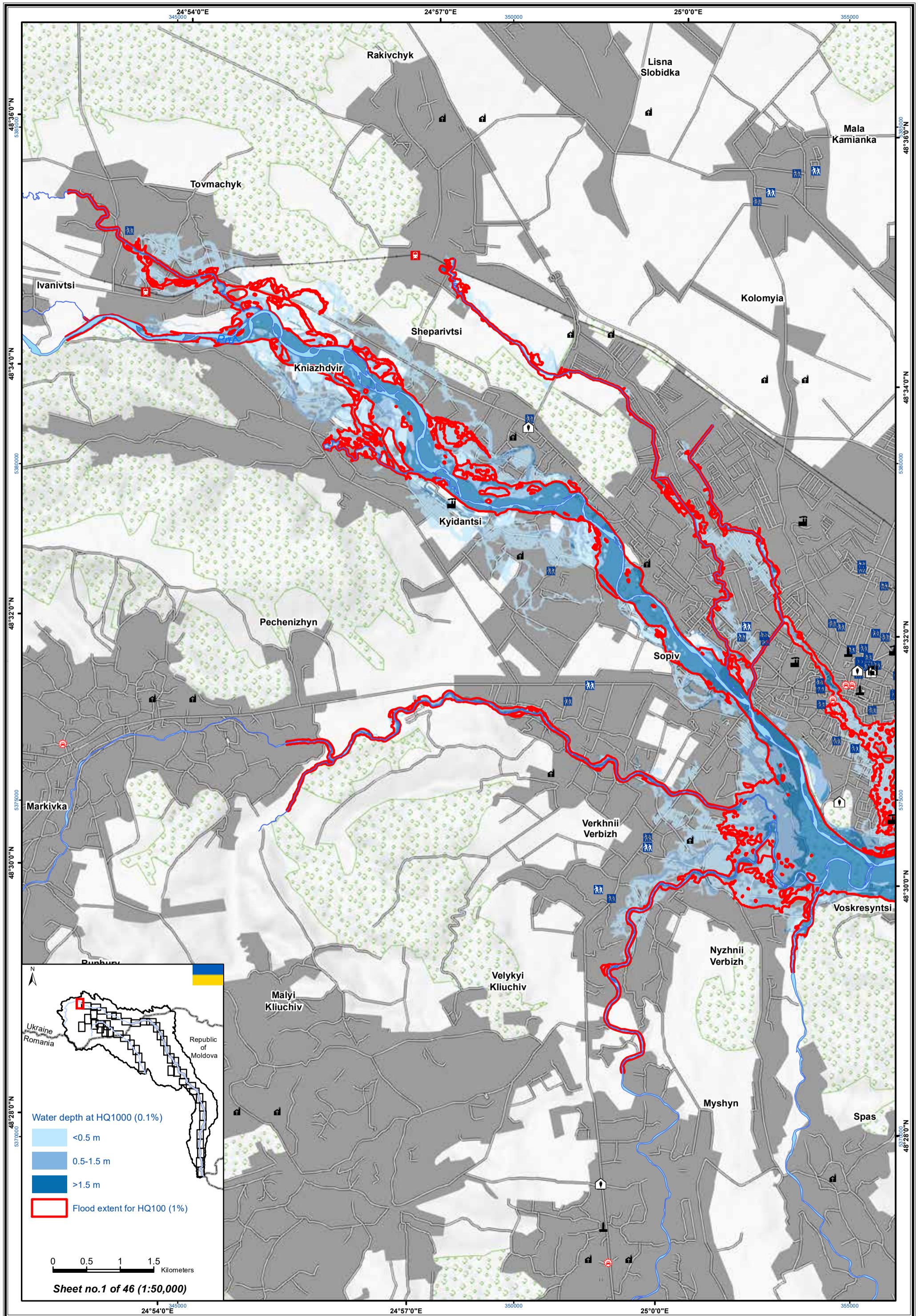


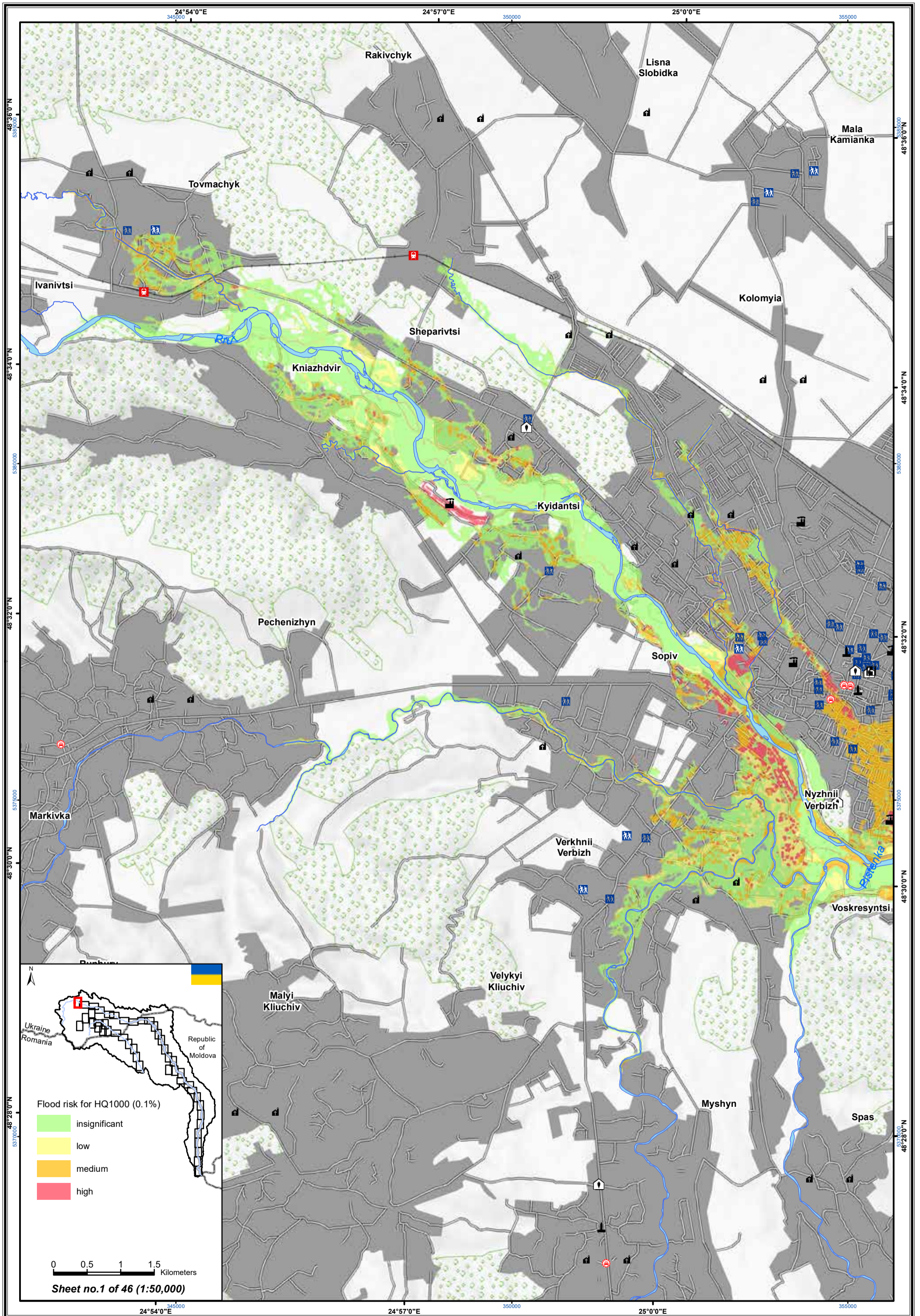
		
	Map Legend	Legenda
	<b>Hazard Map</b>	<b>Harta de hazard</b>
	Water depth at HQ <sub>1000</sub>	Adancimea apei la HQ <sub>1000</sub>
	> 1.5 m	> 1.5 m
	0.5 - 1.5 m	0.5 - 1.5 m
	< 0.5 m	< 0.5 m
	Flood extent for HQ <sub>100</sub>	Limita de inundabilitate la HQ <sub>100</sub>
	<b>Risk Map</b>	<b>Harta de risc</b>
	Classes of Potential Damage	Categorii de daune potentiale
	High	Mare
	Medium	Mediu
	Low	Scazut
	Insignificant	Nesemnificativ
	<b>Affected population*</b>	<b>Gradul de afectare al populatiei*</b>
	Insignificant	Nesemnificativ
	Low	Mic
	Medium	Mediu
	High	Mare
	<b>General Aspects</b>	<b>Aspecte generale</b>
	Country border	Granita de stat
	River	Curs de apa
	Study area	Zona de studiu
	<b>Point of interest</b>	<b>Punct de interes</b>
	Church	Biserica
	Museum	Muzeu
	Monument	Monument
	School	Scoala
	Hospital	Spital, dispensar
	Industrial site	Sit industrial
	Socio-administrative objective	Obiectiv socio-administrativ
	Settlement	Asezare umana
	Main train station	Statie de cale ferata
	Roads	Drumuri
	Railroads	Cai ferate
	Waterbody	Corp de apa
	Woodland and park	Padure si parc

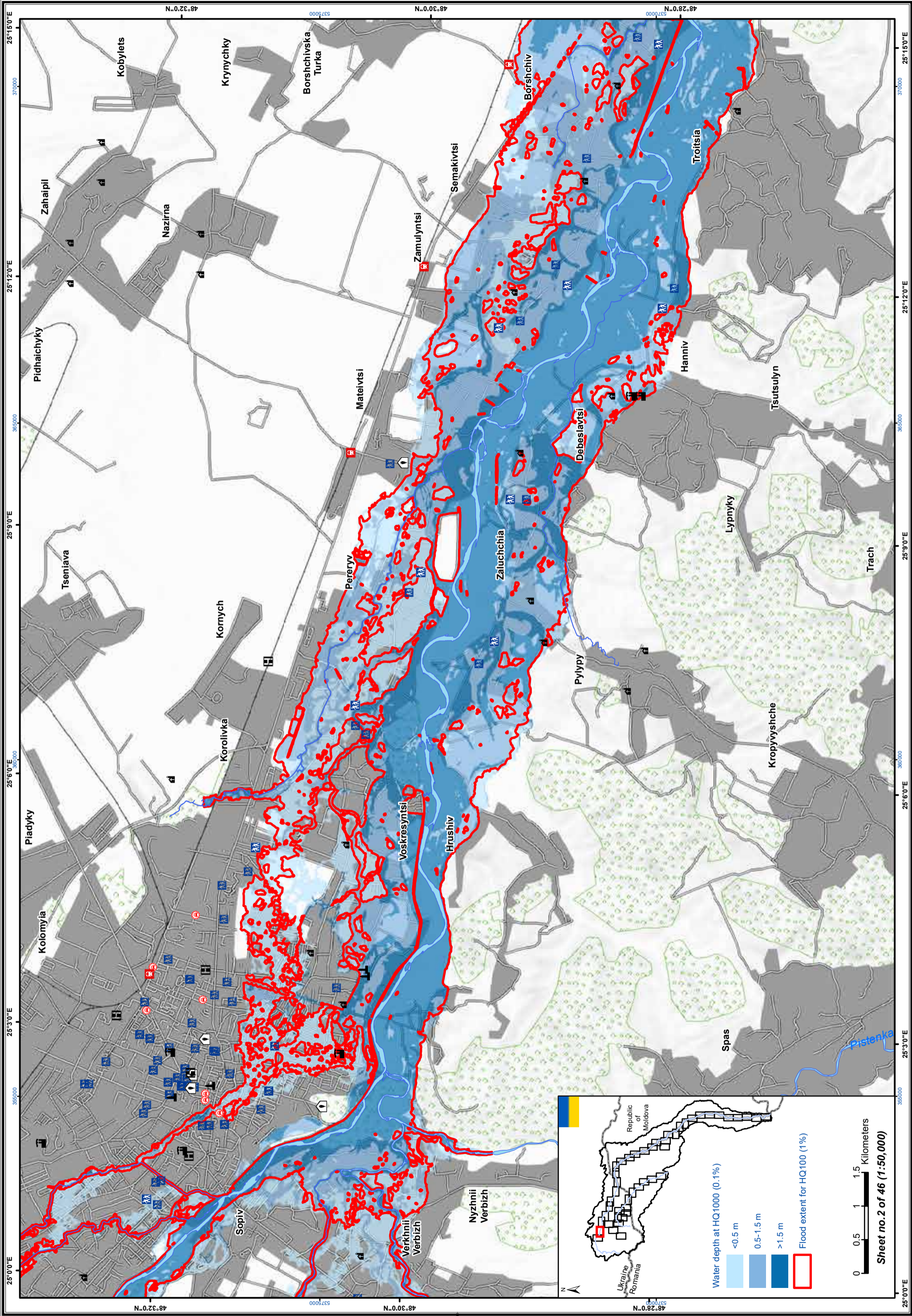


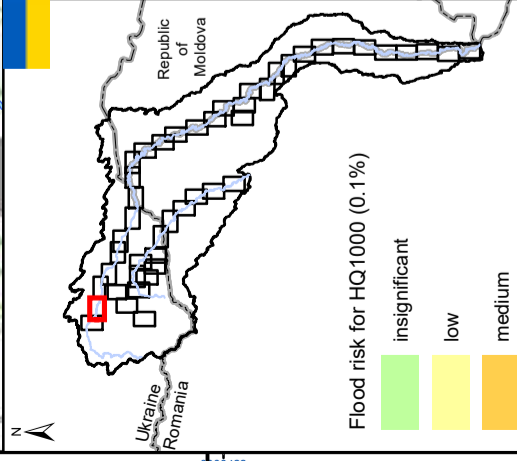
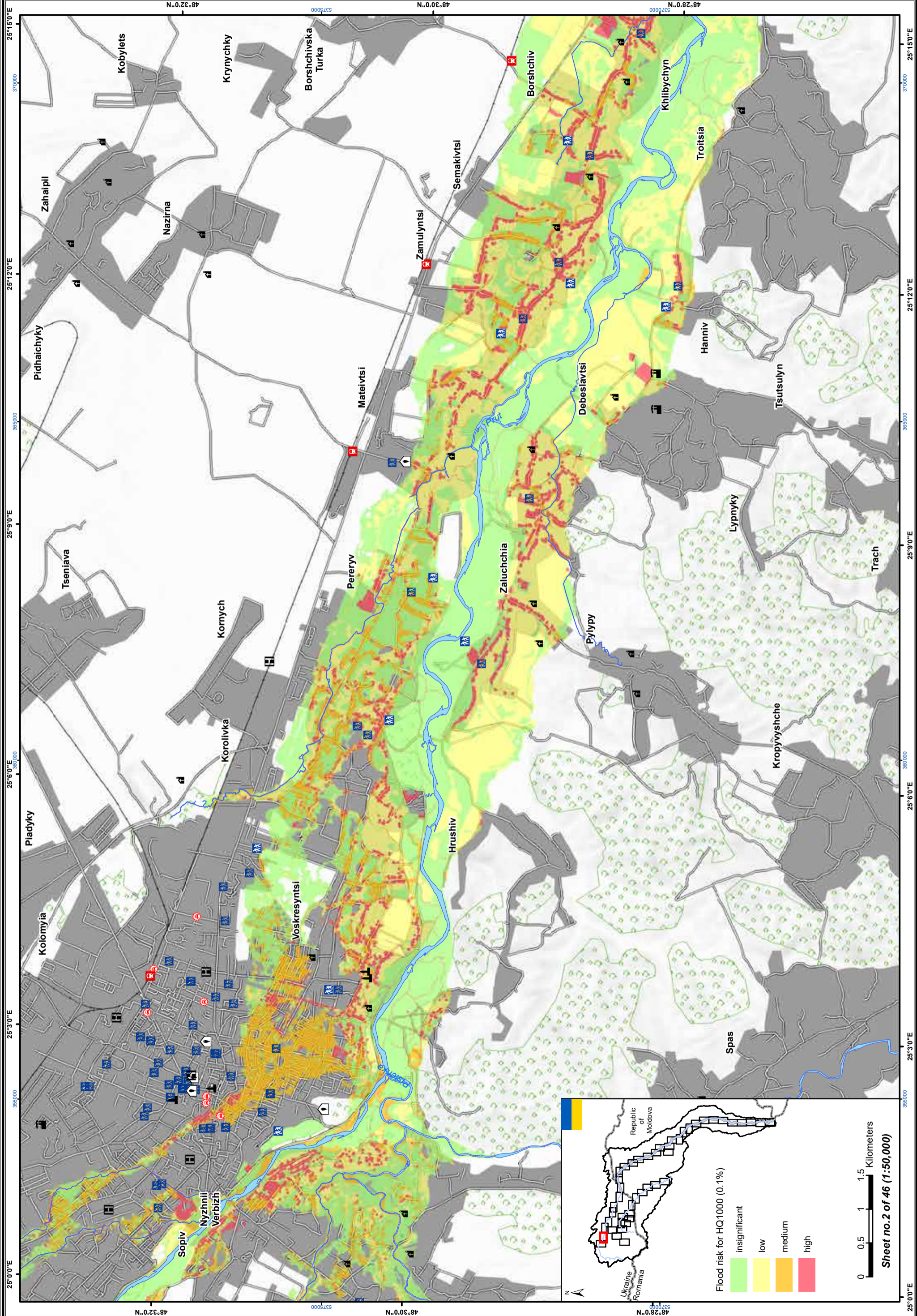
\*These symbols will be used only in the potential flooded settlements list /  
 Aceste simboluri vor fi utilizate numai în lista localităților potențial inundabile









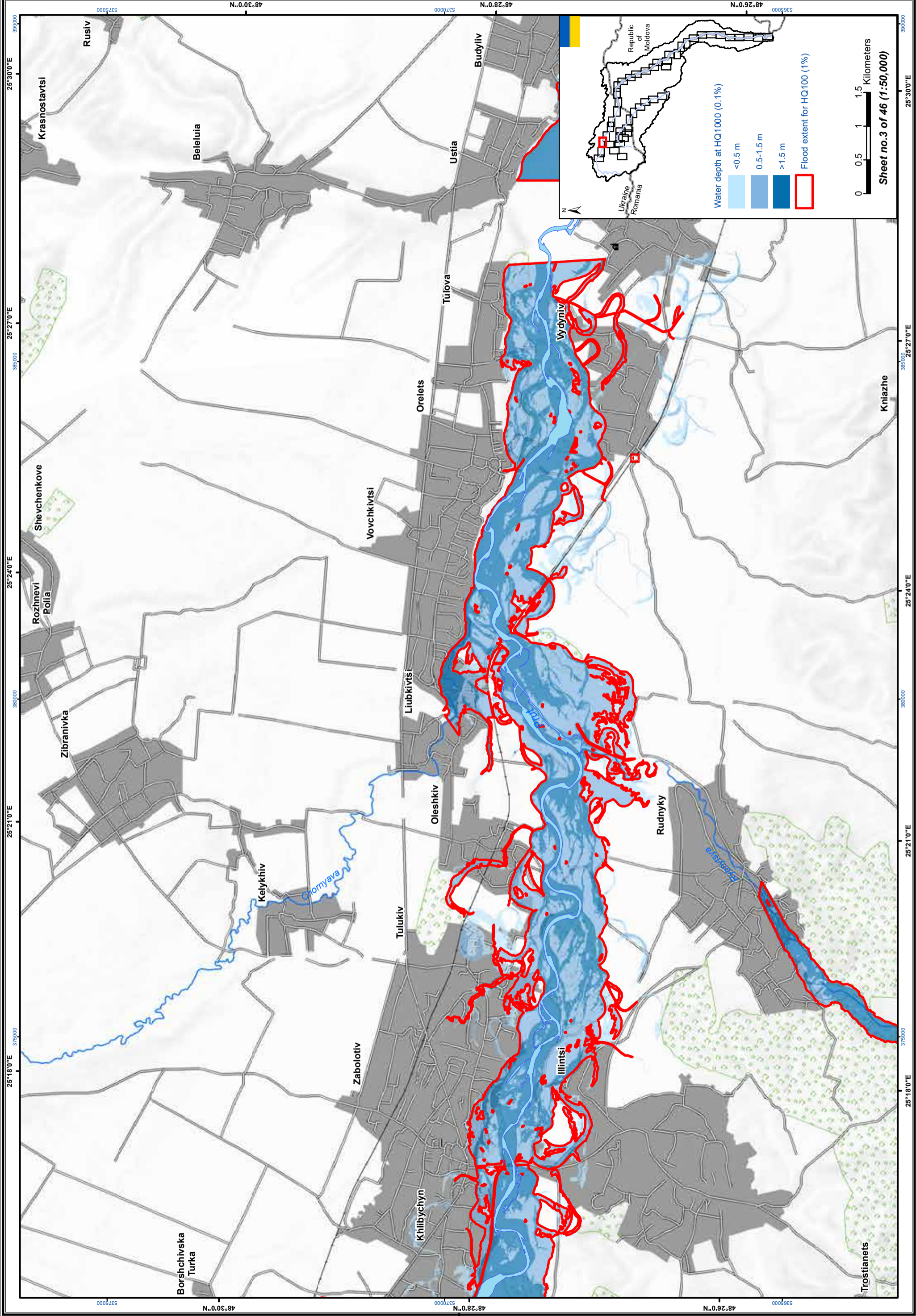


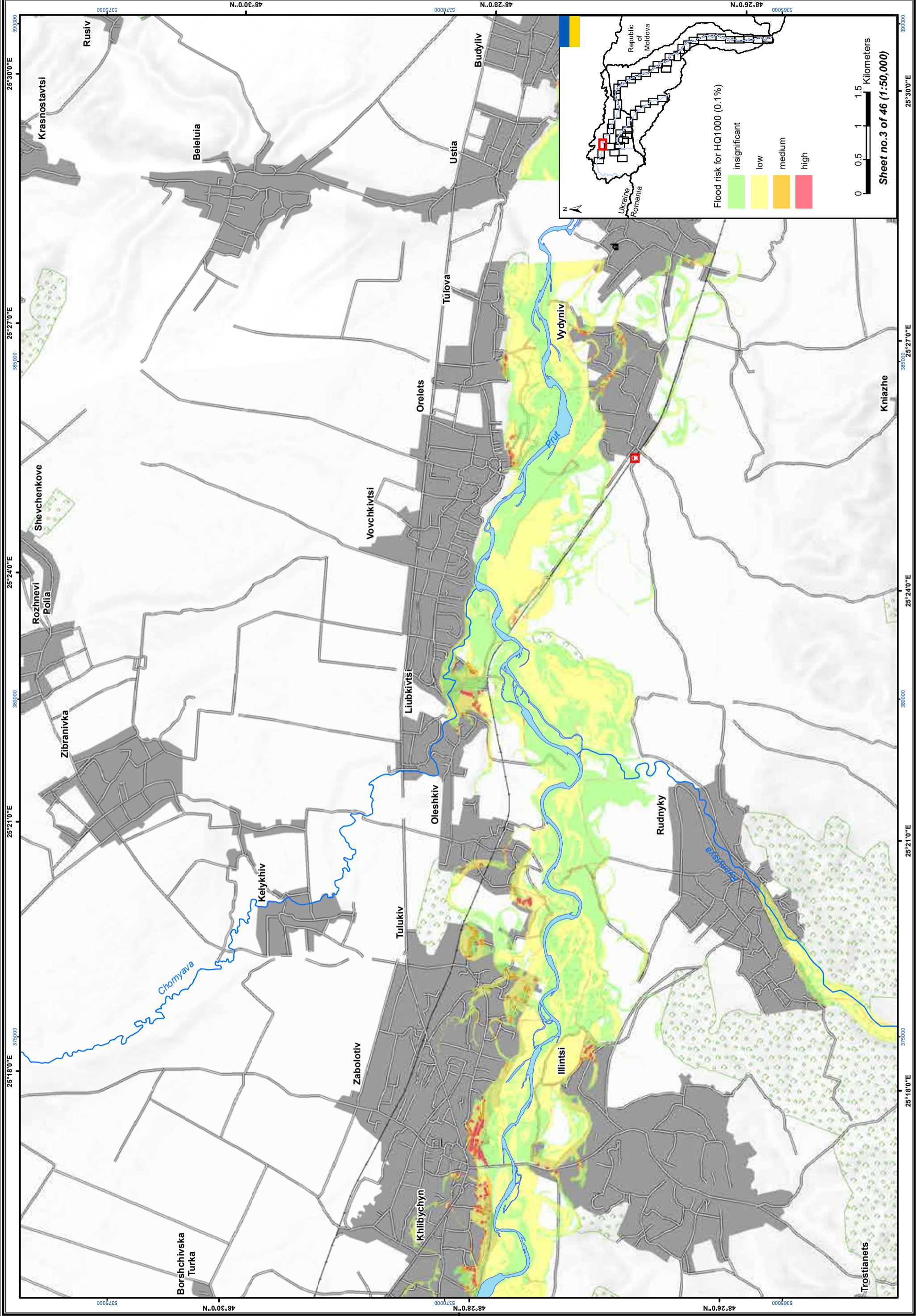
Flood risk for HQ1000 (0.1%)

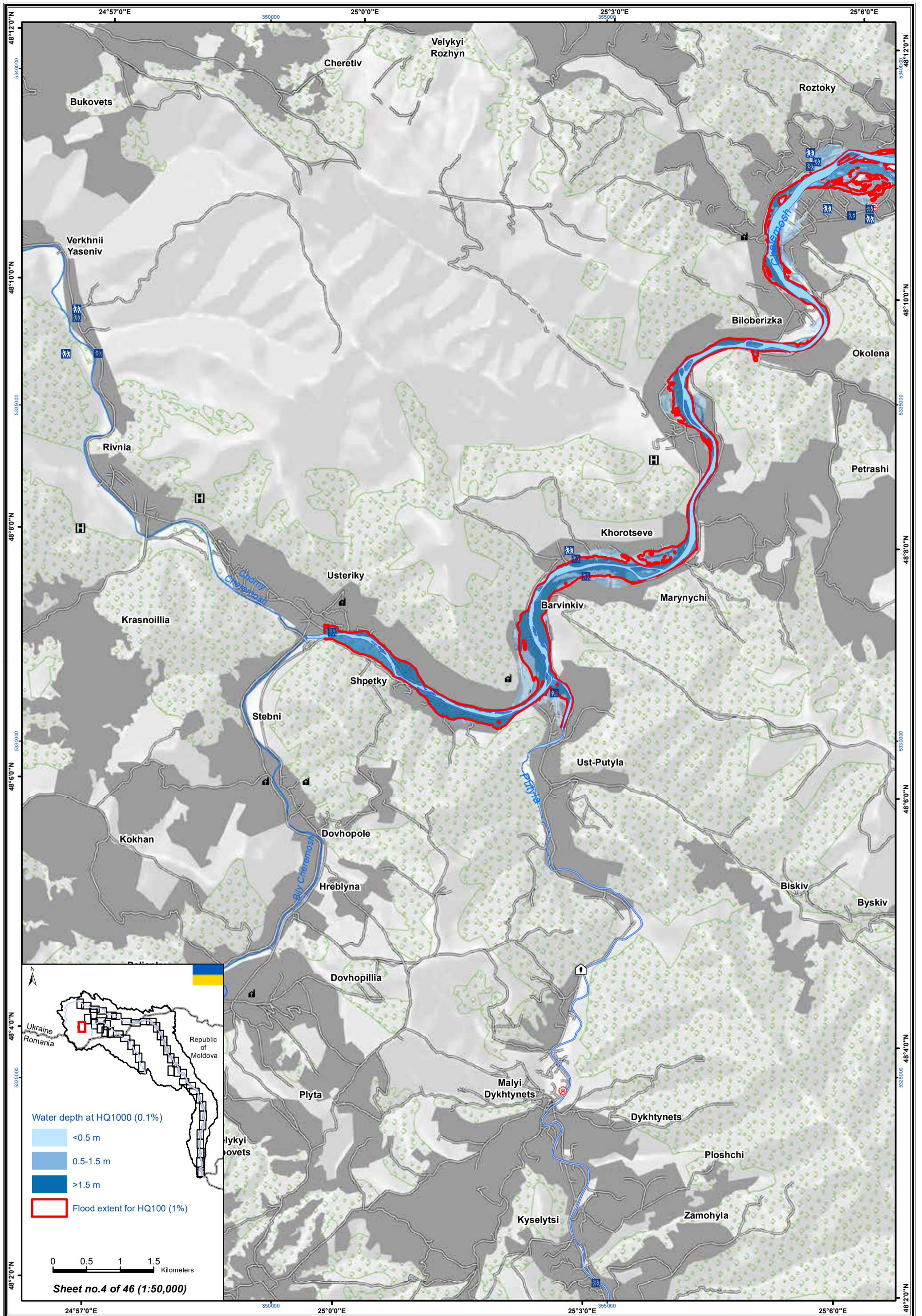
- insignificant
- low
- medium
- high

0 0.5 1 1.5 Kilometers

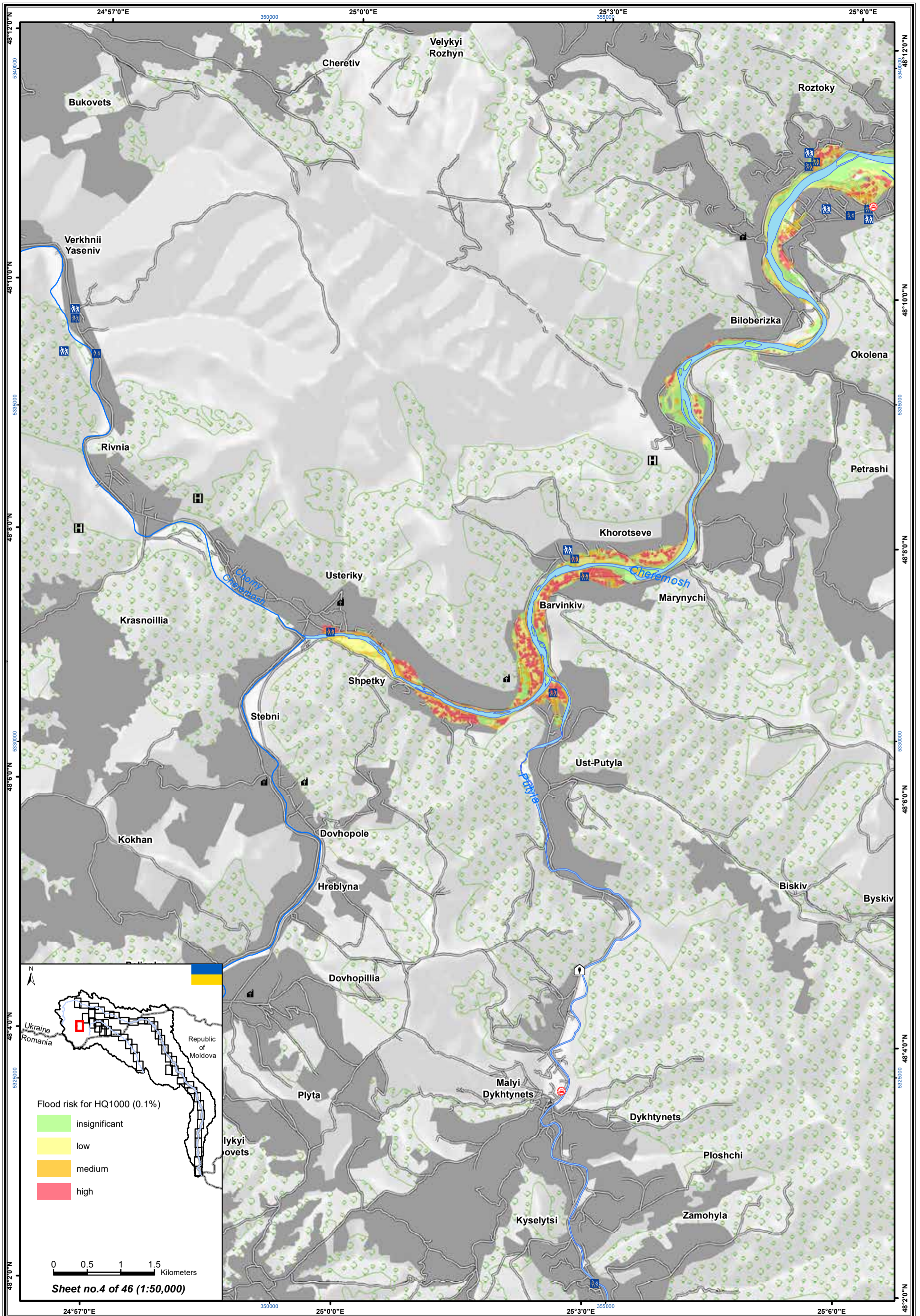
**Sheet no. 2 of 46 (1:50,000)**

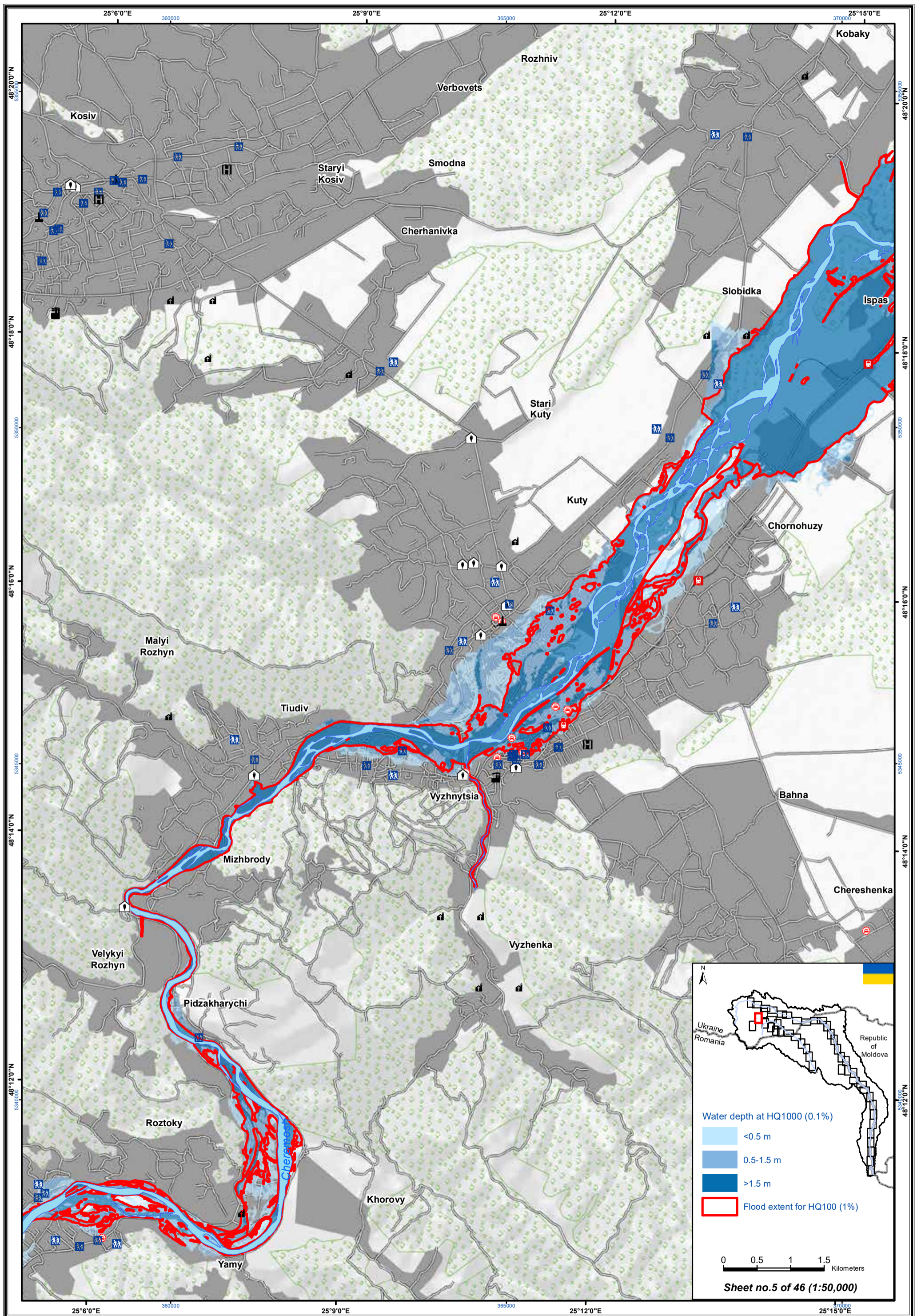


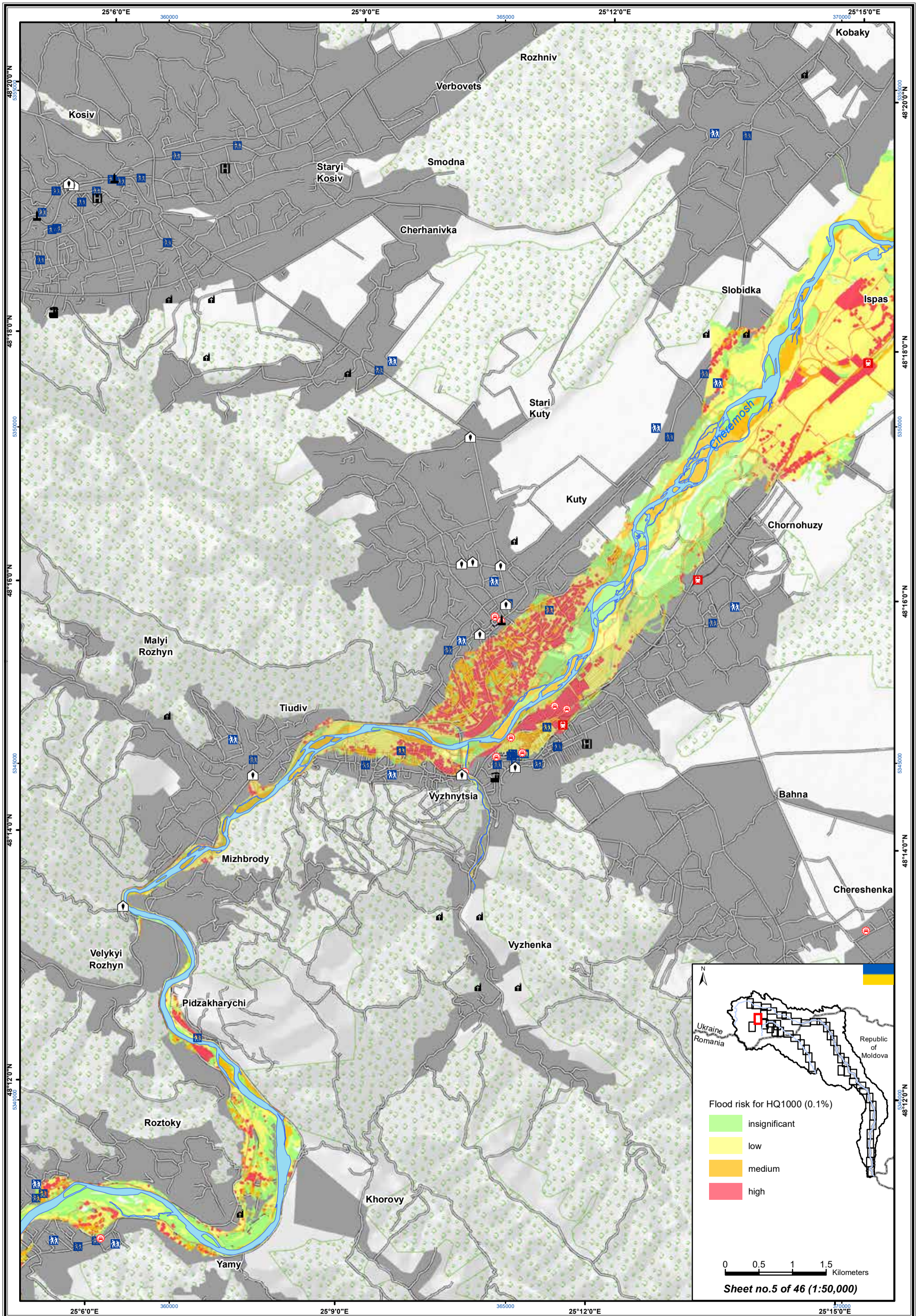


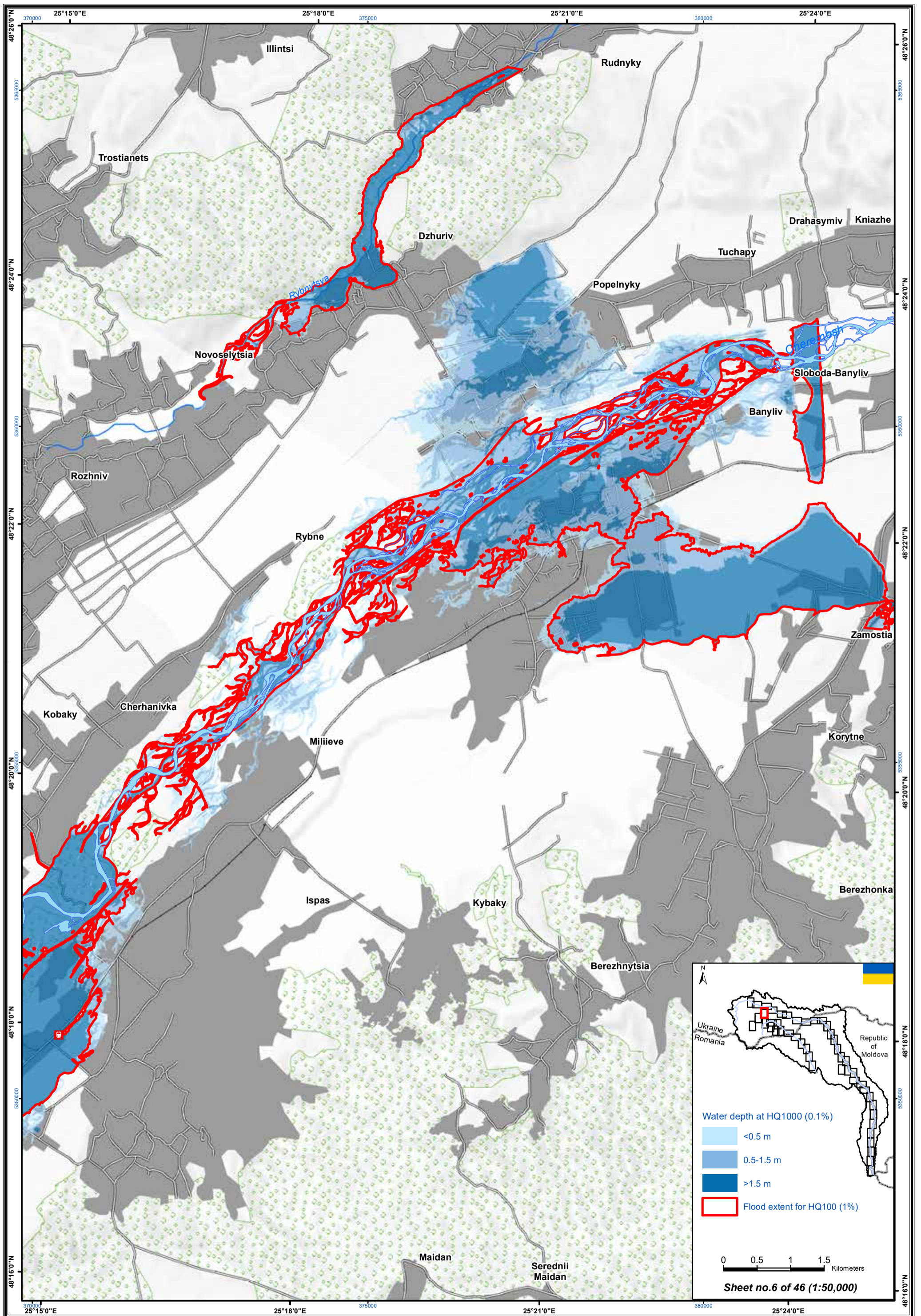


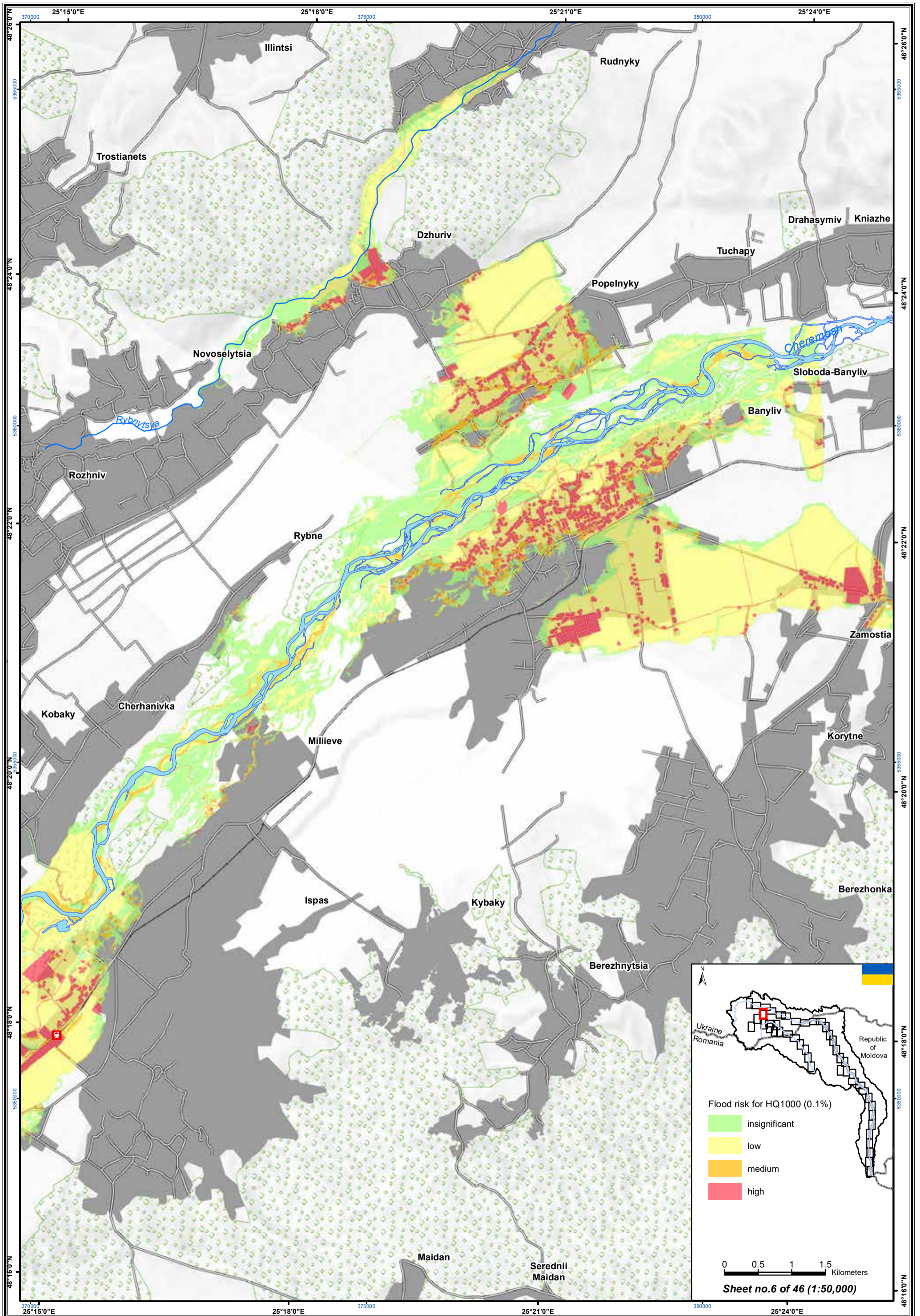


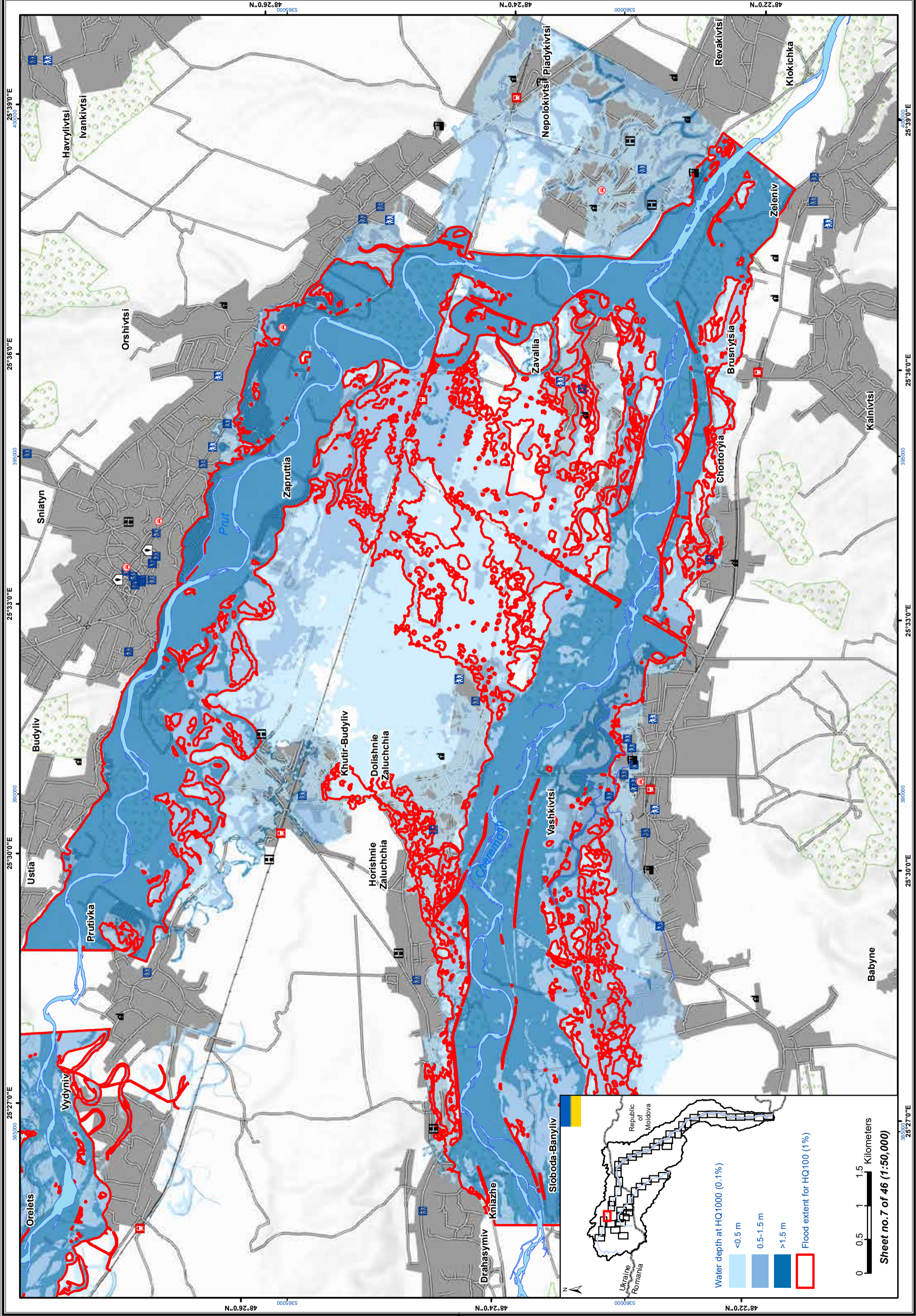




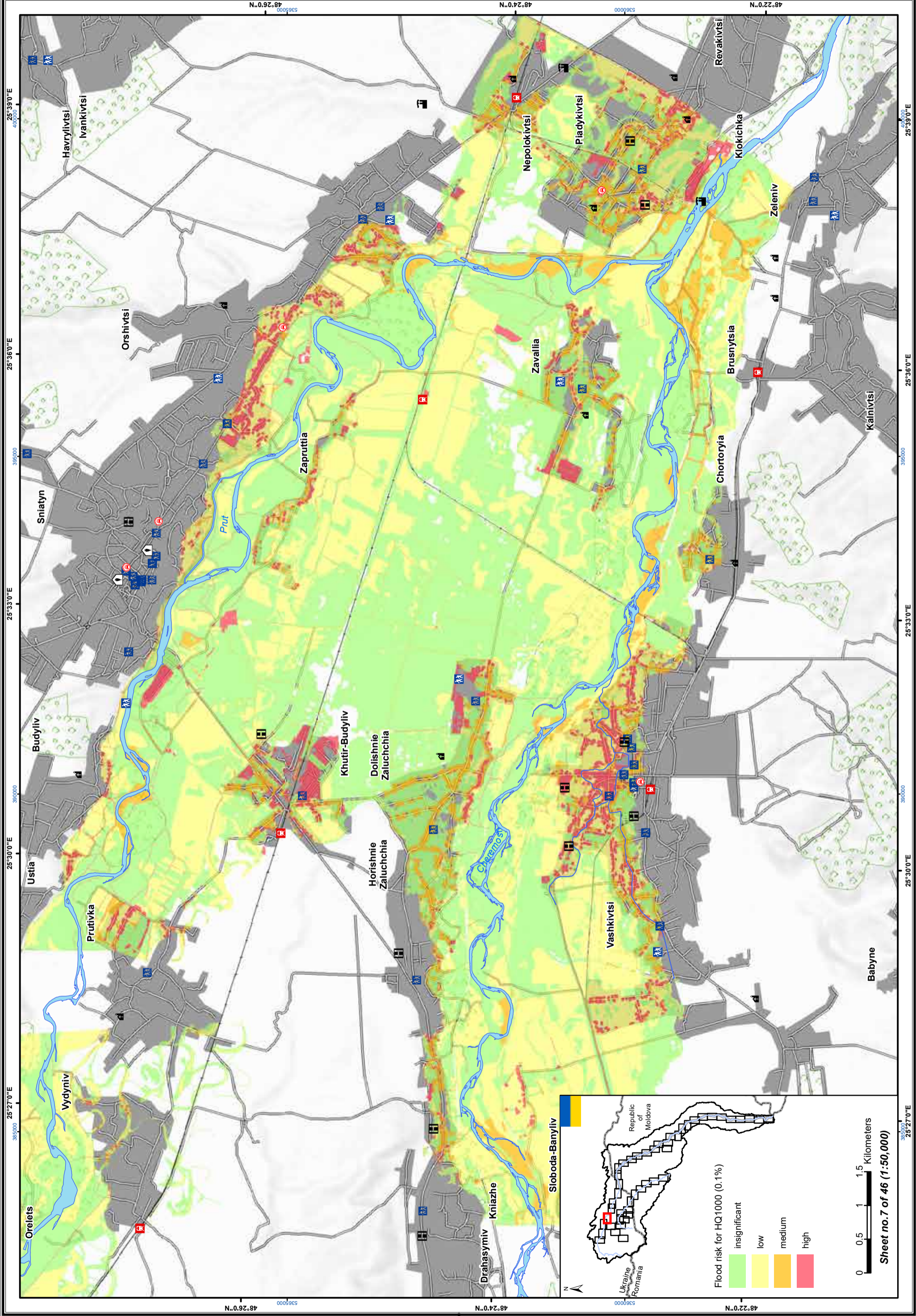








Sheet no.7 of 46 (1:50,000)



25°27'0"E 385000 25°30'0"E 390000 25°33'0"E 395000 25°36'0"E 400000 25°39'0"E 405000

48°22'0"N 536000 48°24'0"N 536000 48°26'0"N 536000

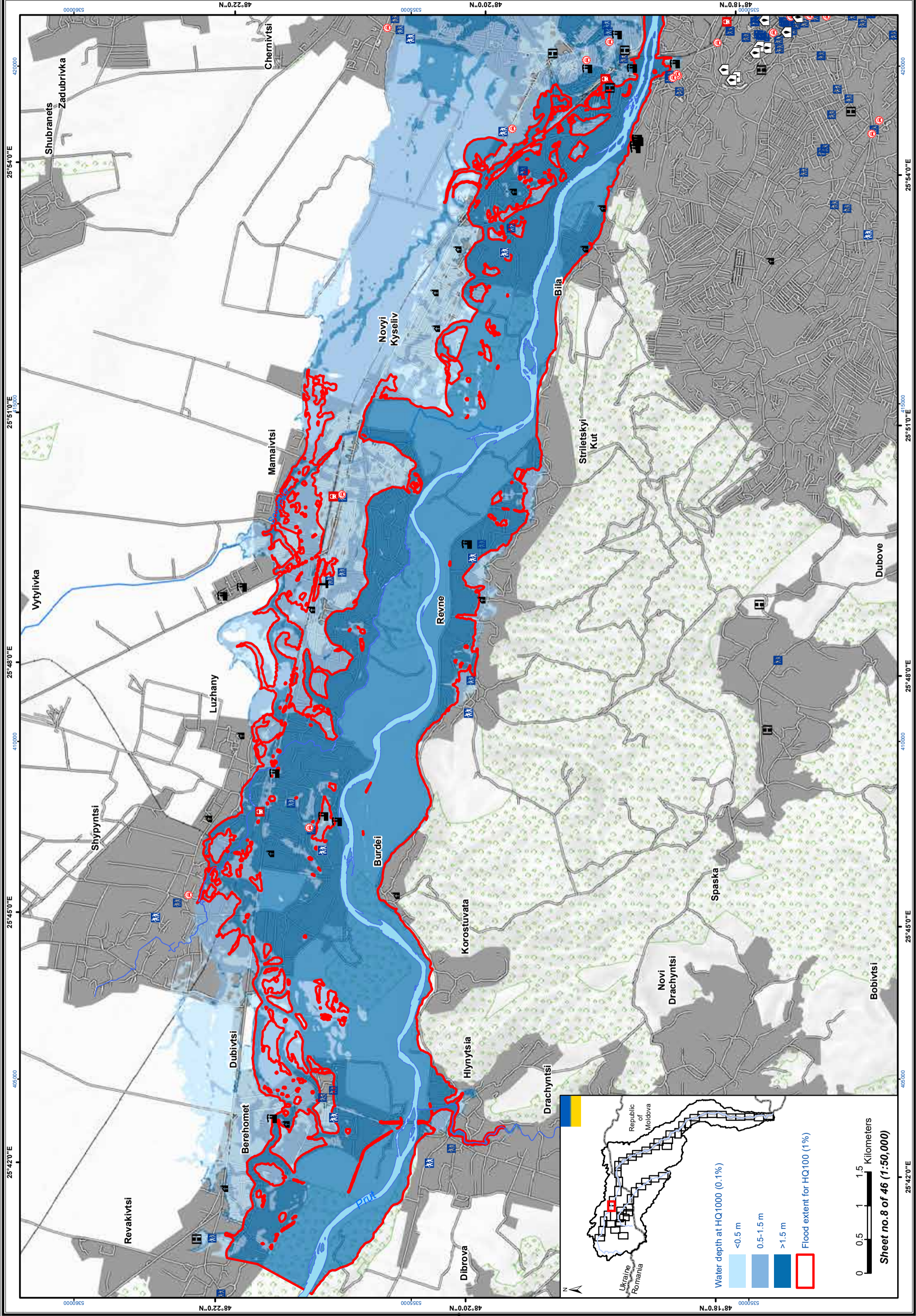
25°27'0"E 385000 25°30'0"E 390000 25°33'0"E 395000 25°36'0"E 400000 25°39'0"E 405000

**Flood risk for HQ 1000 (0.1%)**

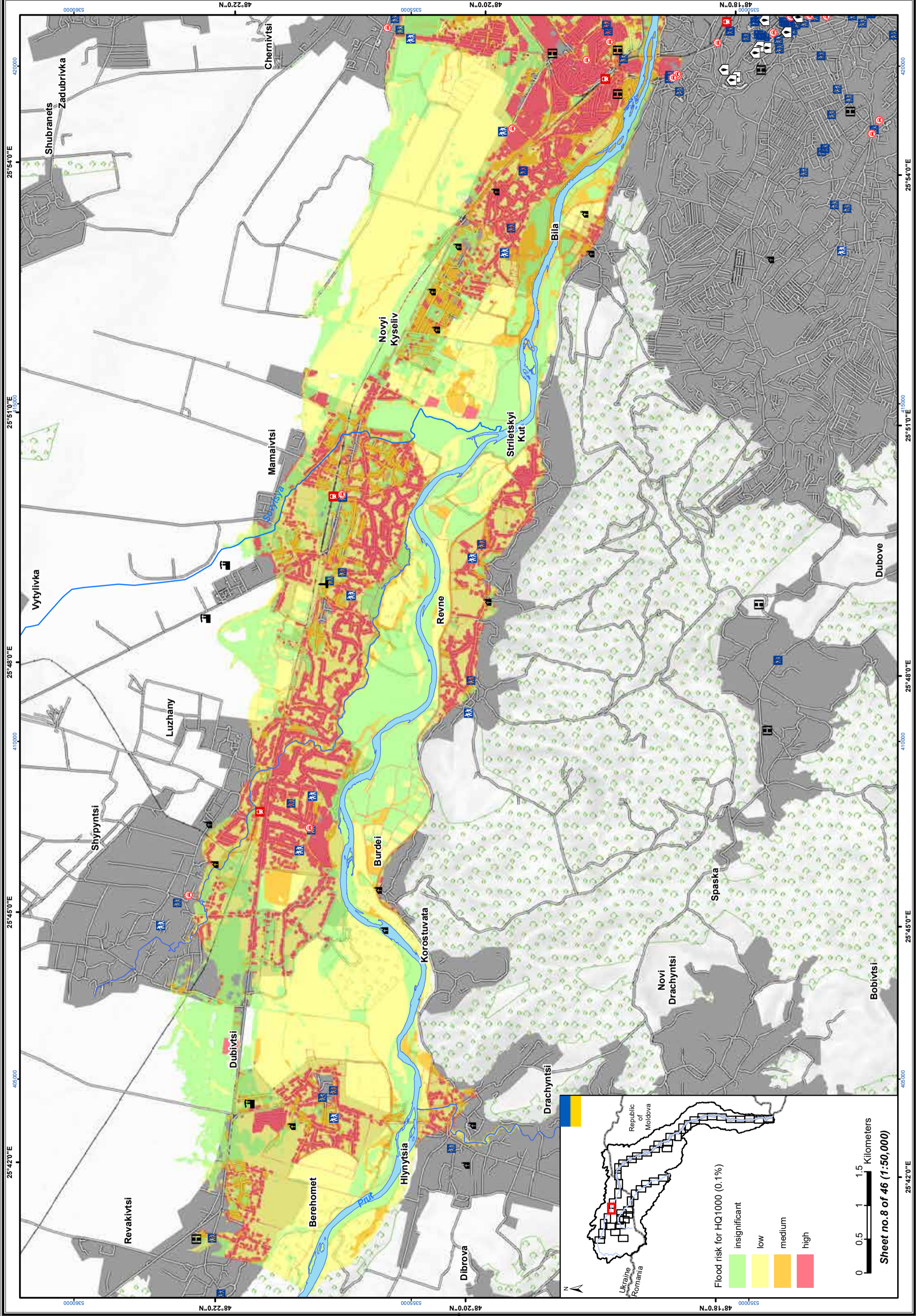
- insignificant
- low
- medium
- high

0 0.5 1 1.5 Kilometers

**Sheet no.7 of 46 (1:50,000)**



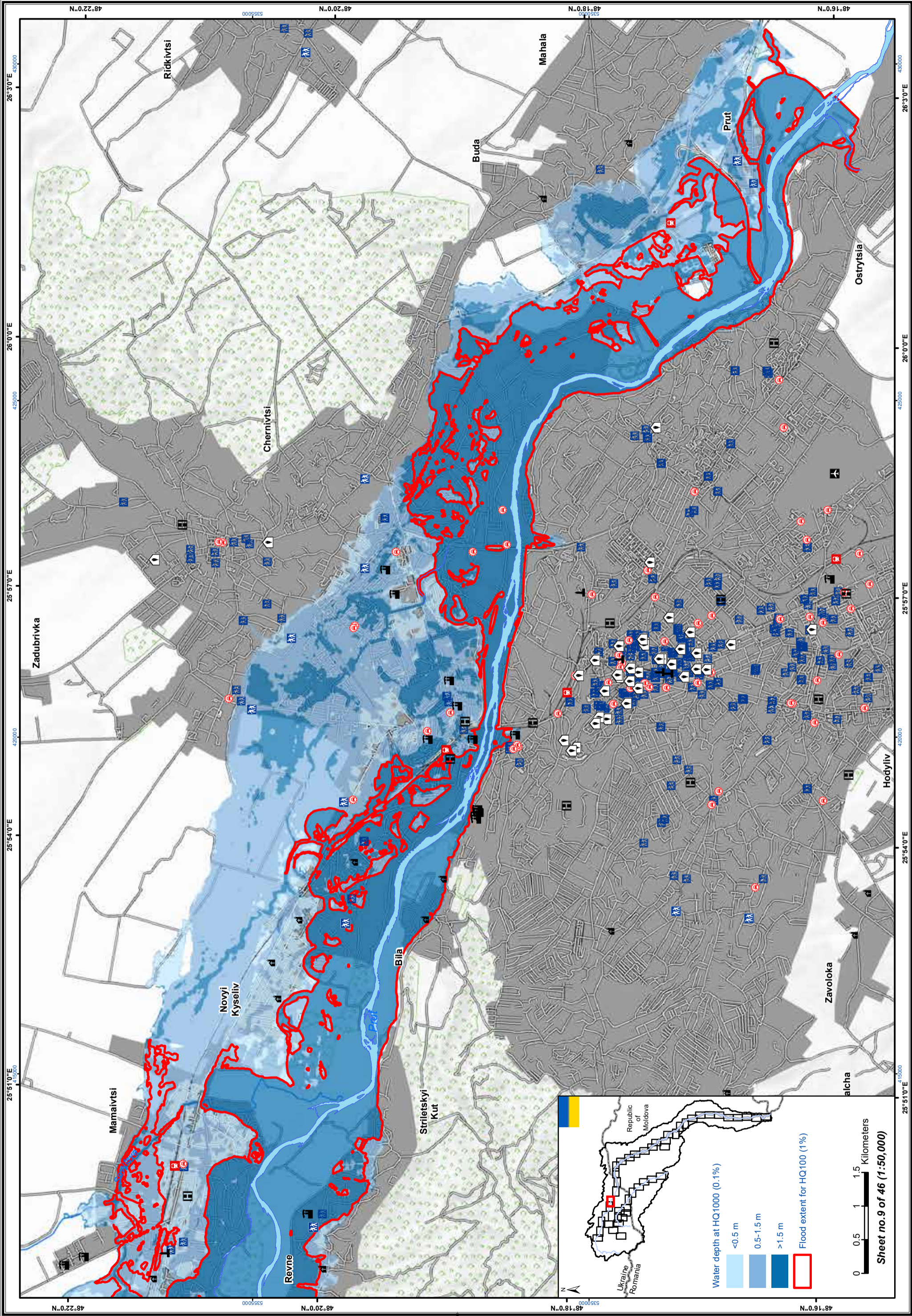




48°22'0"N 25°42'0"E 48°22'0"N 25°45'0"E 48°22'0"N 25°48'0"E 48°22'0"N 25°51'0"E 48°22'0"N 25°54'0"E

Revakivtsi Dubivtsi Berehomet Hlynysia Korostuvata Burdei Revne Striletskyi Kut Bilva Novyi Kyseliv Mamaivtsi Shyptyntsi Luzhany Vytylivka Shubranets Zadubrivka Chernivtsi Dubove Spaska Novi Drachyntsi Bobivtsi Drachyntsi Dibrova

48°18'0"N 25°42'0"E 48°18'0"N 25°45'0"E 48°18'0"N 25°48'0"E 48°18'0"N 25°51'0"E 48°18'0"N 25°54'0"E

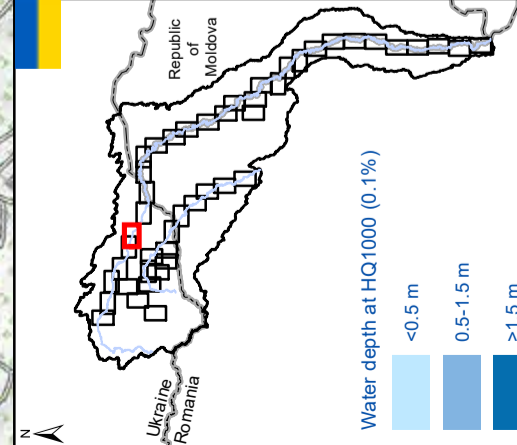


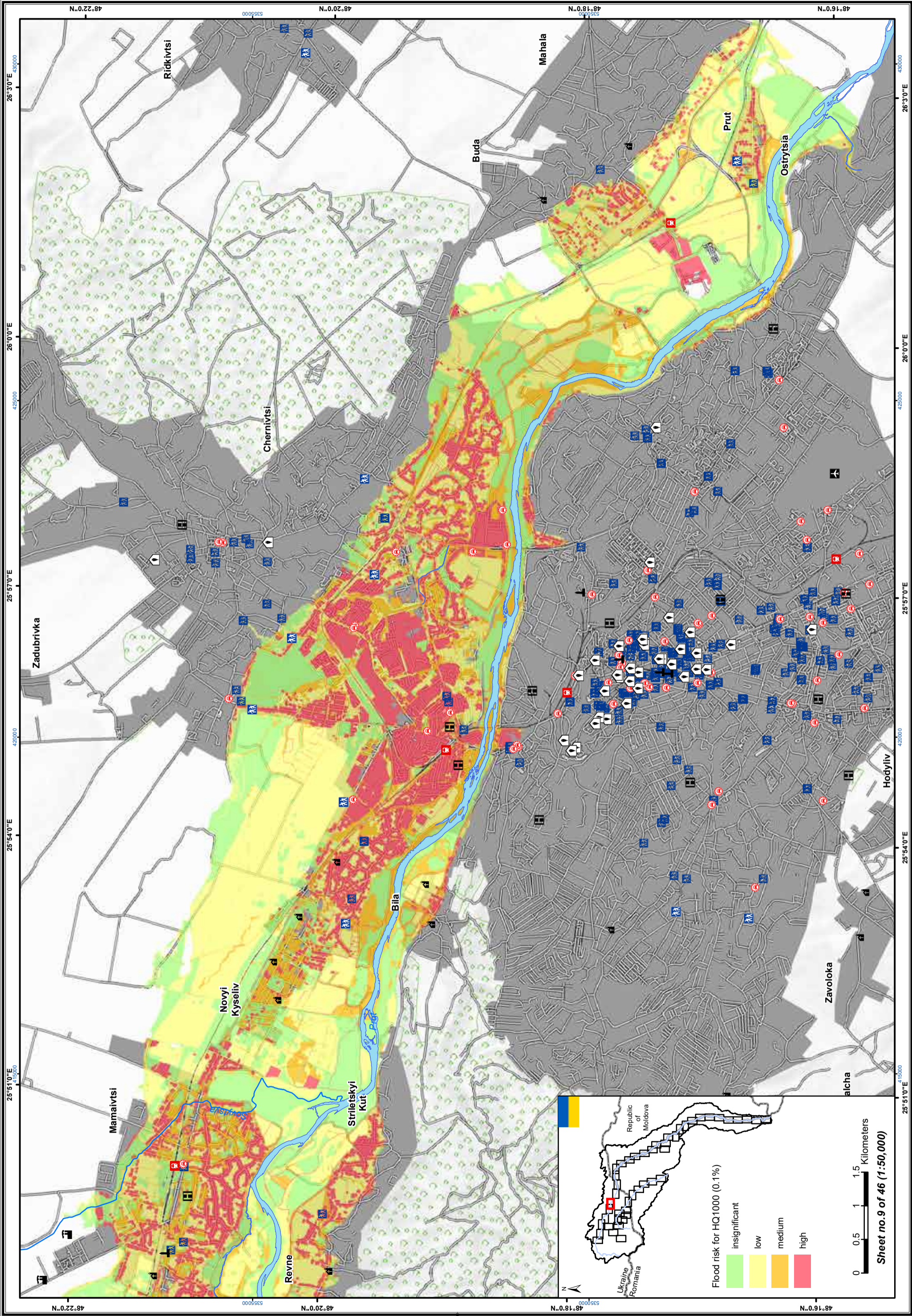
Sheet no. 9 of 46 (1:50,000)

0 0.5 1 1.5 Kilometers

Water depth at HQ1000 (0.1%)

- <0.5 m
- 0.5-1.5 m
- >1.5 m
- Flood extent for HQ100 (1%)

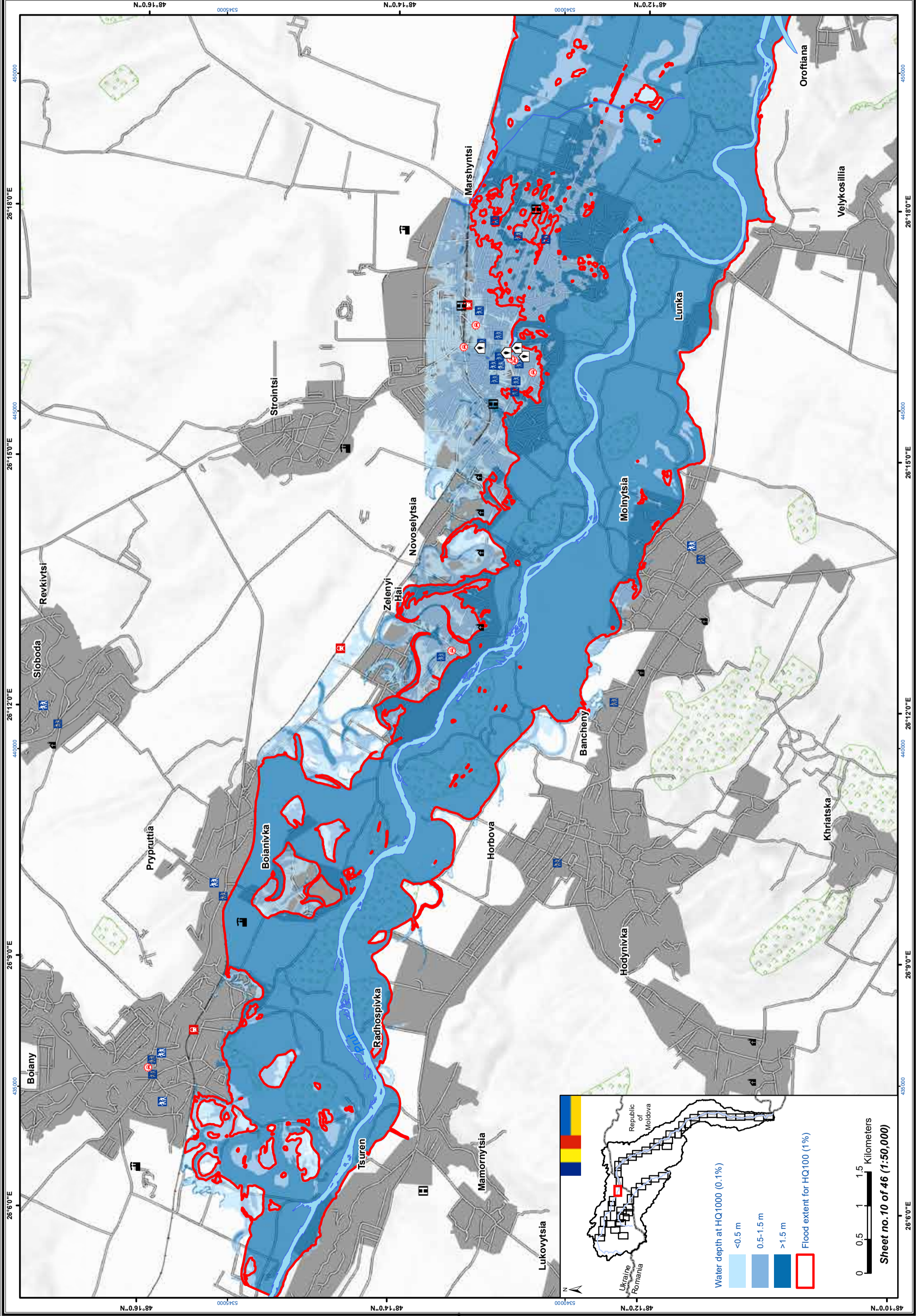




Republic of Moldova  
 Ukraine  
 Romania

Flood risk for HQ1000 (0.1%)  
 insignificant  
 low  
 medium  
 high

0 0.5 1 1.5 Kilometers  
**Sheet no. 9 of 46 (1:50,000)**



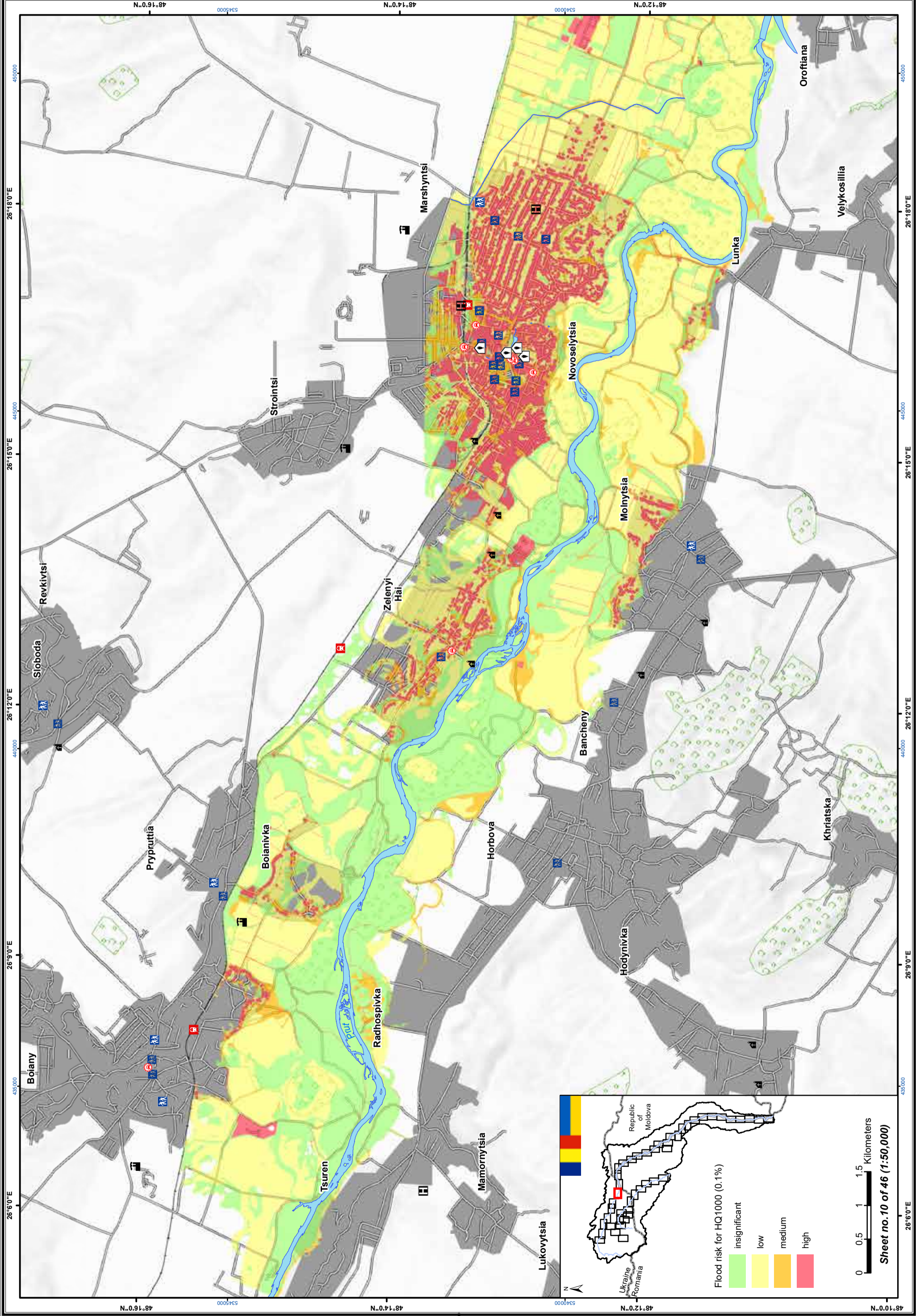
Water depth at HQ1000 (0.1%)

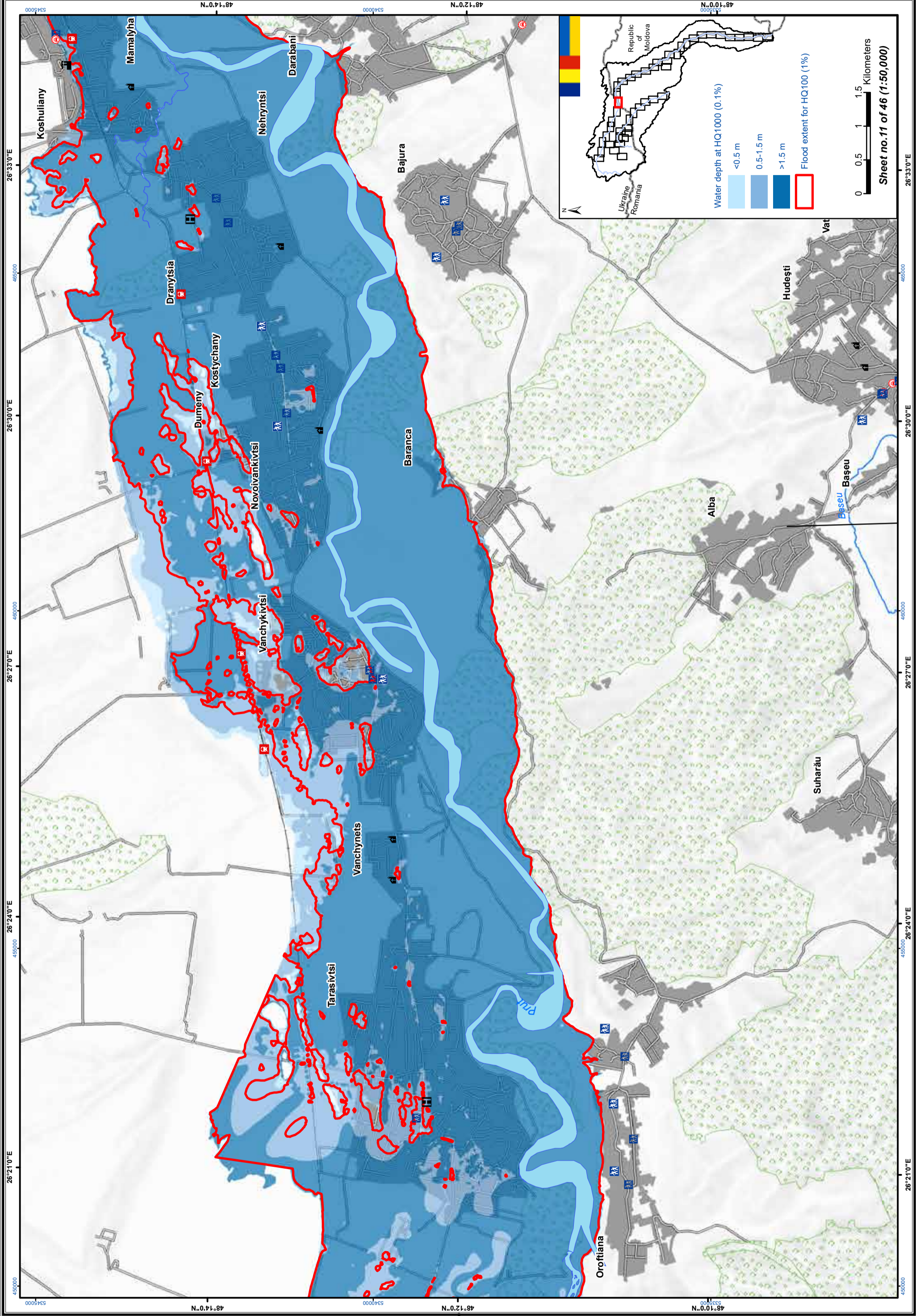
- <0.5 m
- 0.5-1.5 m
- >1.5 m

Flood extent for HQ100 (1%)

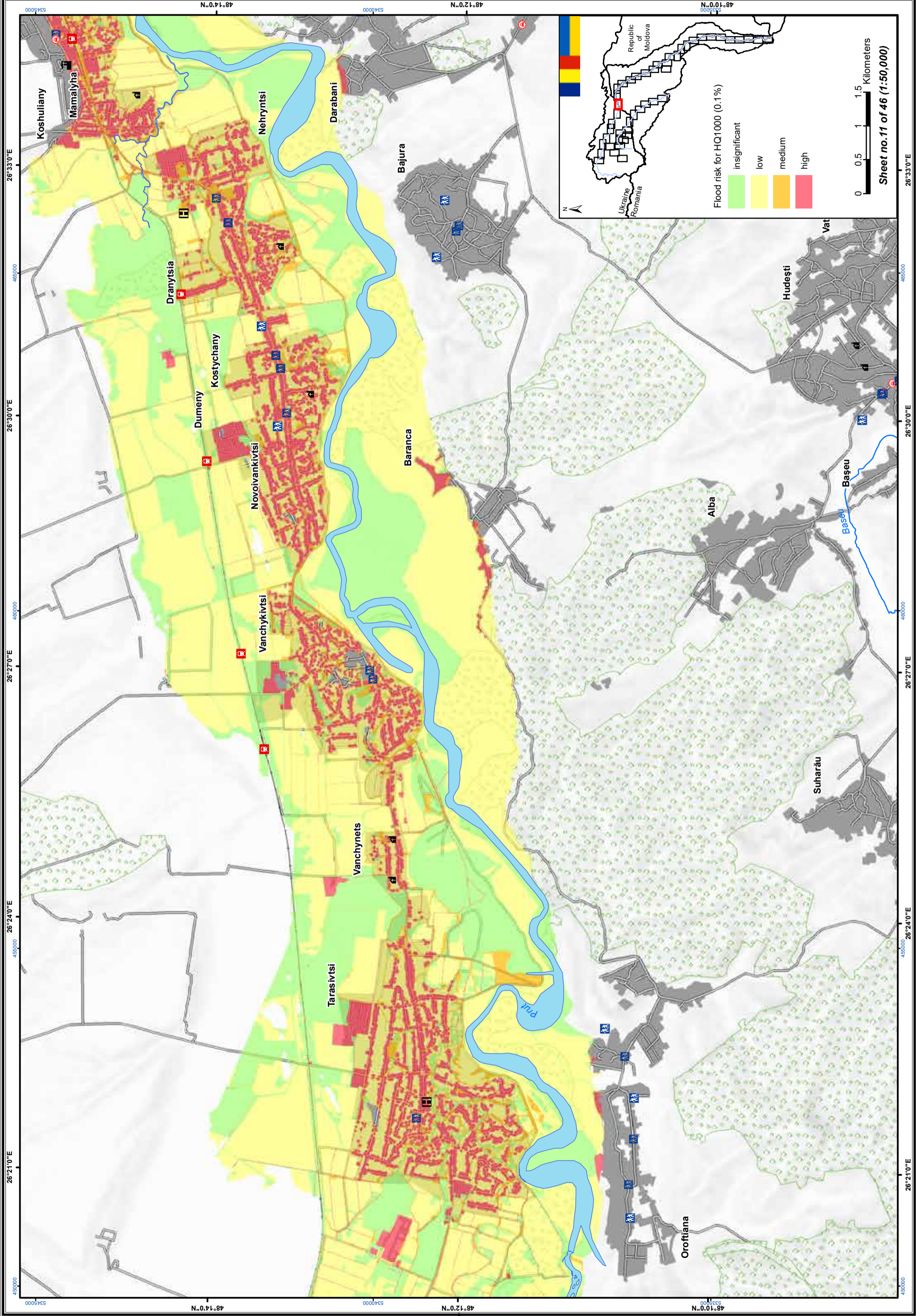
0 0.5 1 1.5 Kilometers

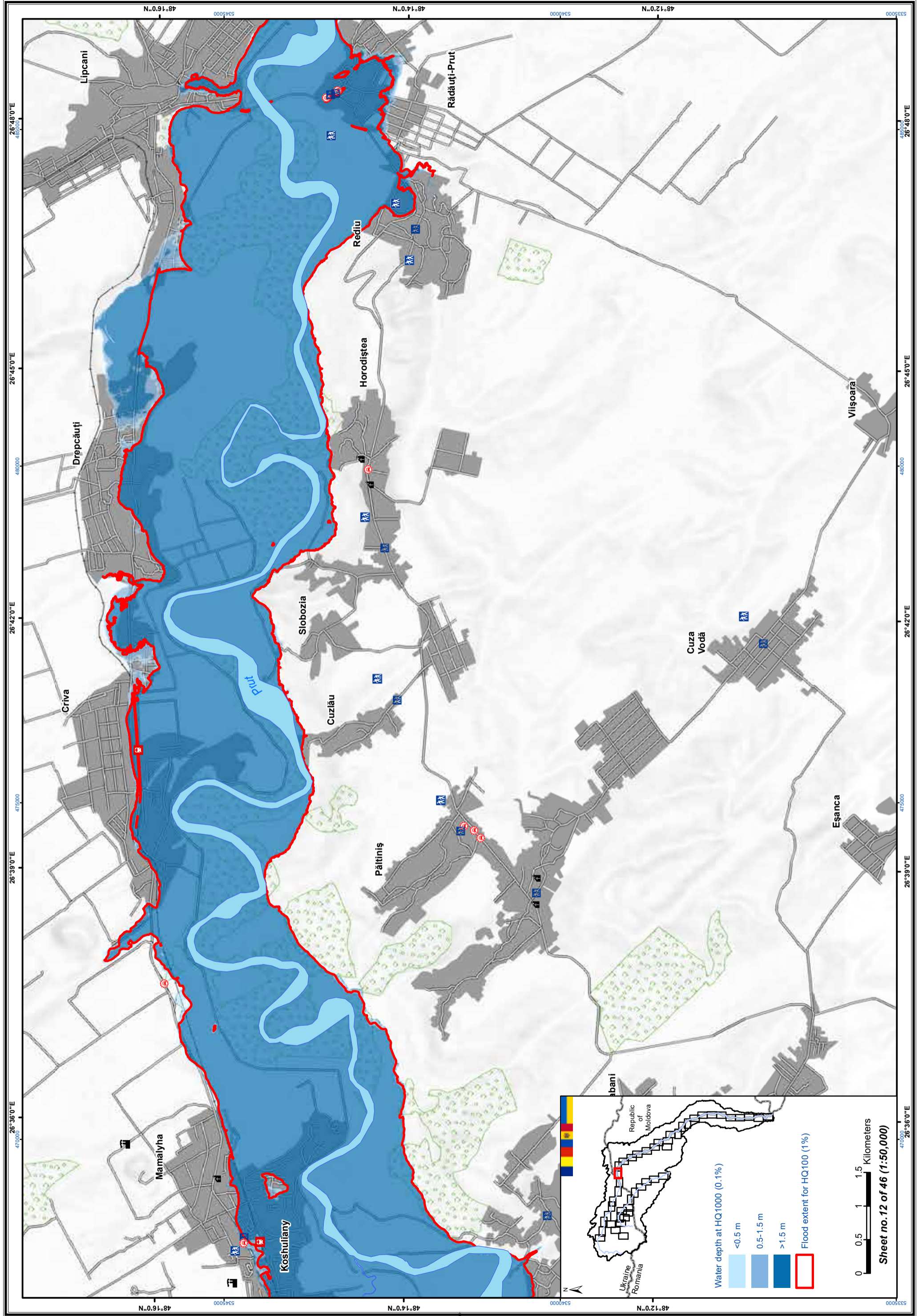
**Sheet no. 10 of 46 (1:50,000)**





Sheet no. 11 of 46 (1:50,000)

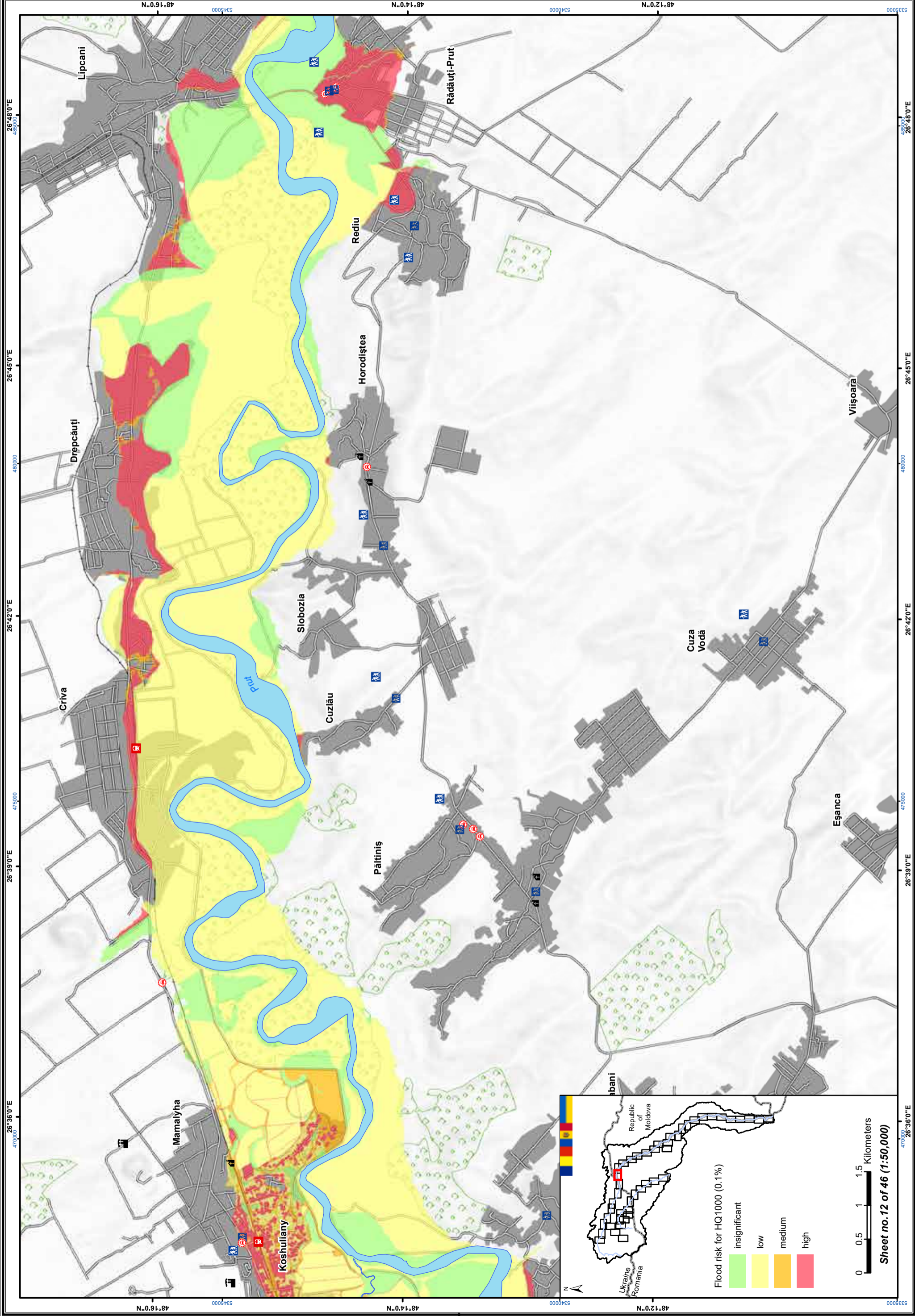


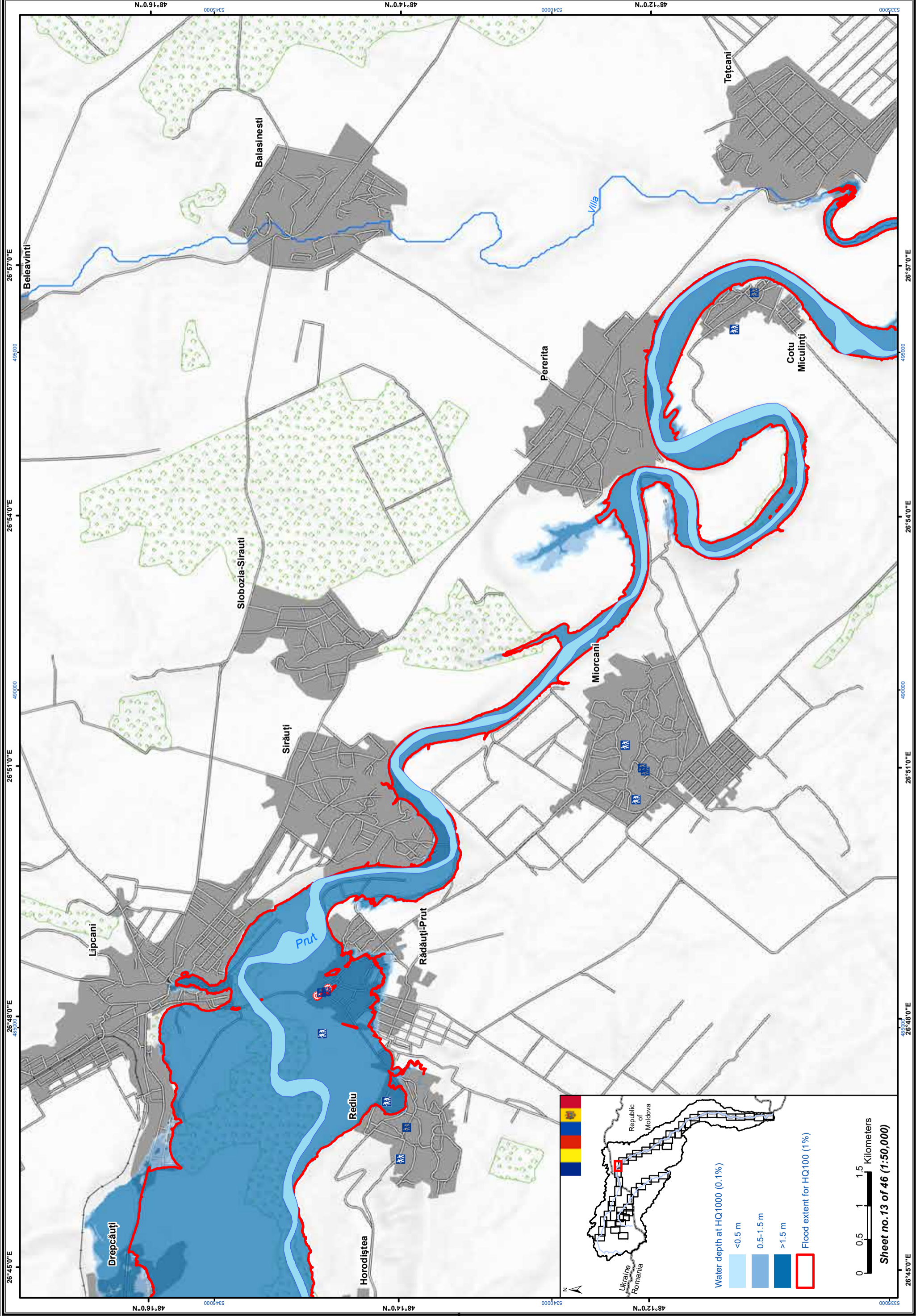


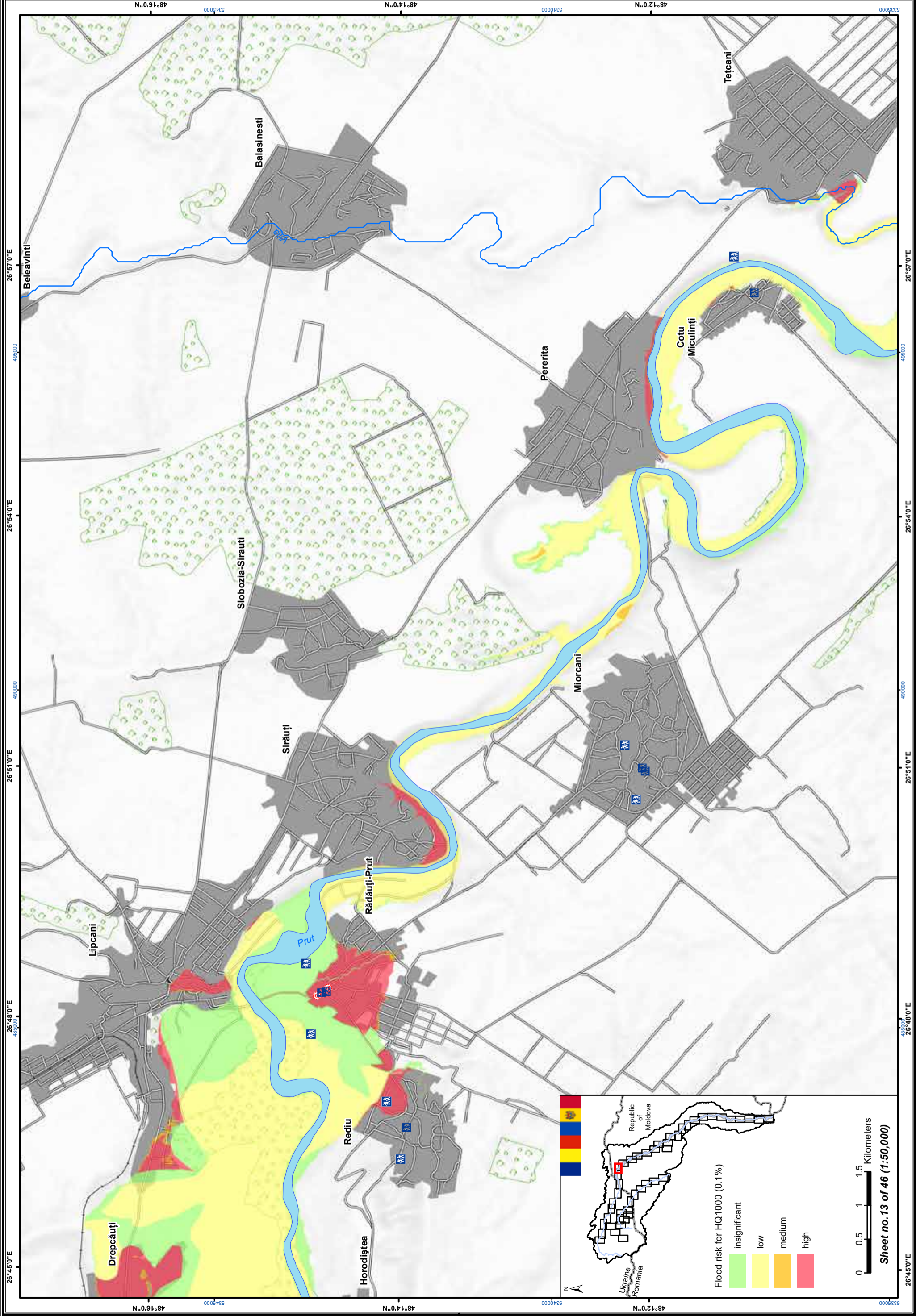
<0.5 m  
 0.5-1.5 m  
 >1.5 m  
 Flood extent for HQ100 (1%)

0 0.5 1 1.5 Kilometers  
**Sheet no.12 of 46 (1:50,000)**







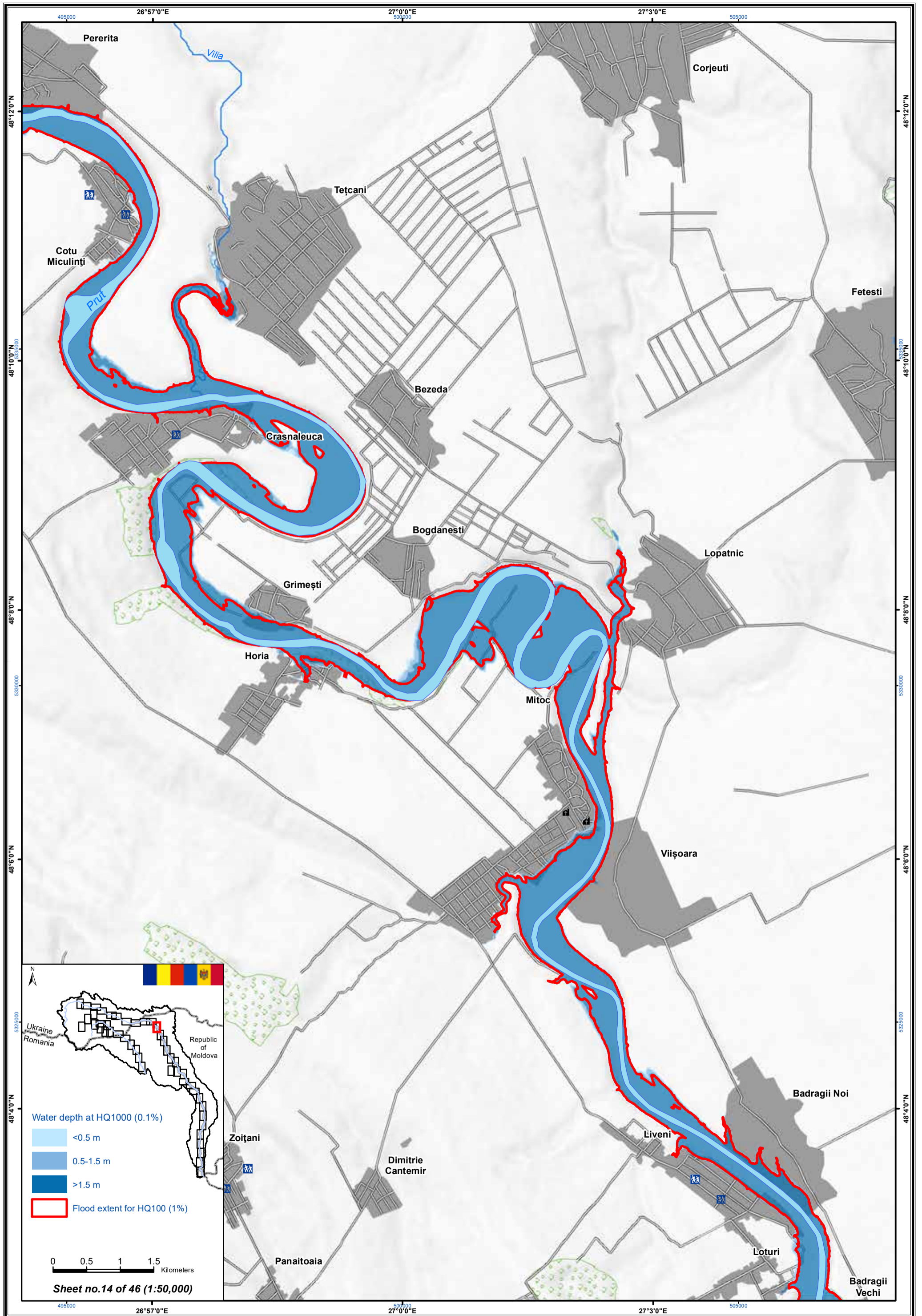


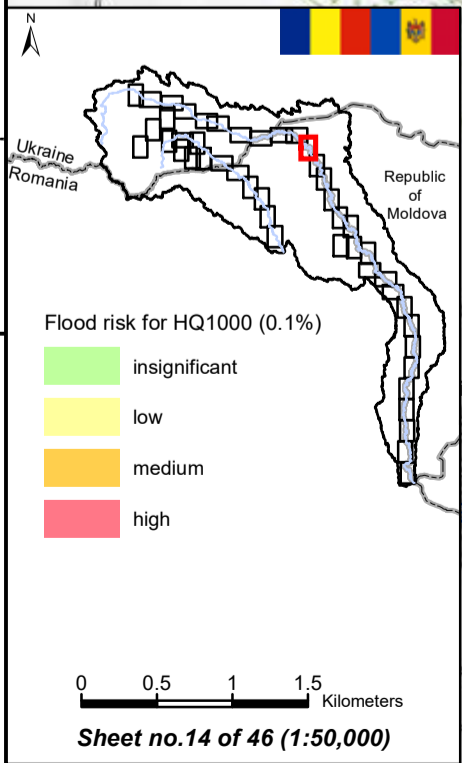
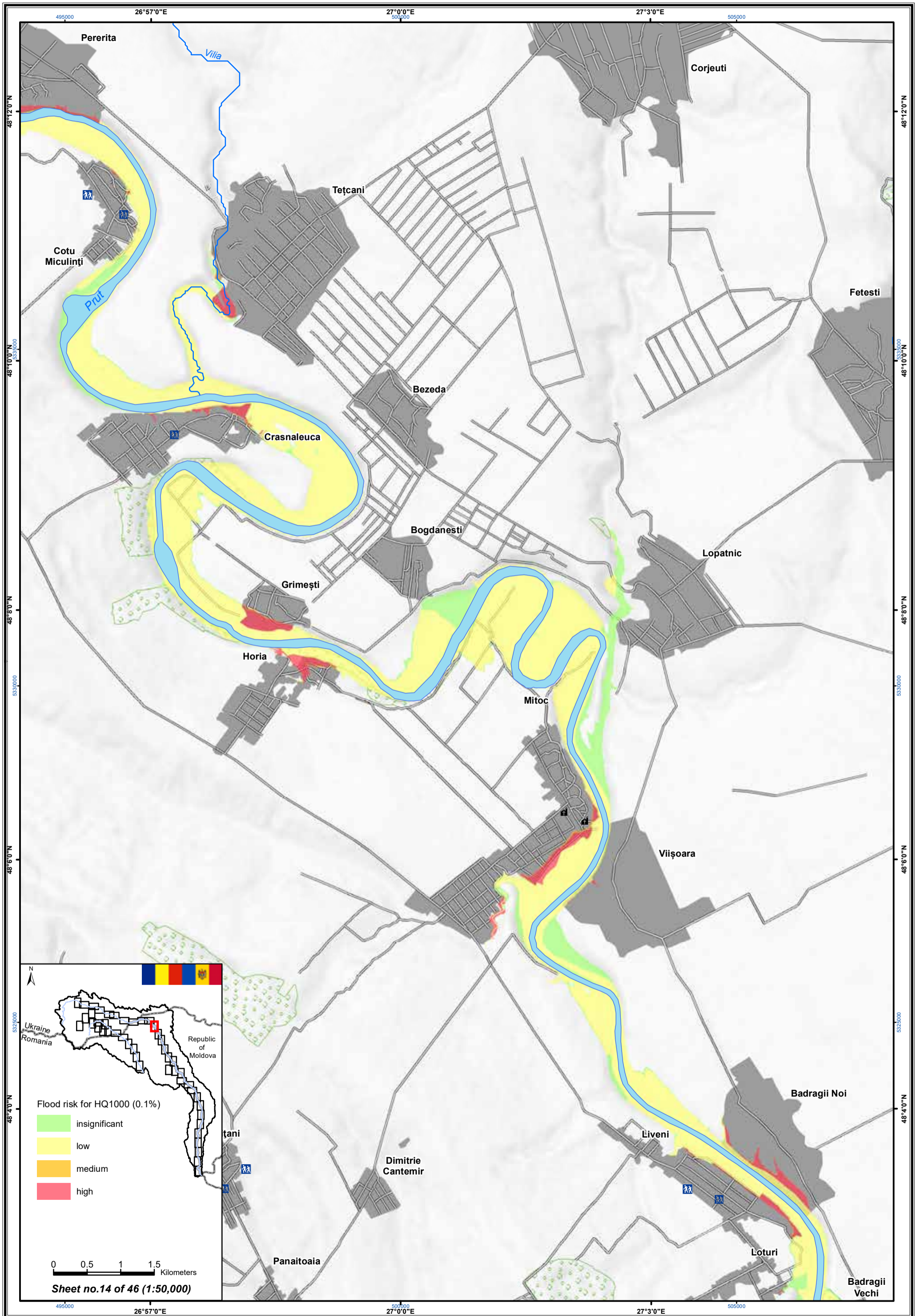
26°45'0"E 26°48'0"E 26°51'0"E 26°54'0"E 26°57'0"E

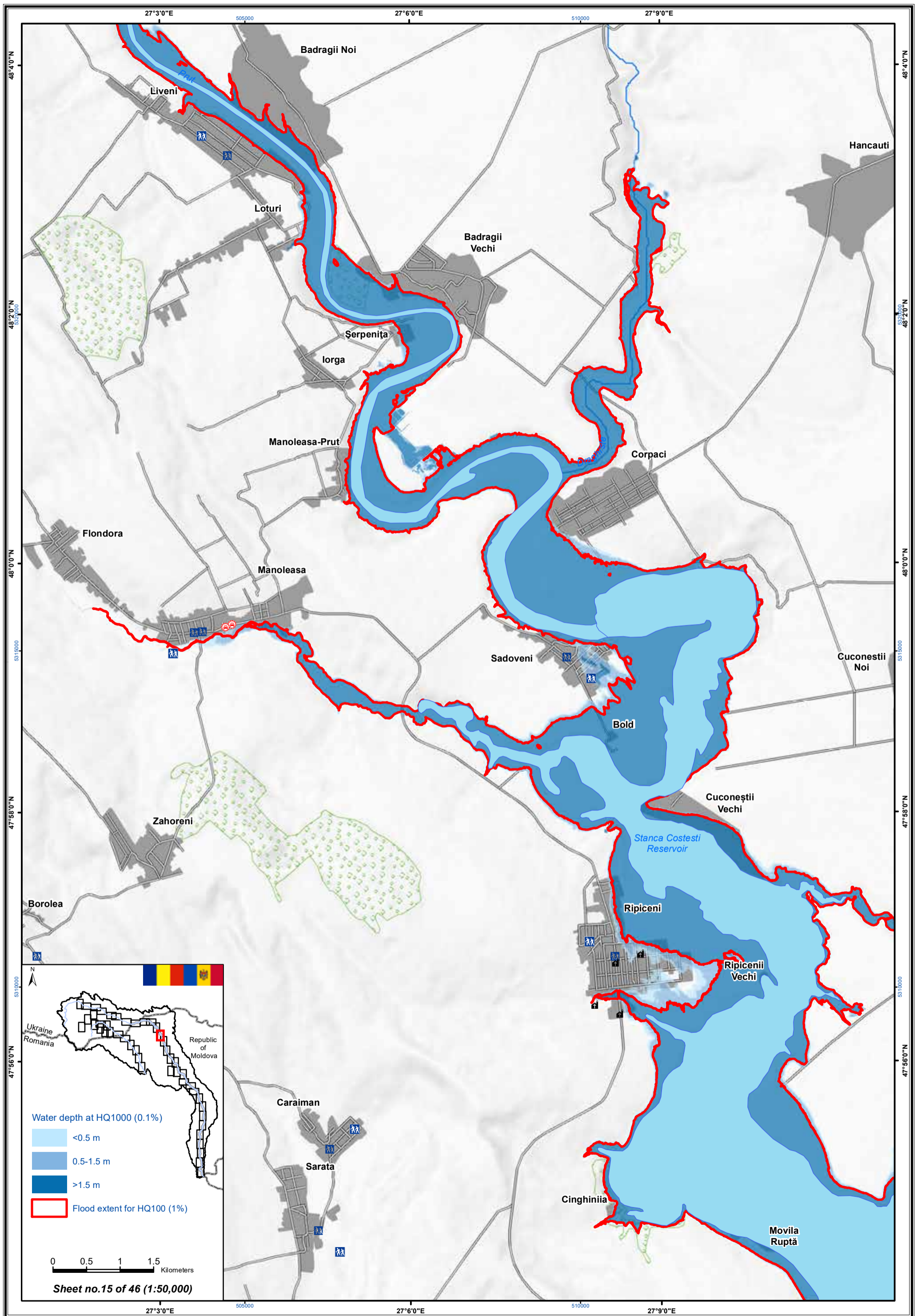
26°45'0"E 26°48'0"E 26°51'0"E 26°54'0"E 26°57'0"E

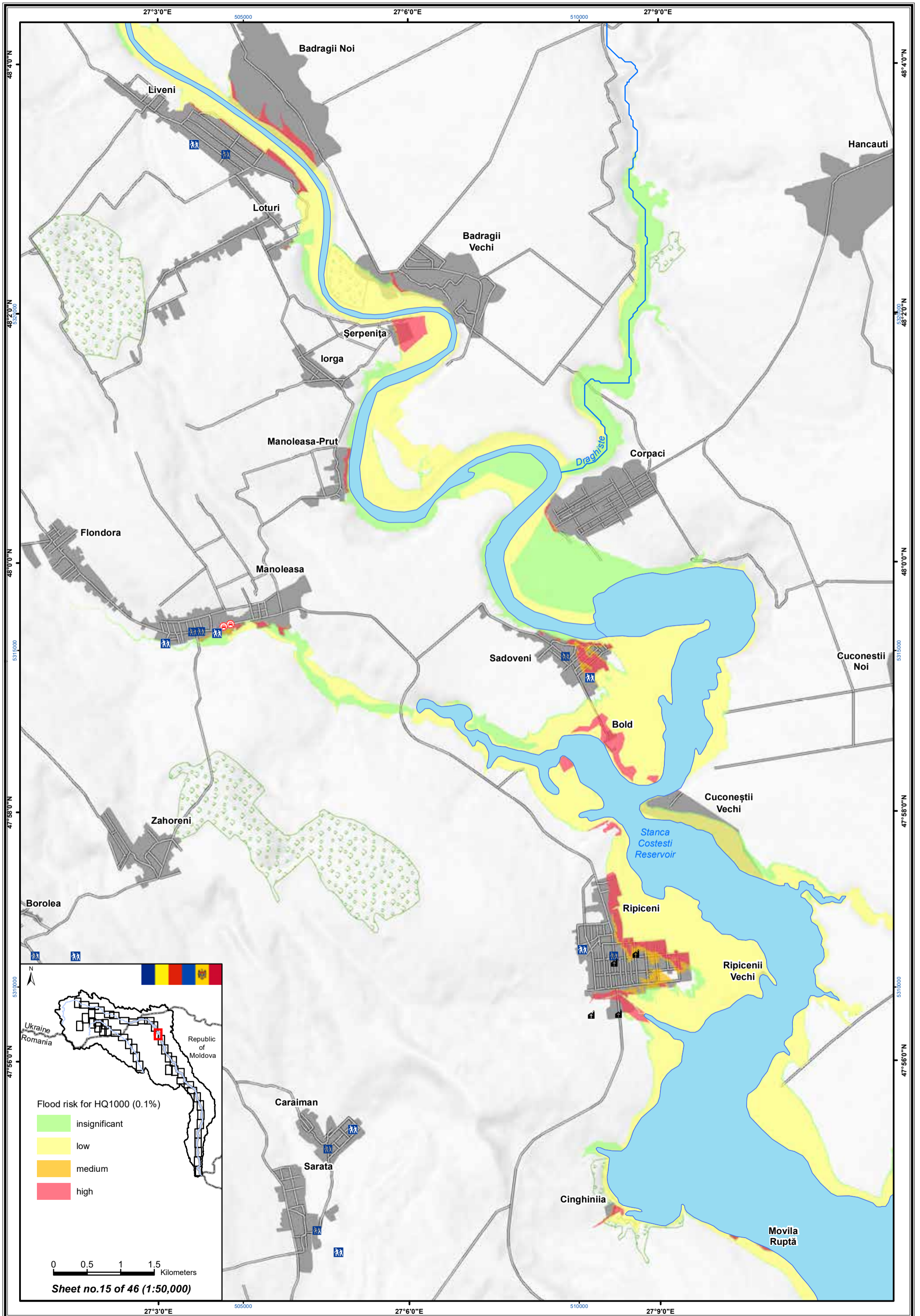
48°12'0"N 48°14'0"N 48°16'0"N

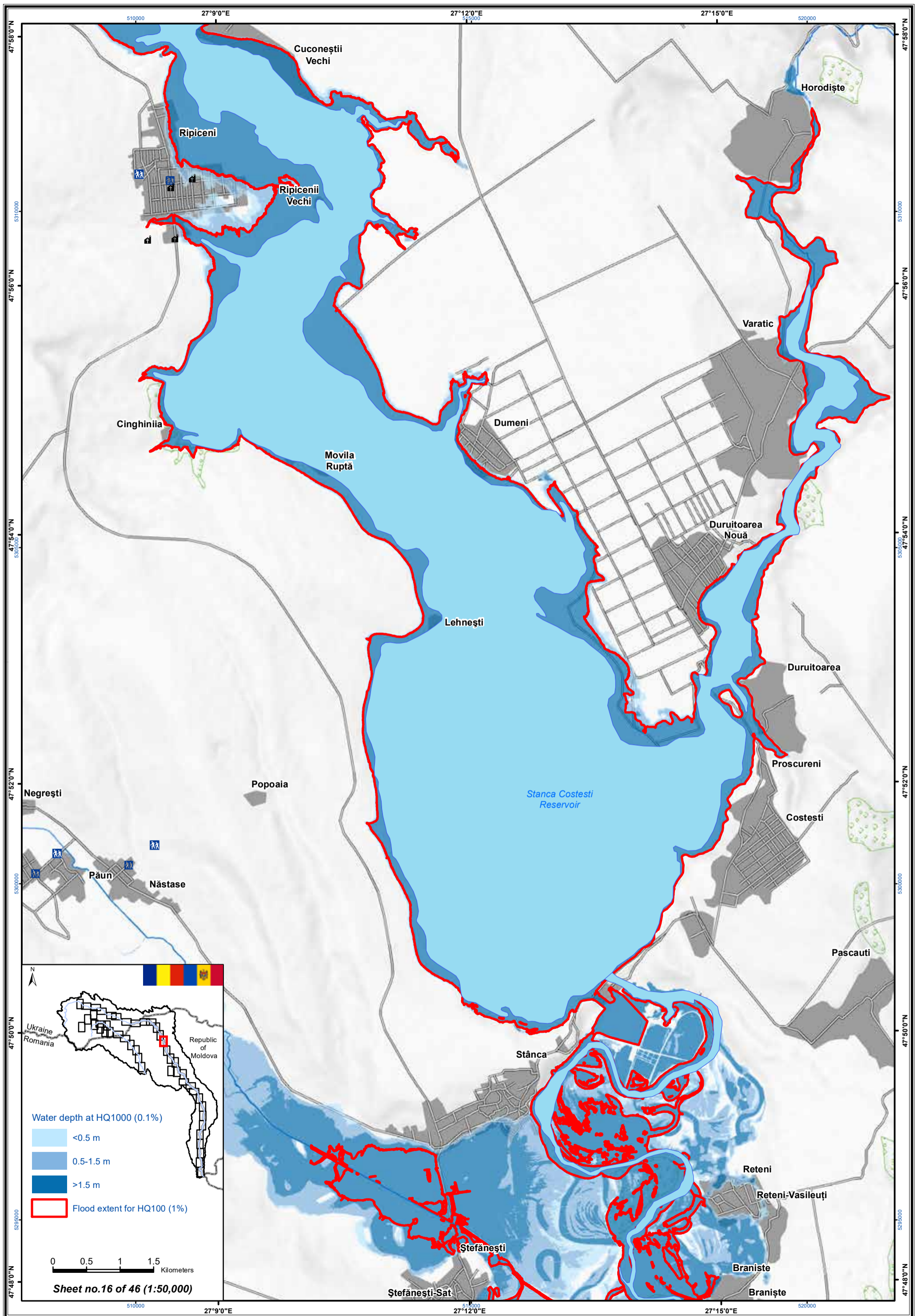
48°12'0"N 48°14'0"N 48°16'0"N



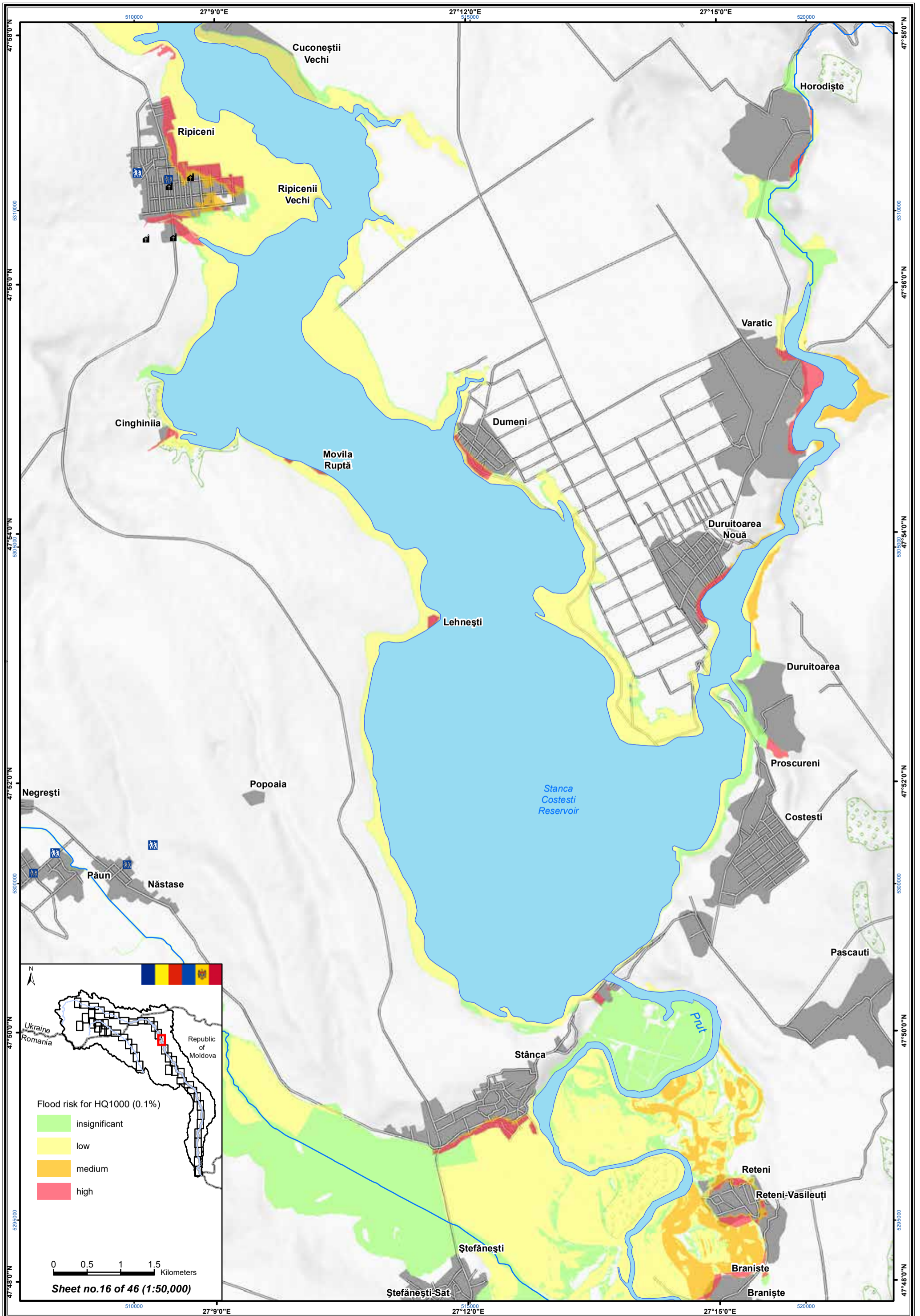


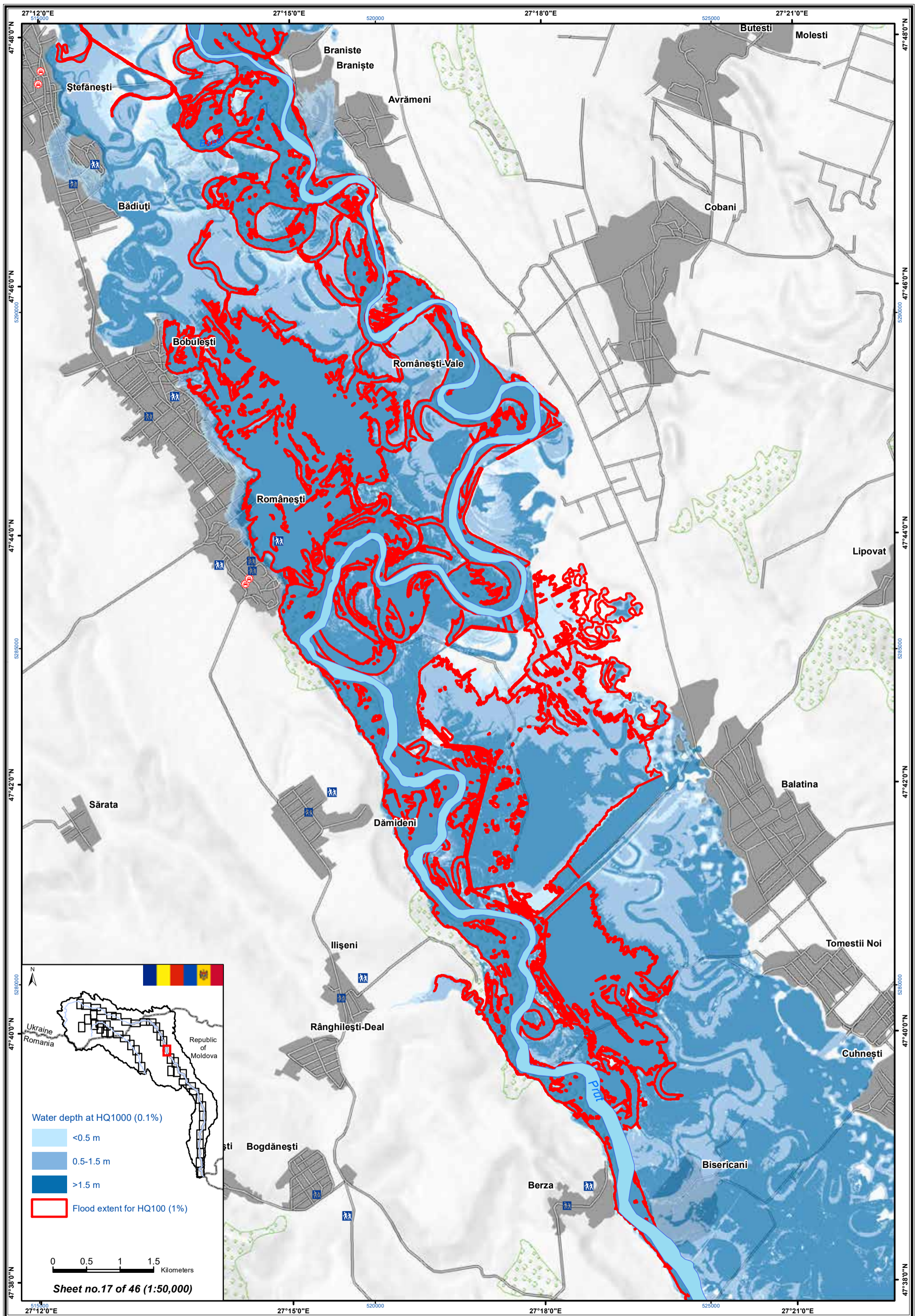


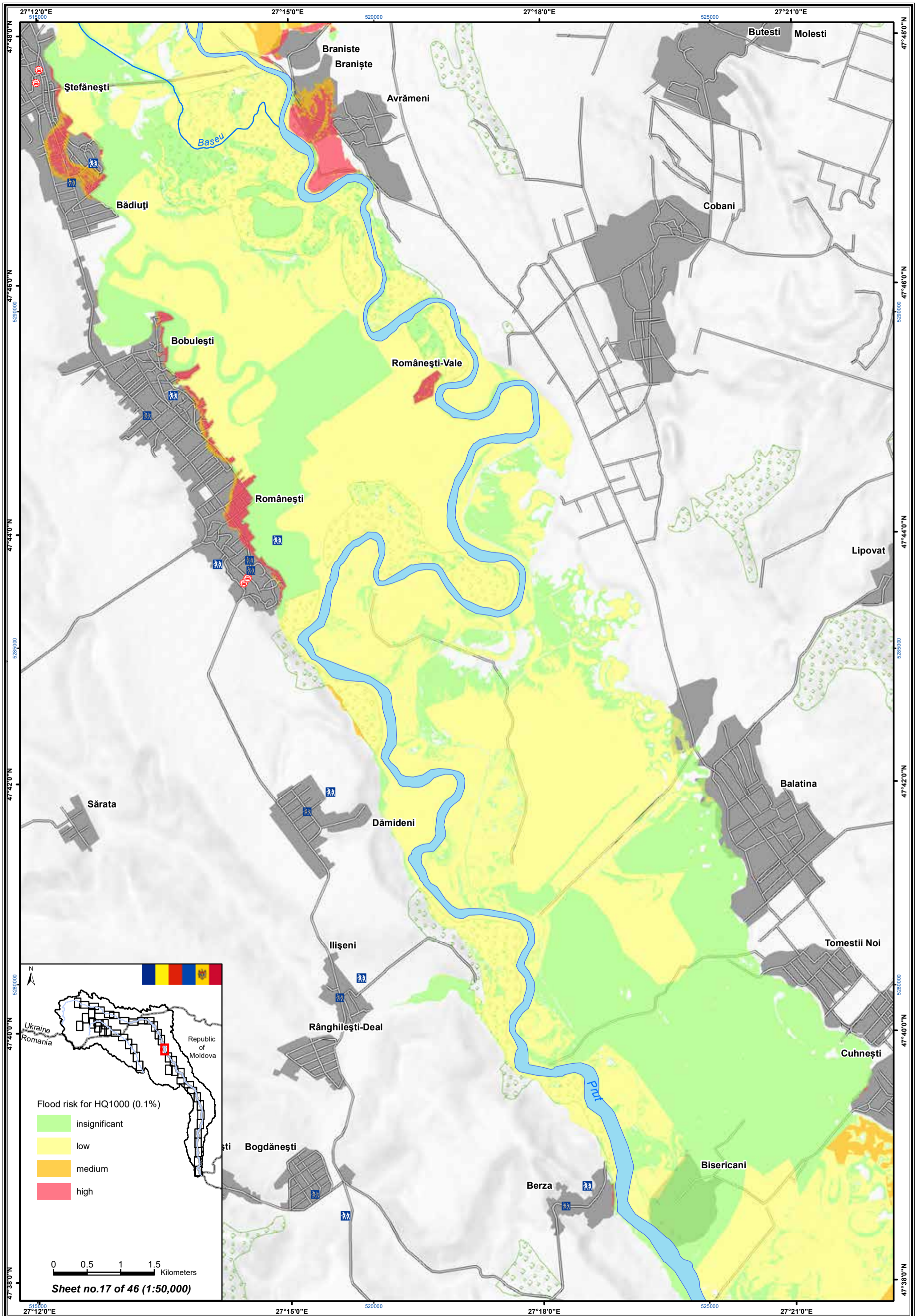


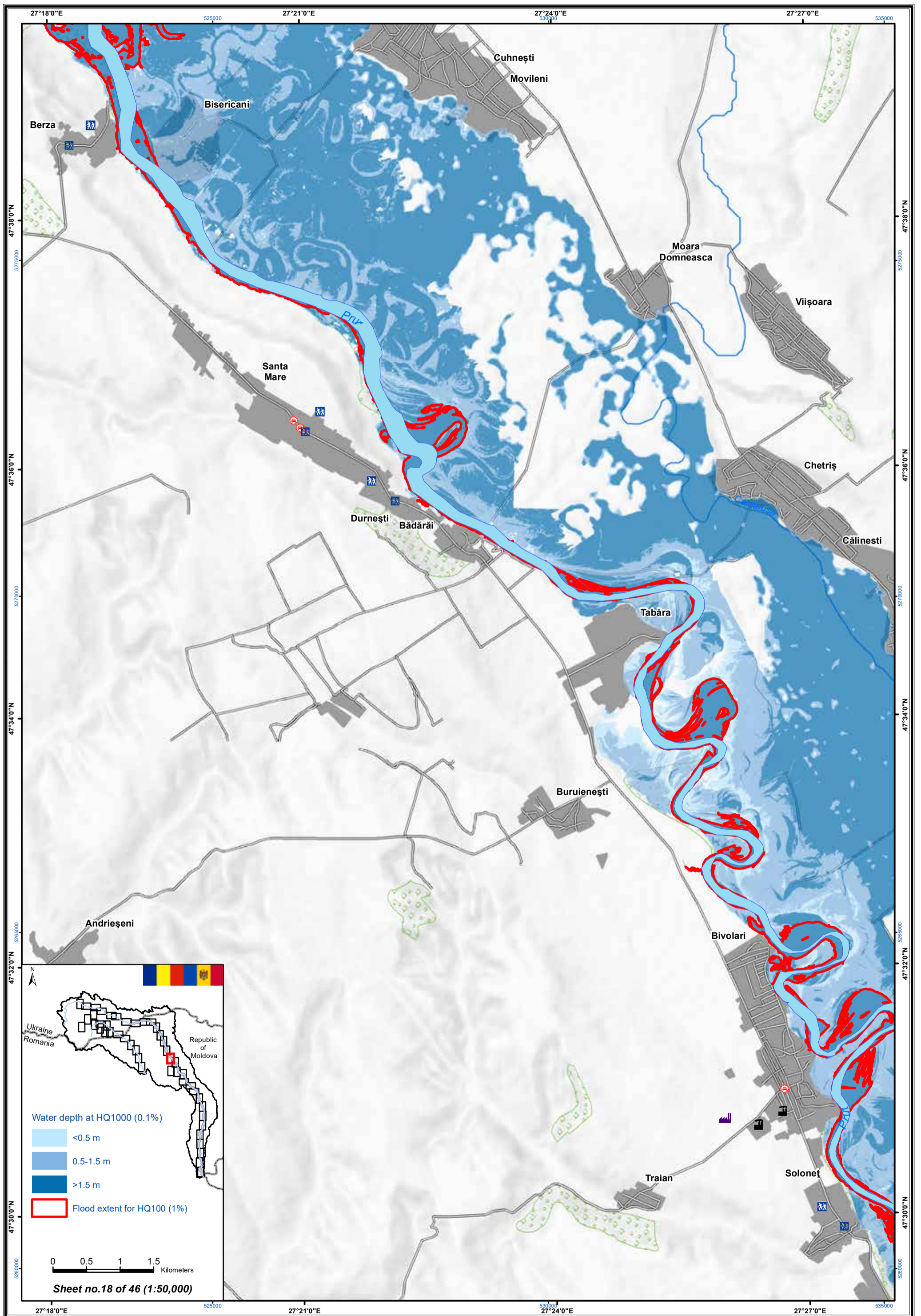


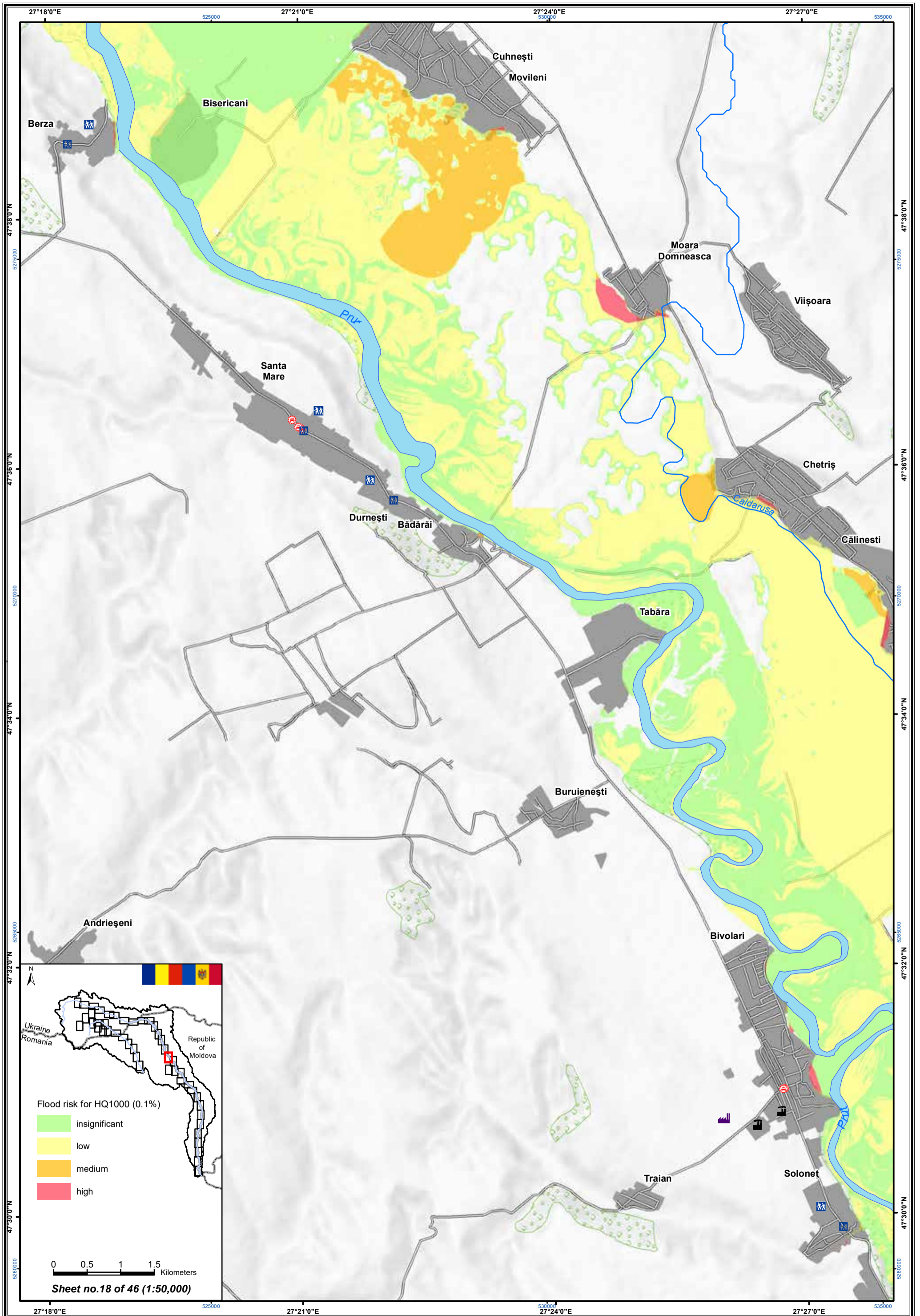


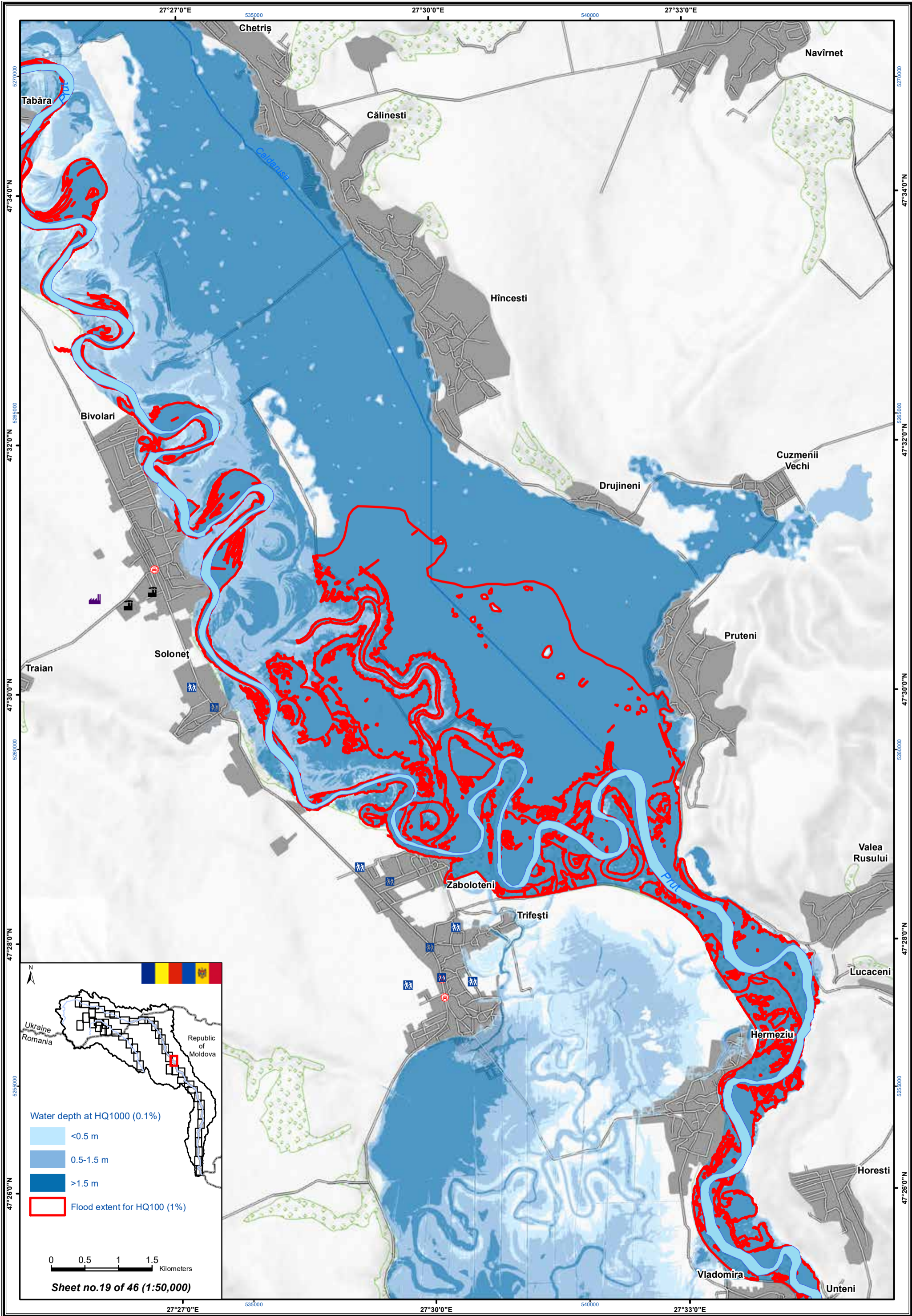


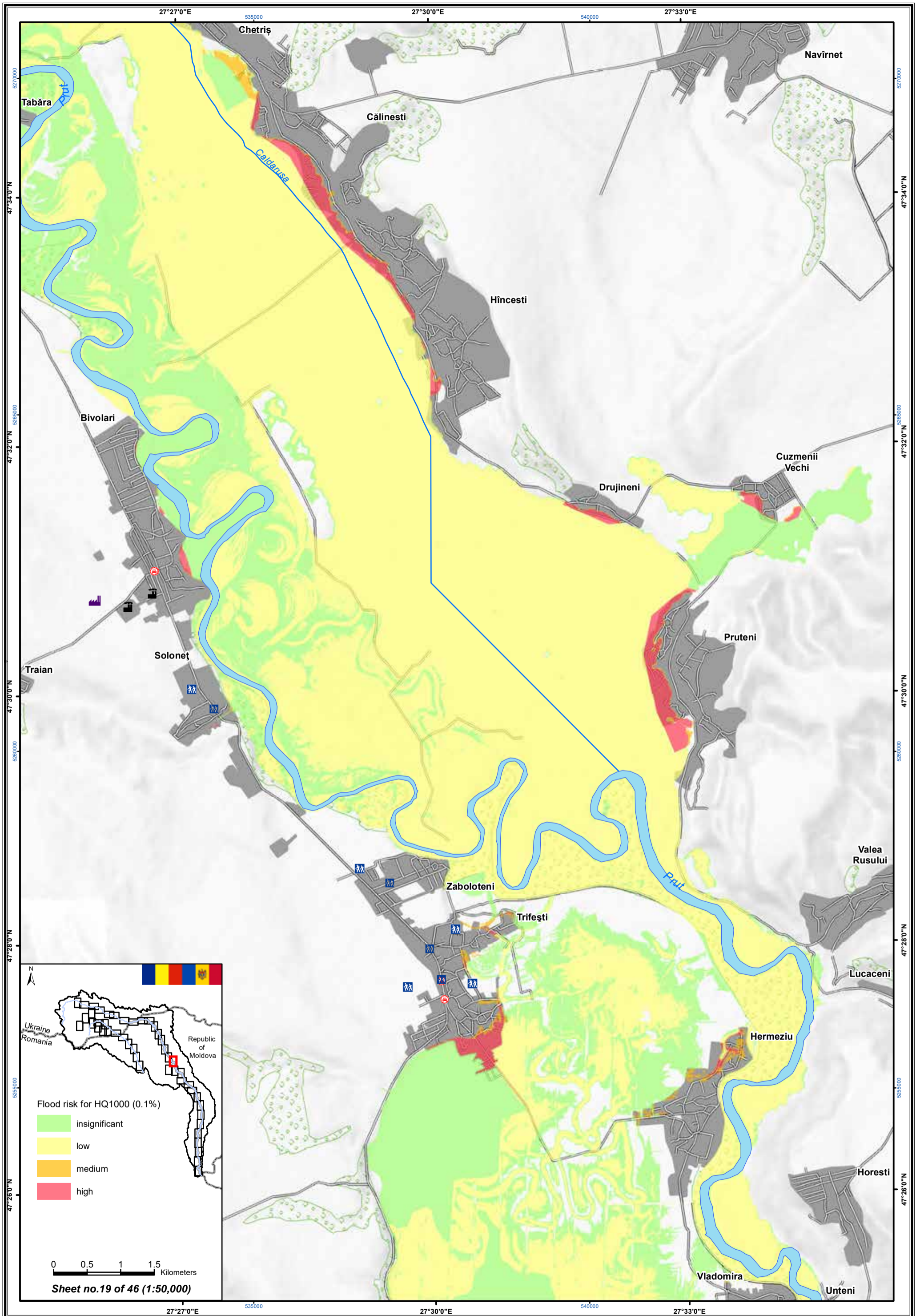


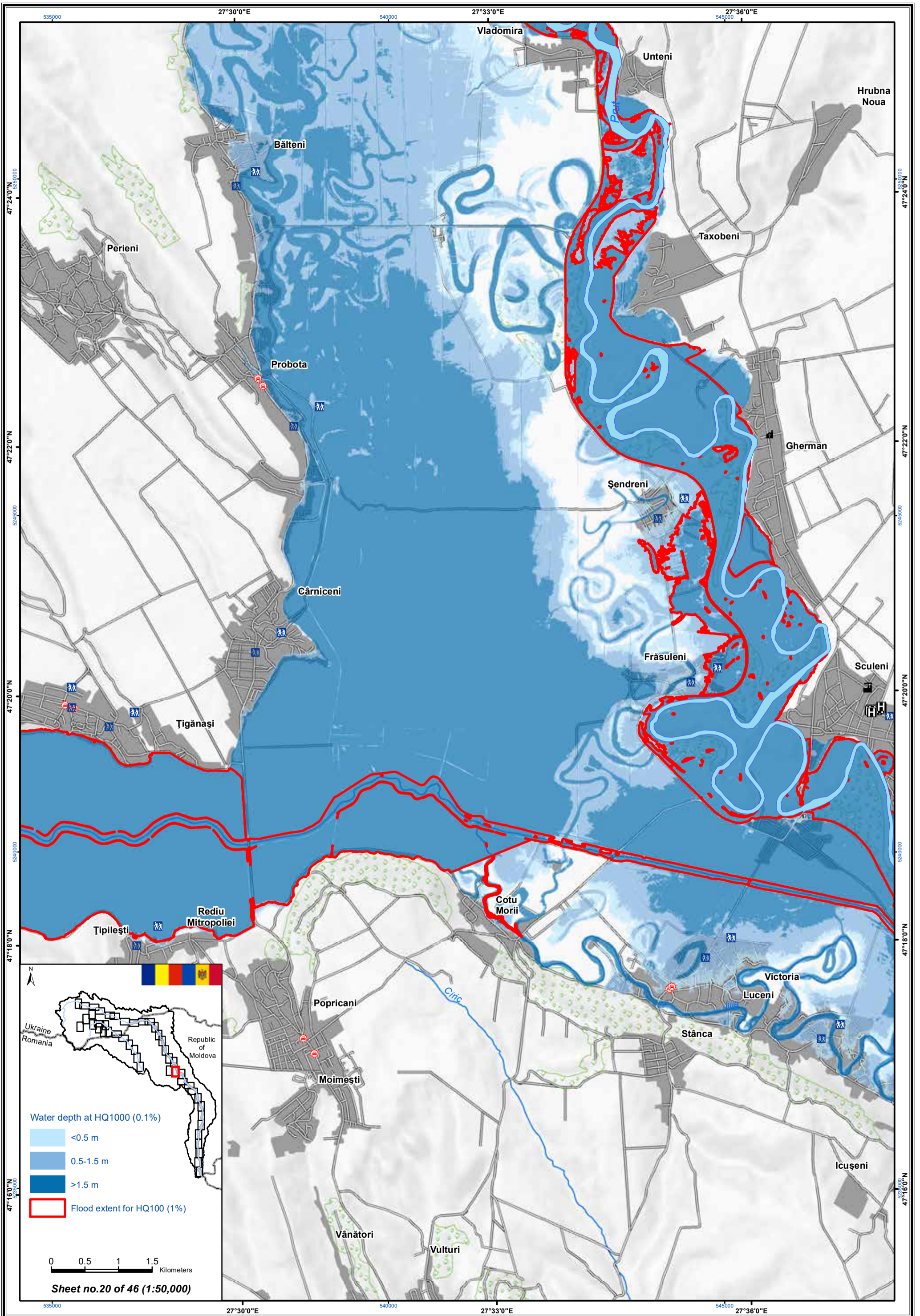




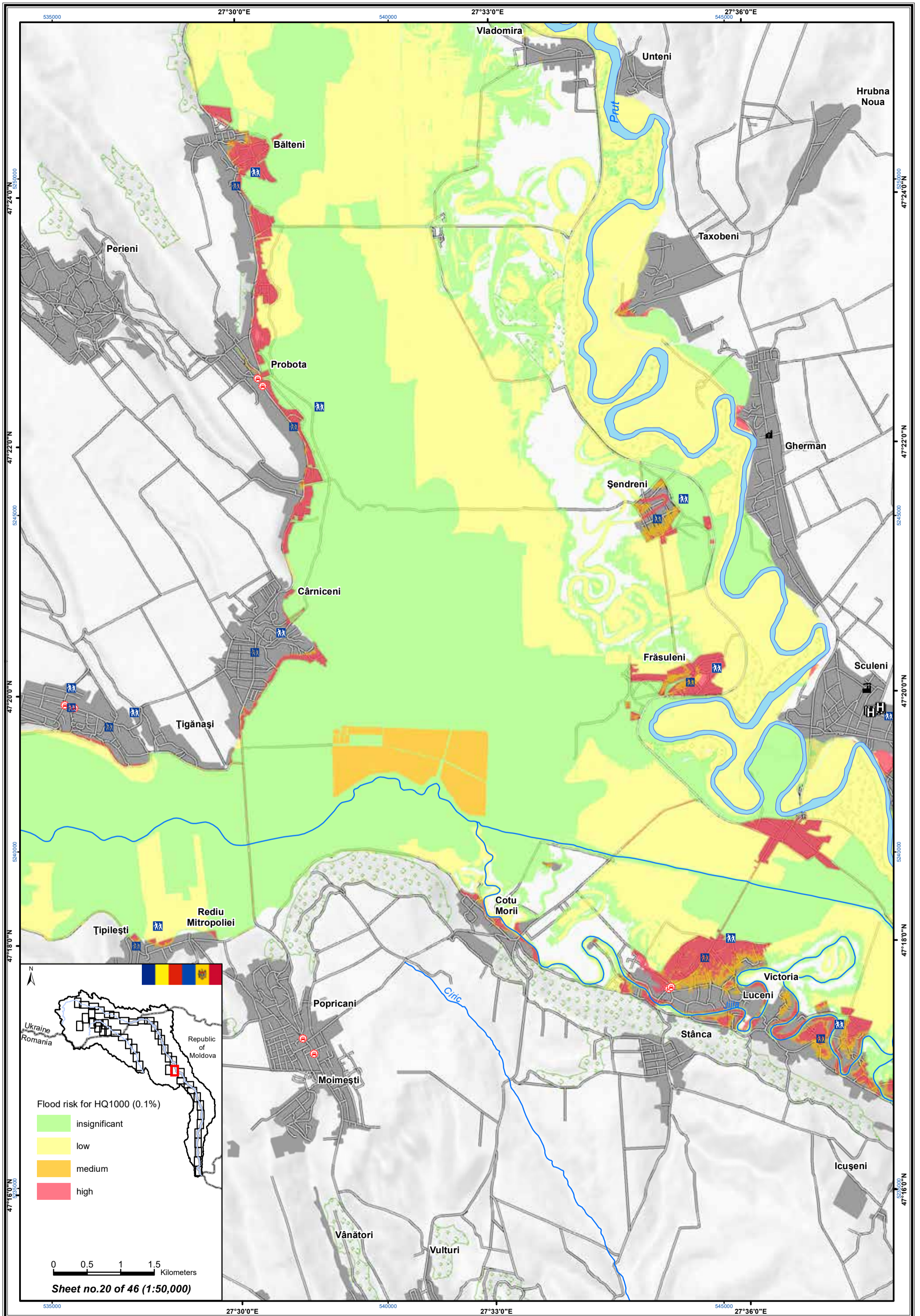


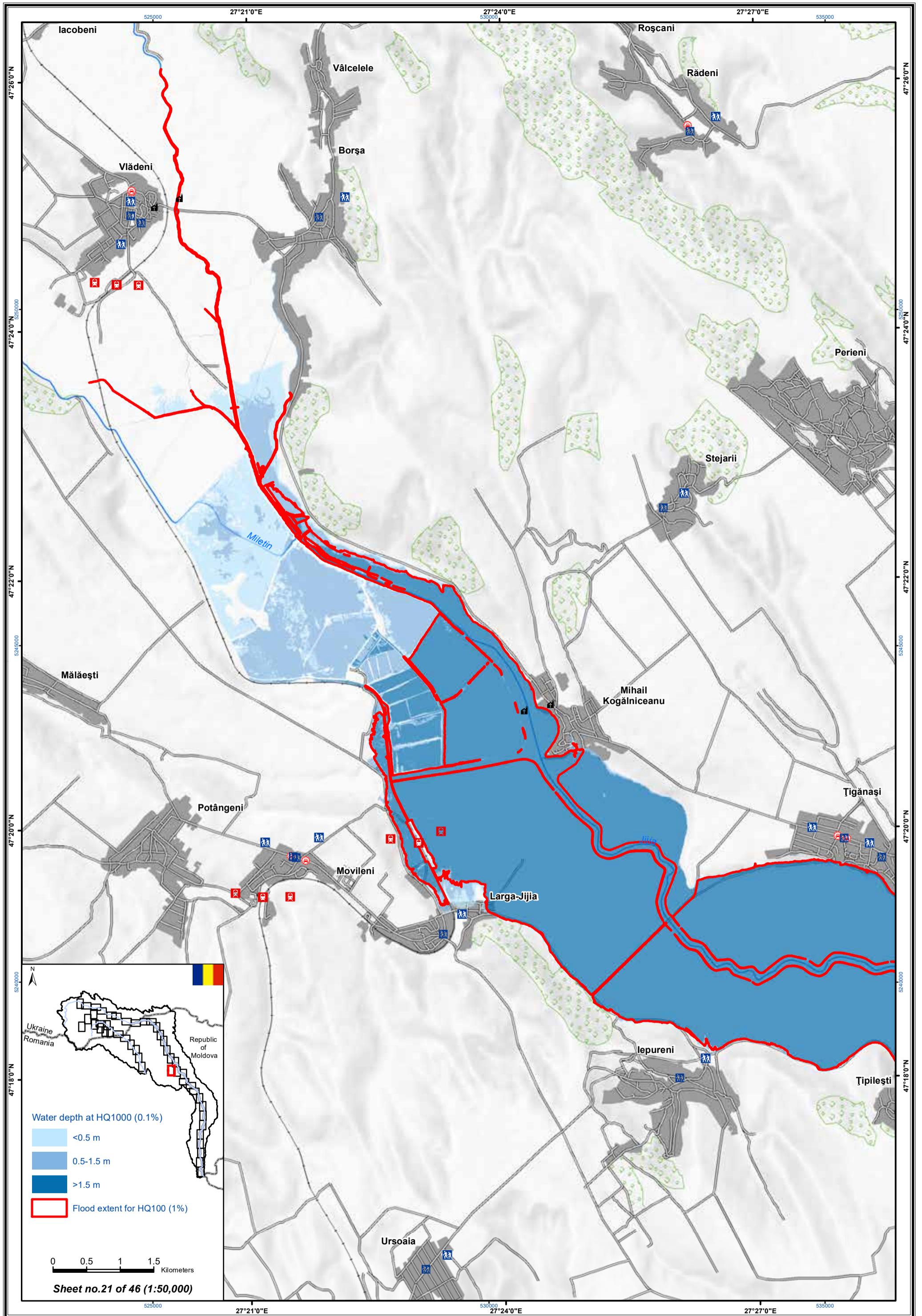


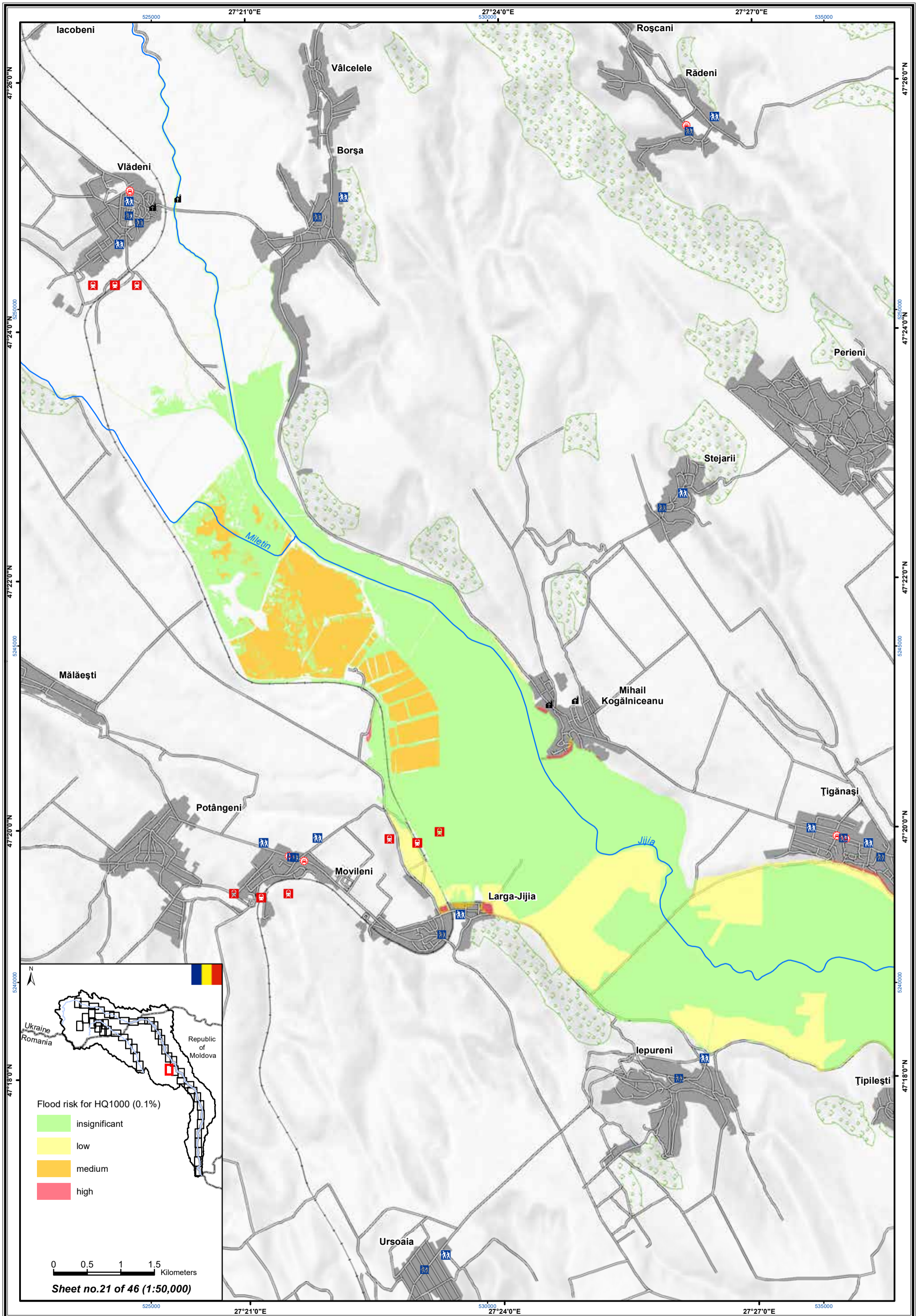


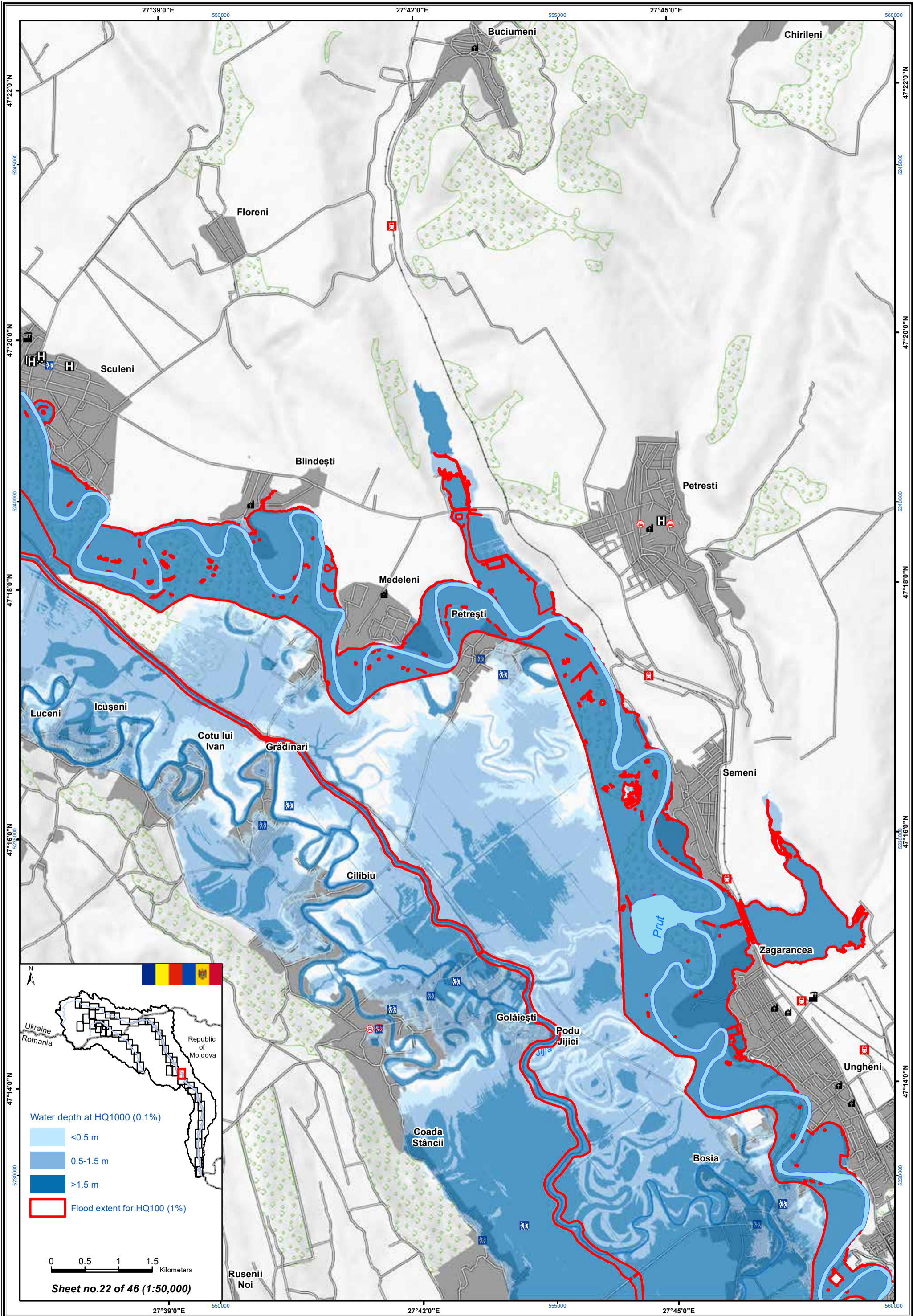


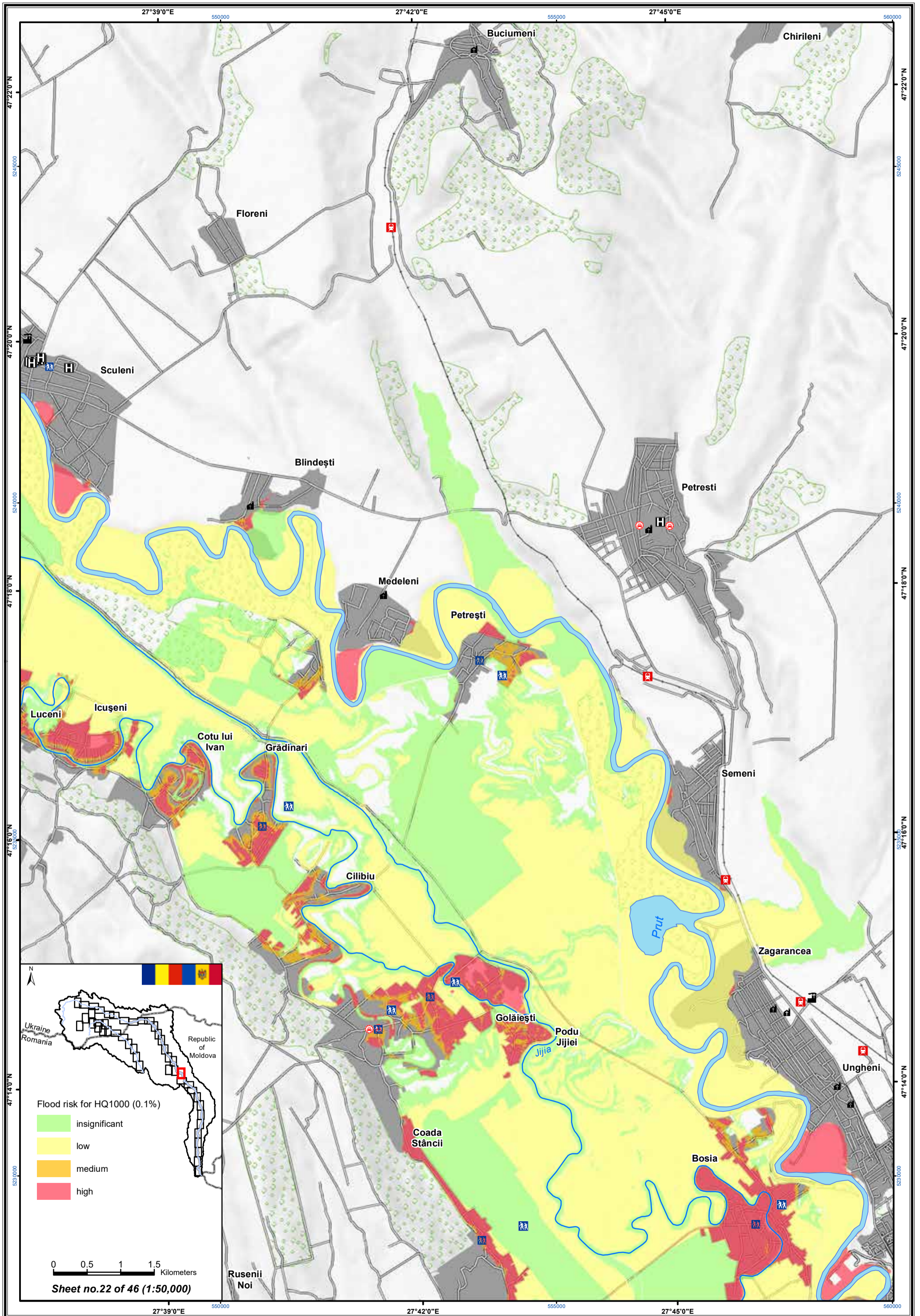


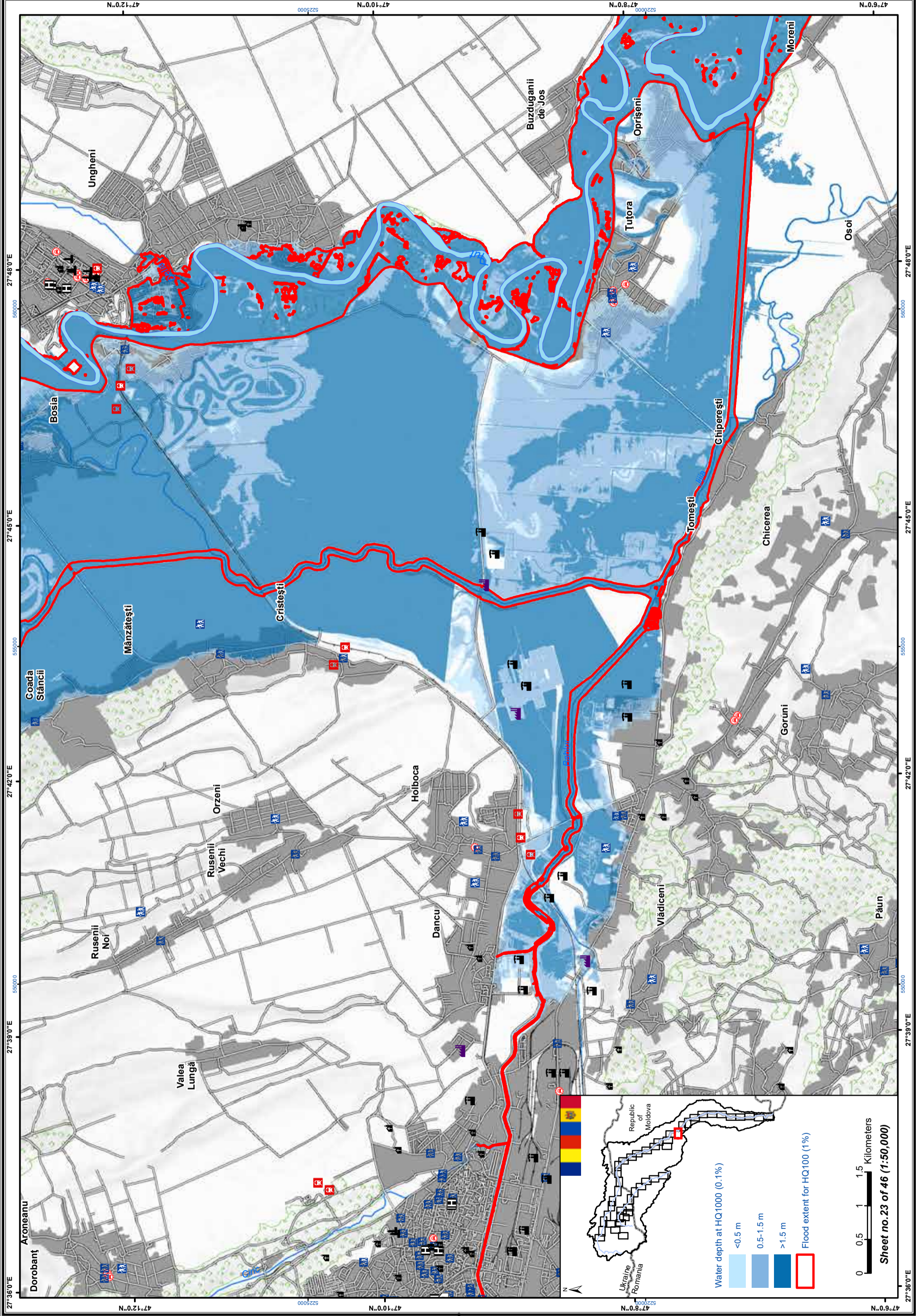


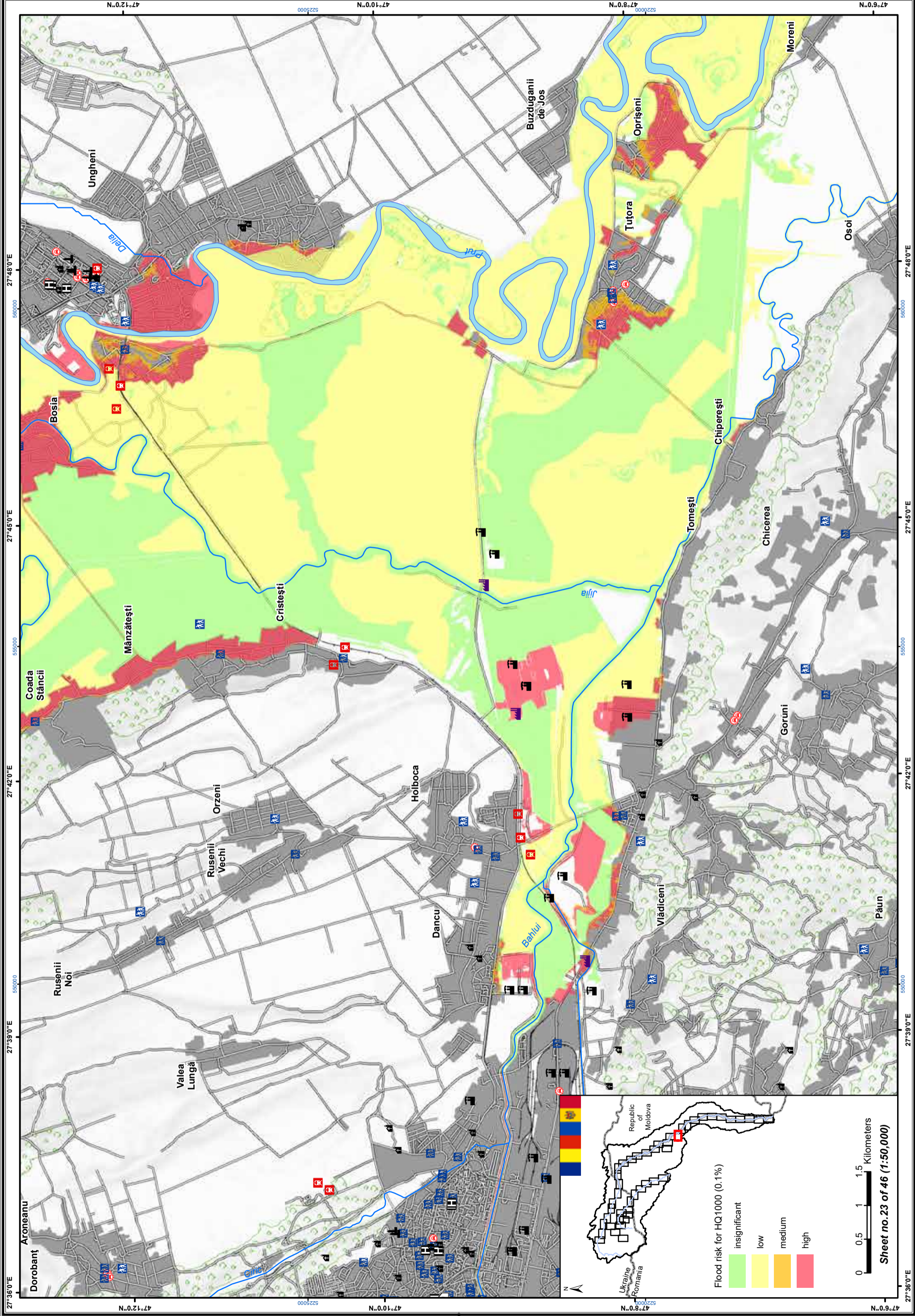










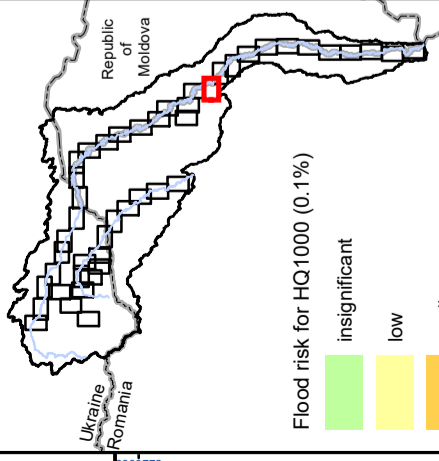
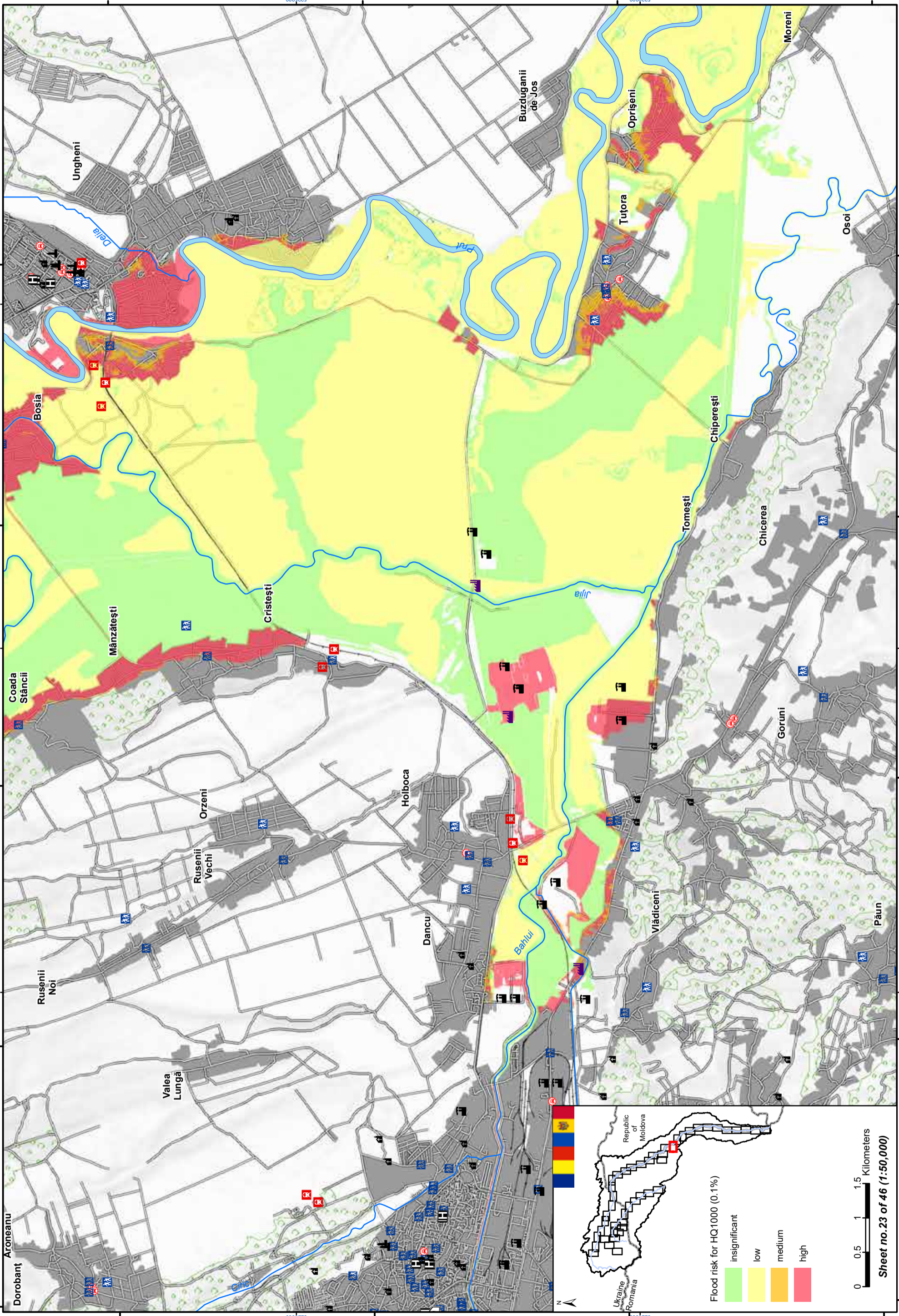


27°36'0"E 27°39'0"E 27°42'0"E 27°45'0"E 27°48'0"E

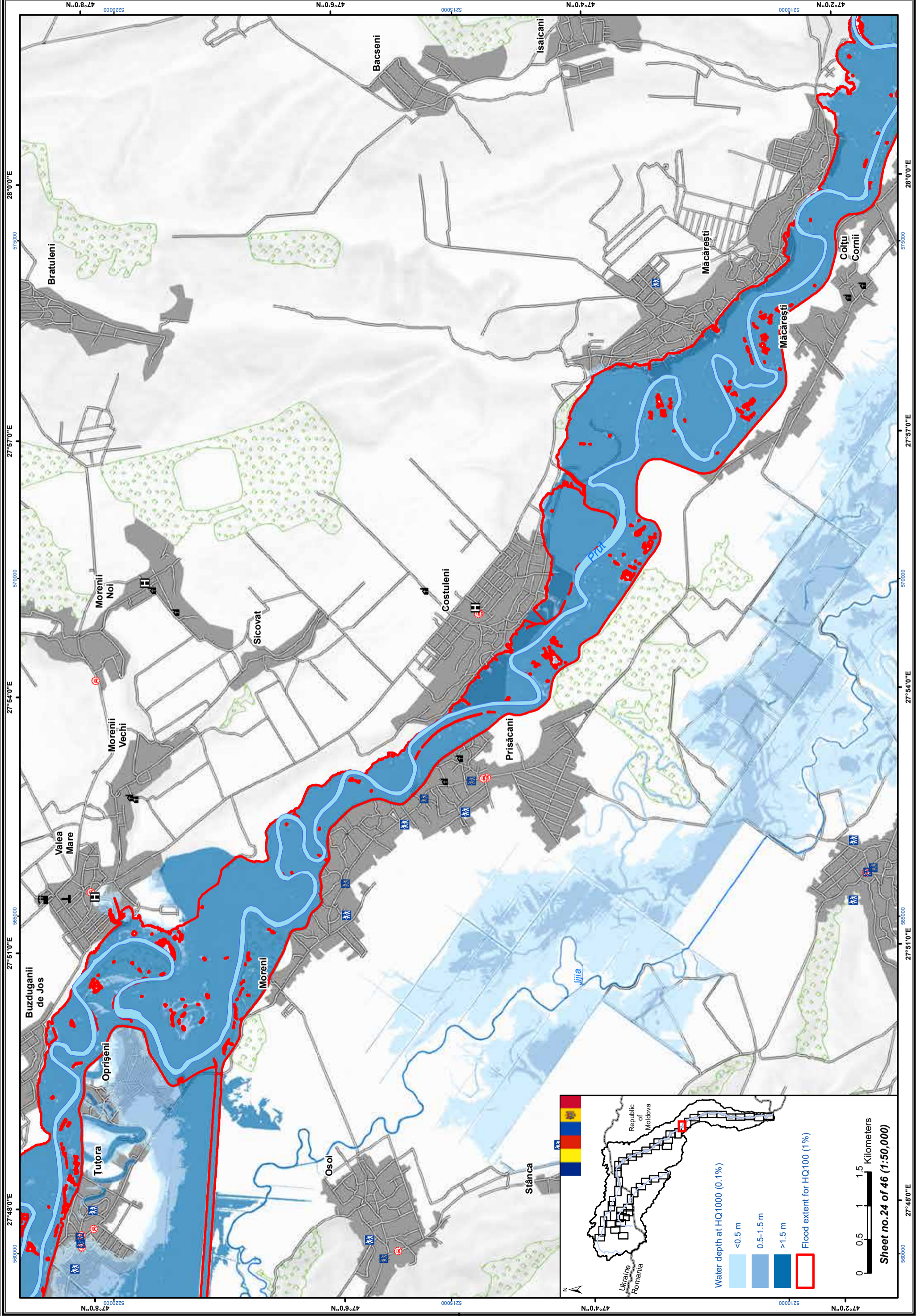
27°36'0"E 27°39'0"E 27°42'0"E 27°45'0"E 27°48'0"E

47°12'0"N 47°10'0"N 47°8'0"N 47°6'0"N

47°12'0"N 47°10'0"N 47°8'0"N 47°6'0"N



Ukraine  
Romania  
Republic of Moldova

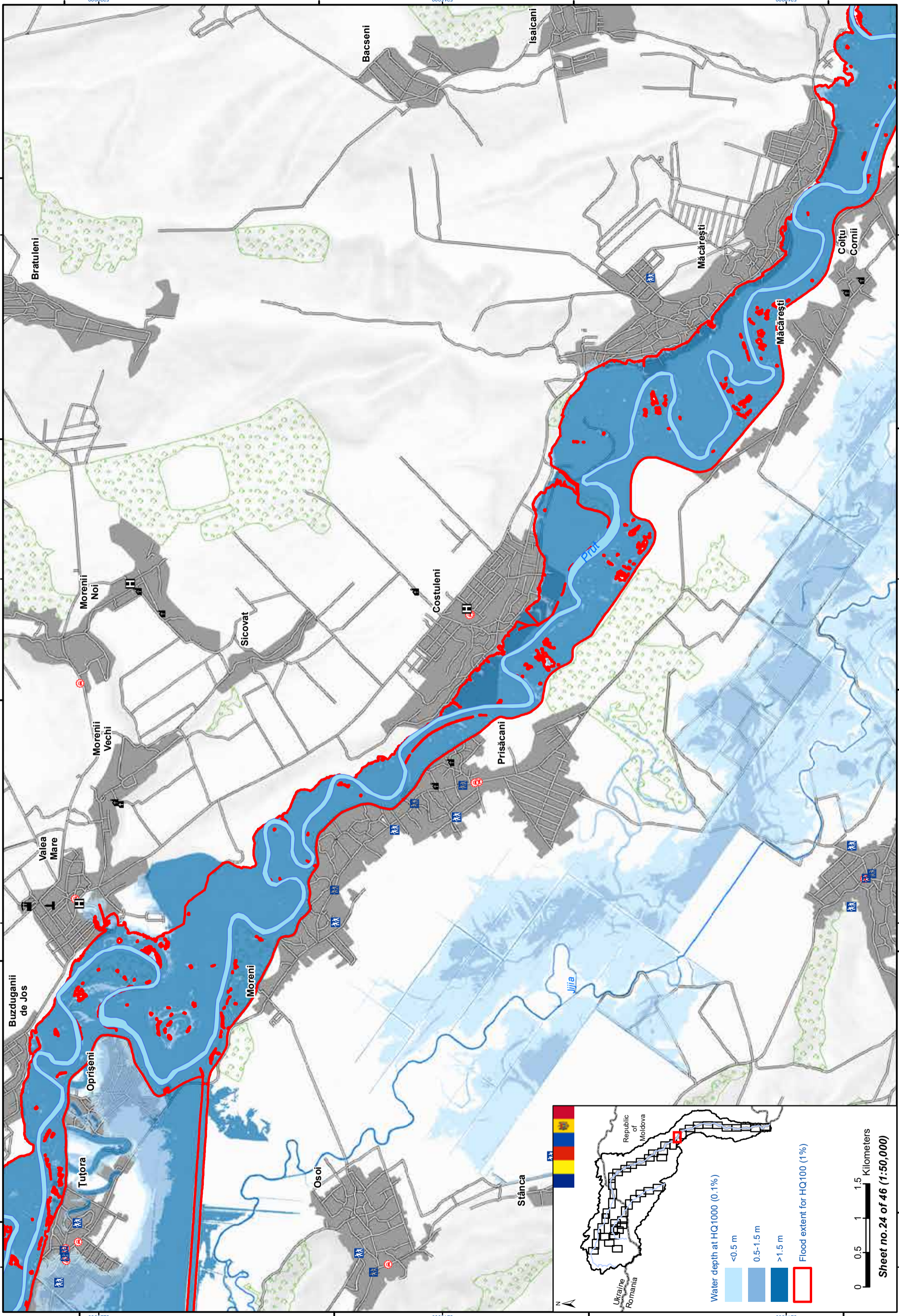


27°48'0"E 27°51'0"E 27°54'0"E 27°57'0"E 28°0'0"E

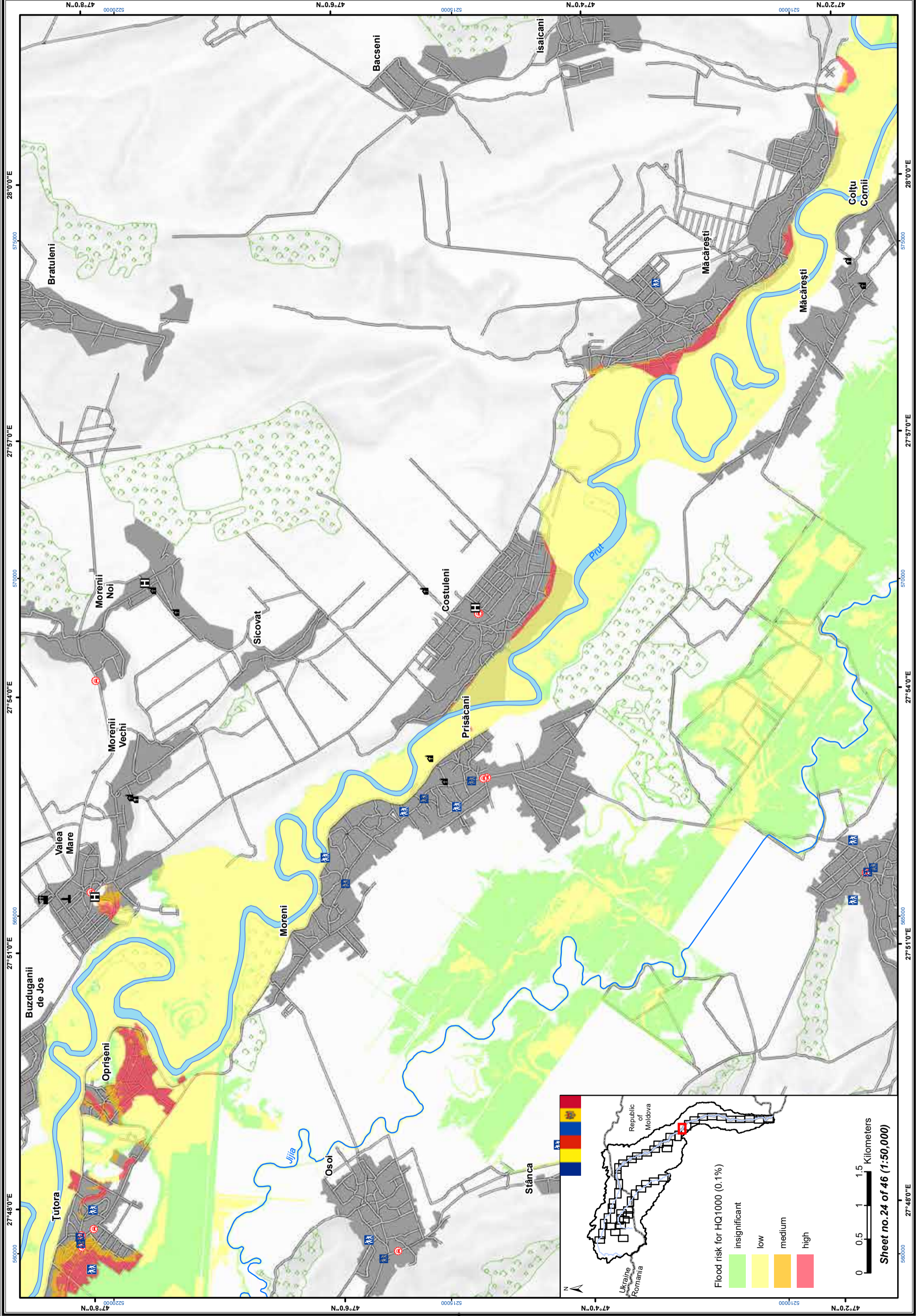
27°48'0"E 27°51'0"E 27°54'0"E 27°57'0"E 28°0'0"E

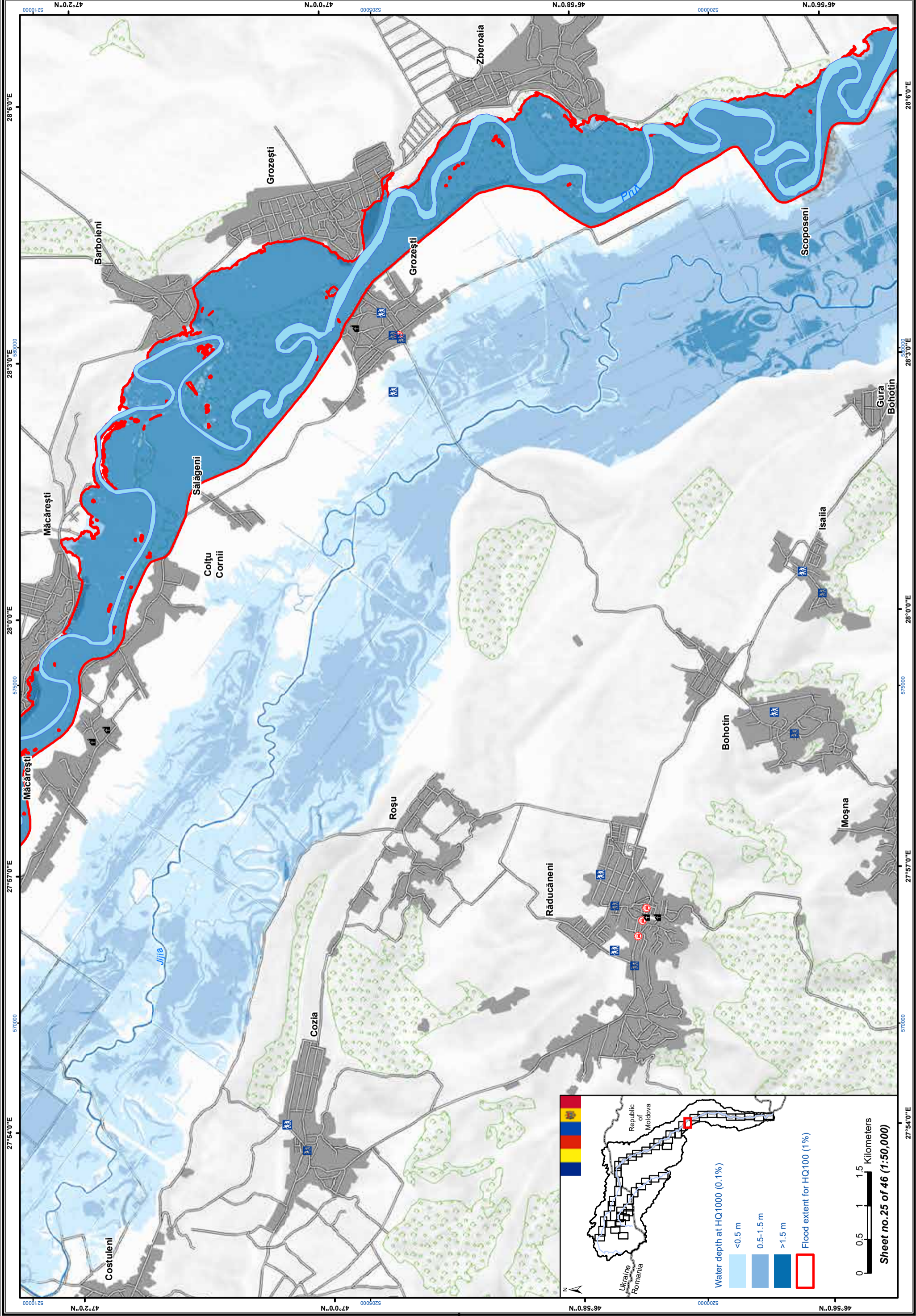
47°2'0"N 47°4'0"N 47°6'0"N 47°8'0"N

47°2'0"N 47°4'0"N 47°6'0"N 47°8'0"N

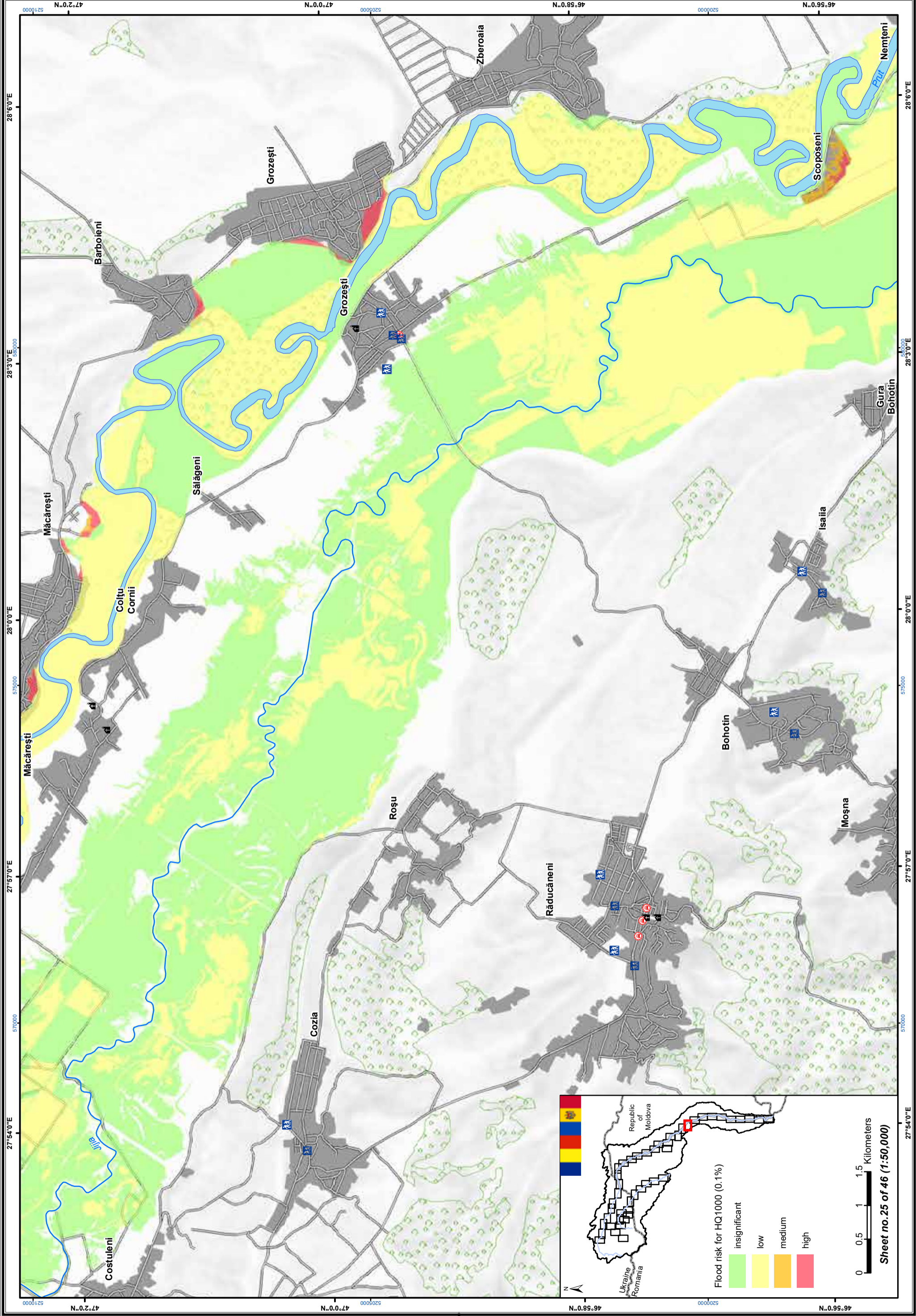




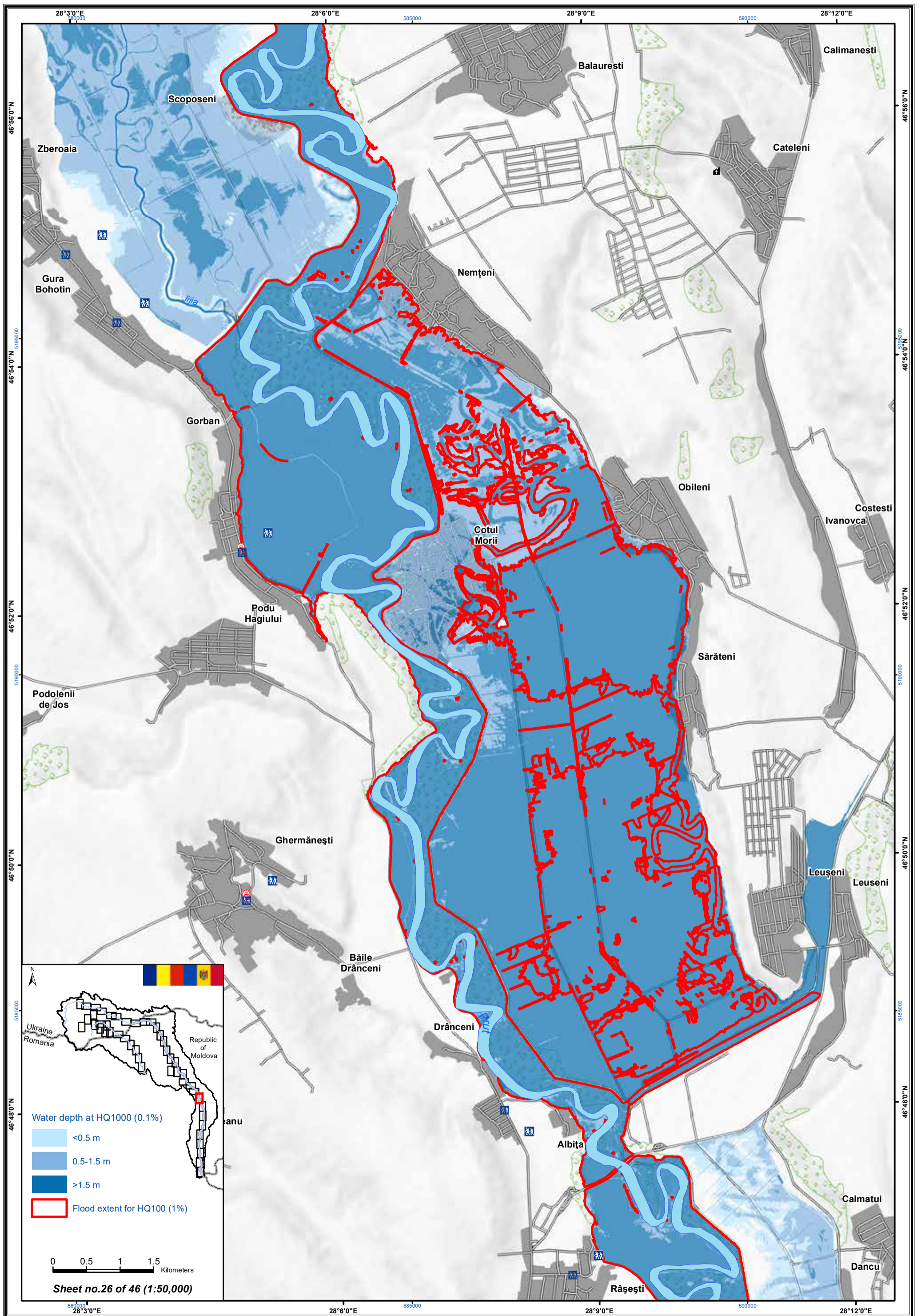


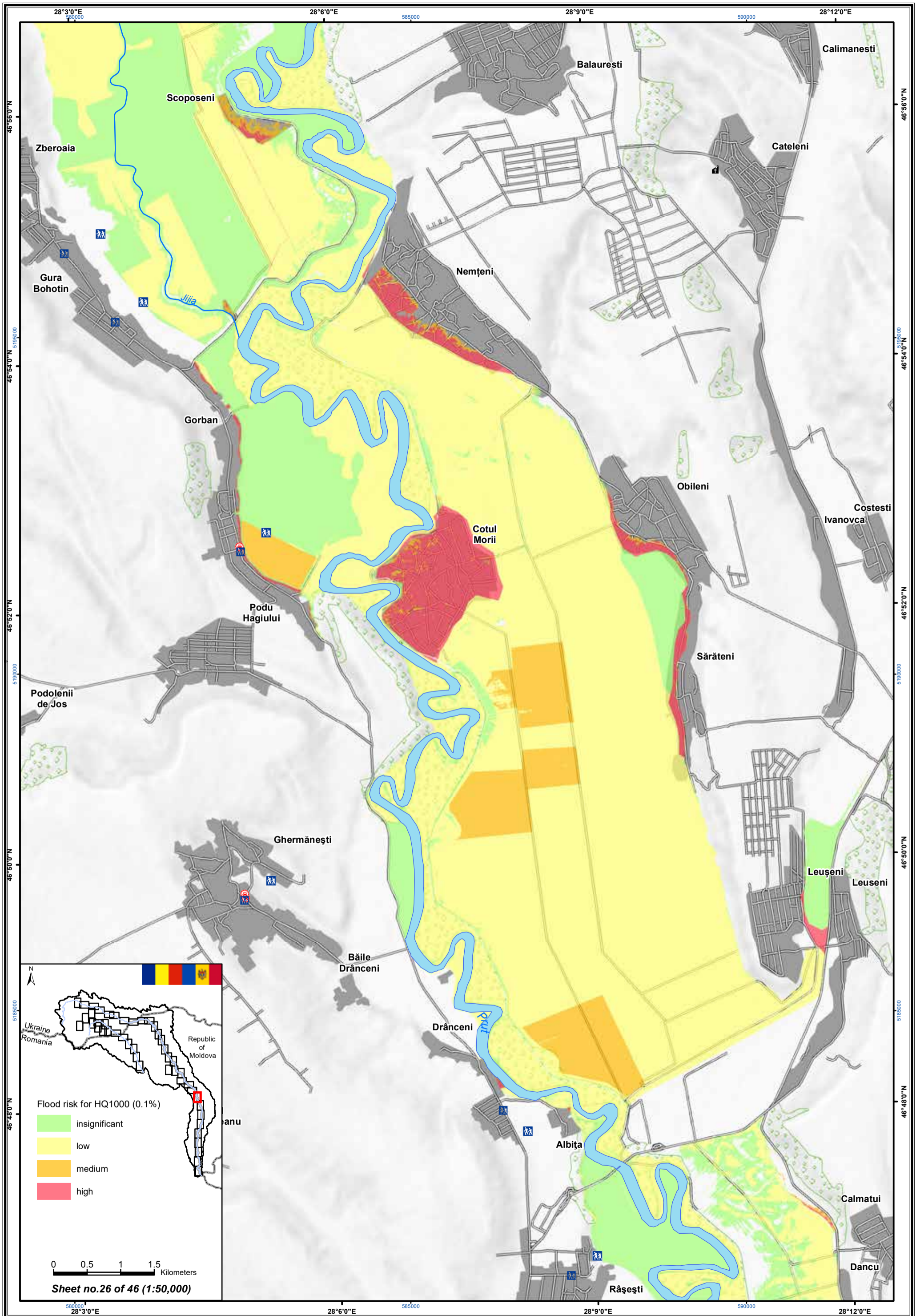


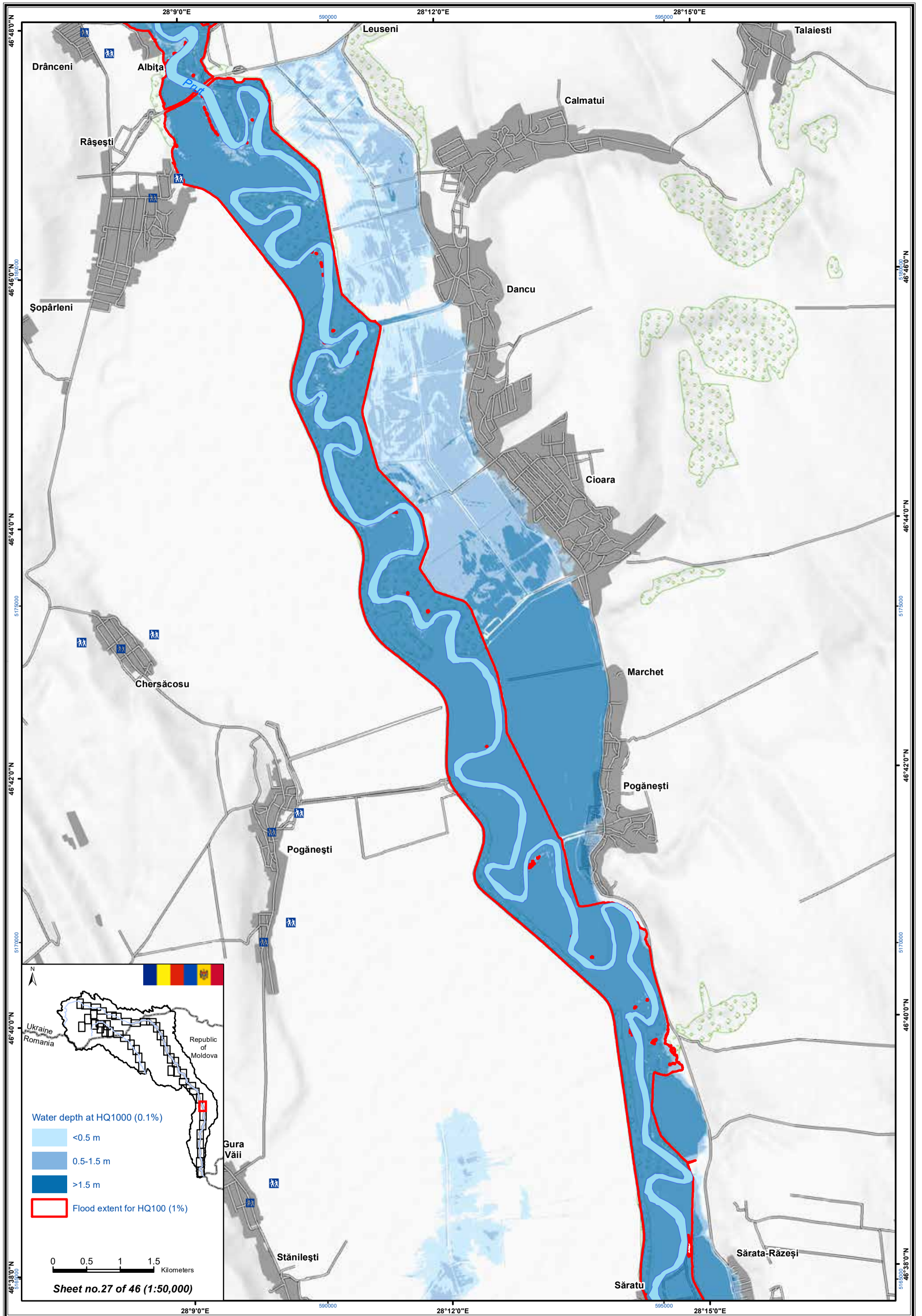
Sheet no. 25 of 46 (1:50,000)

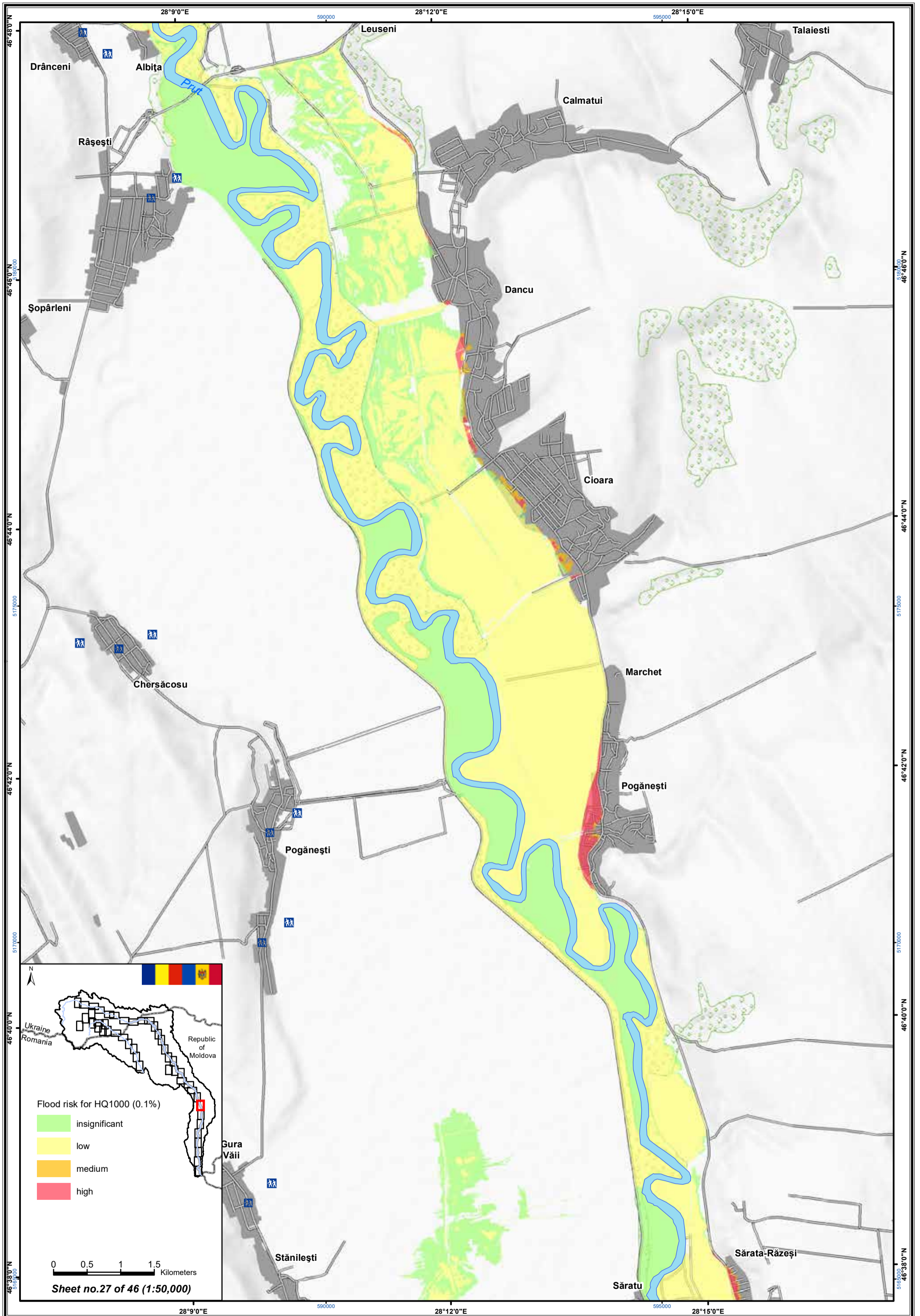


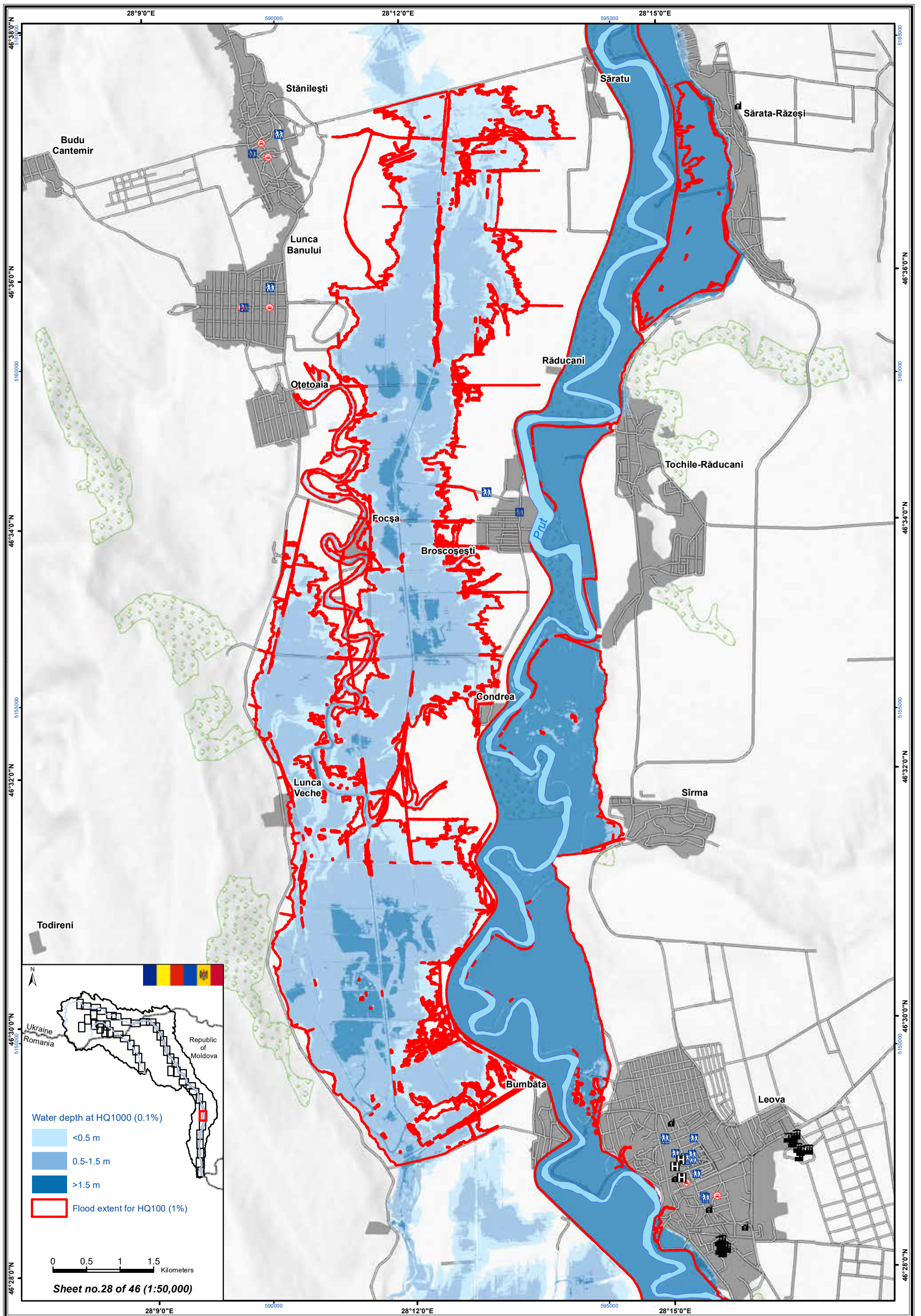
Sheet no. 25 of 46 (1:50,000)



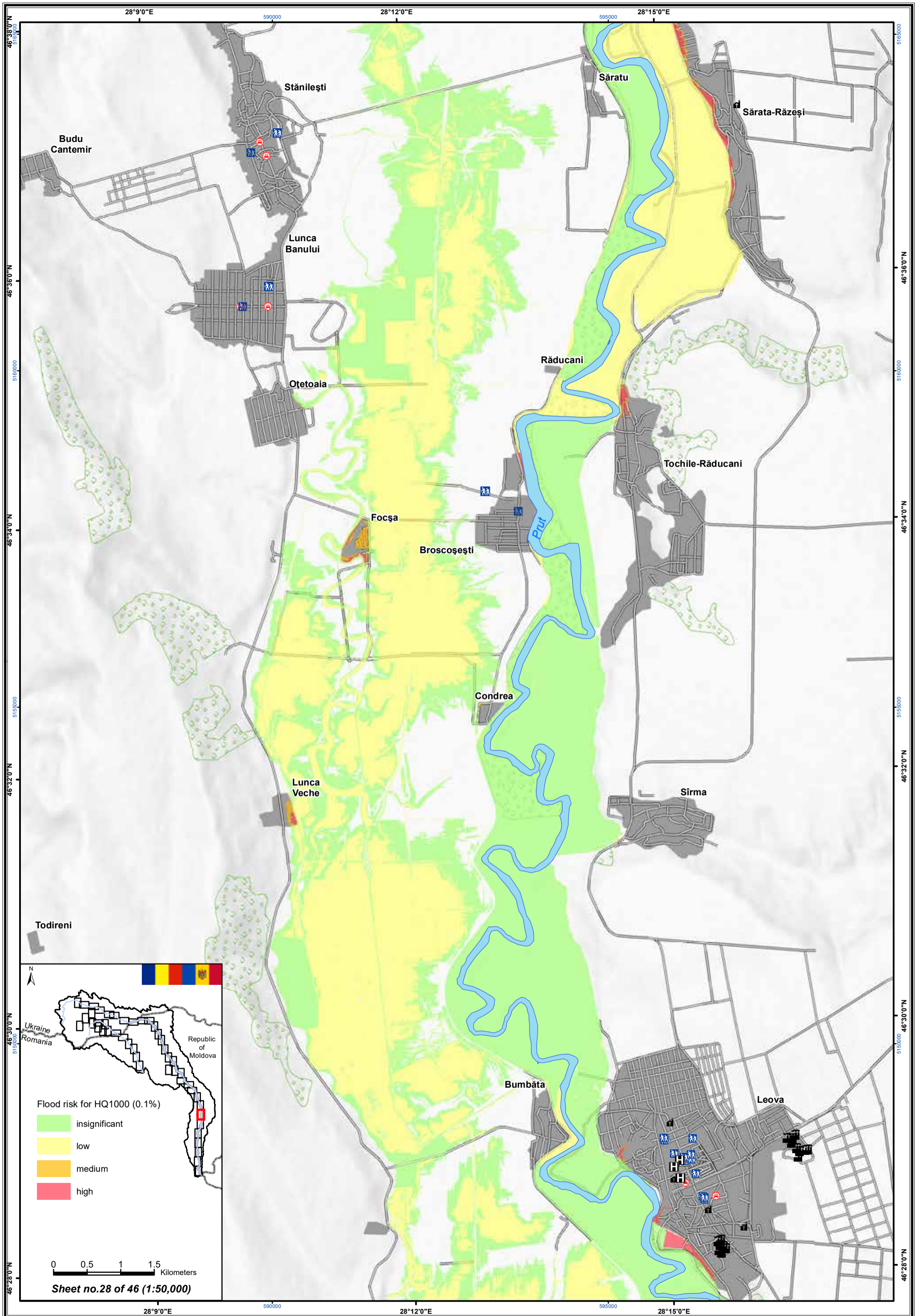












28°9'0"E 28°12'0"E 28°15'0"E

46°35'0"N 46°36'0"N 46°34'0"N 46°32'0"N 46°30'0"N 46°28'0"N

590000 590000 590000

Budu Cantemir

Stănileşti

Lunca Banului

Oțetoaia

Focșa

Broscășești

Condrea

Lunca Veche

Sîrma

Bumbăta

Leova

Sărata-Răzeși

Sărata

Răducani

Tochile-Răducani

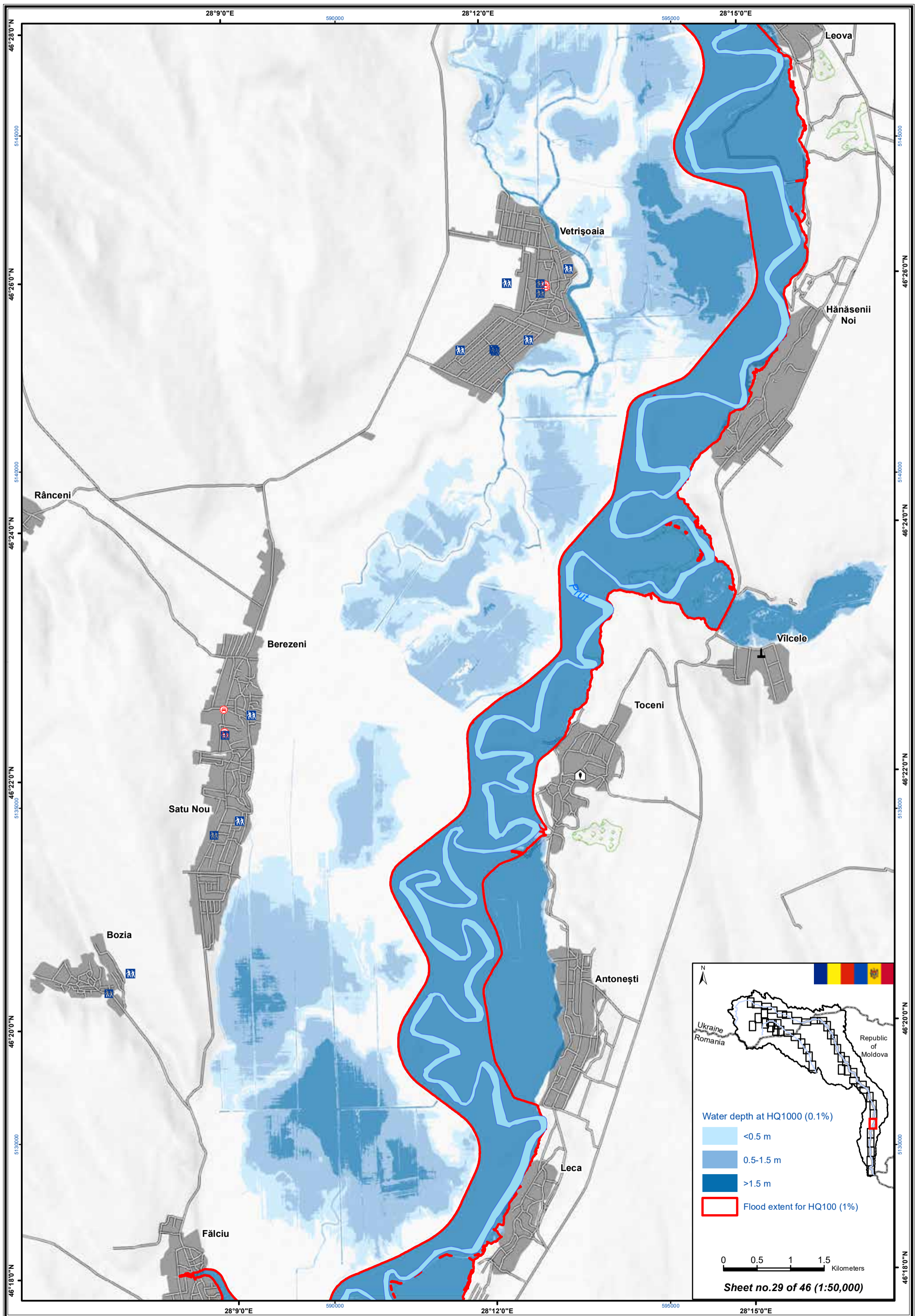
Prut

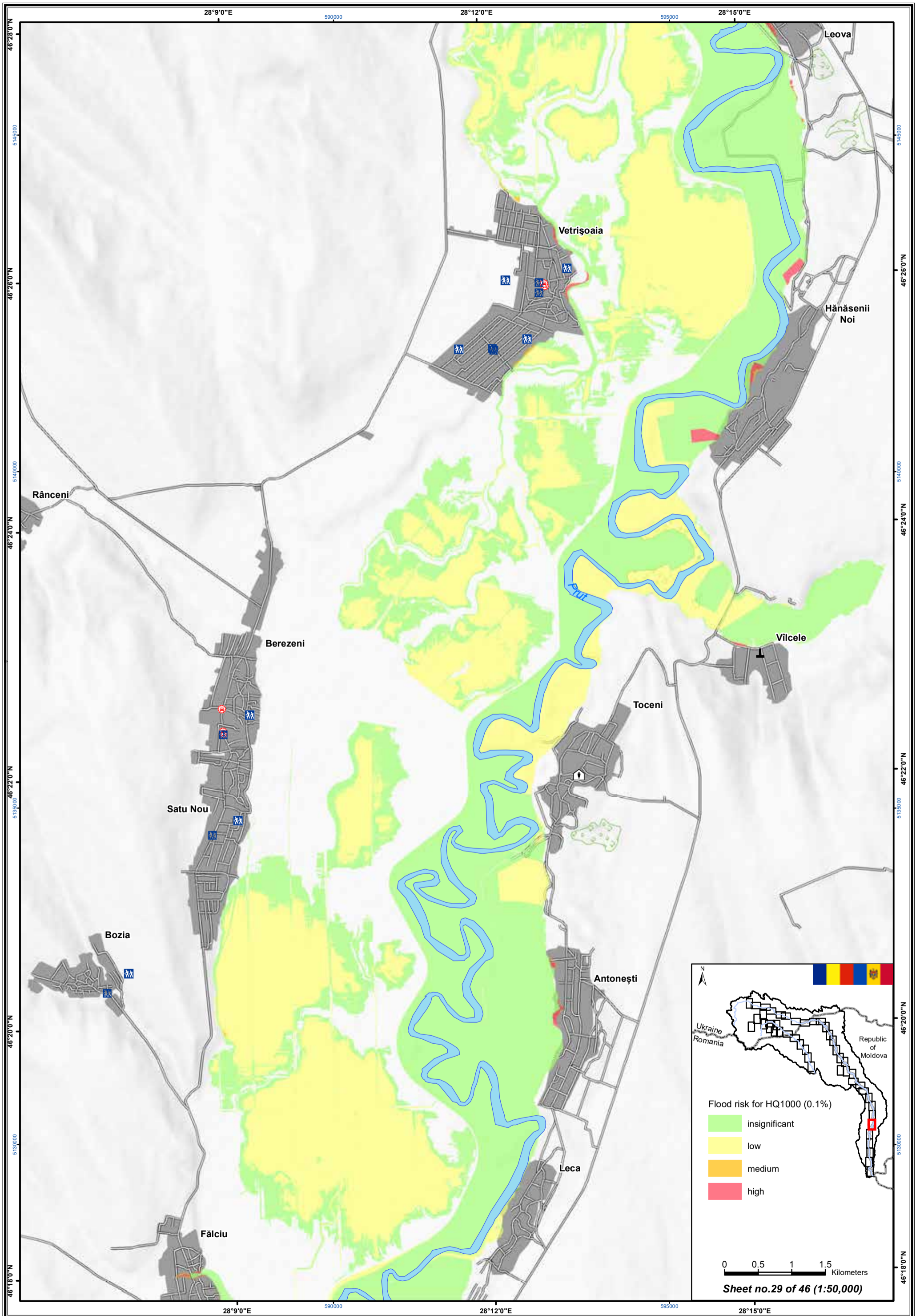
Todireni

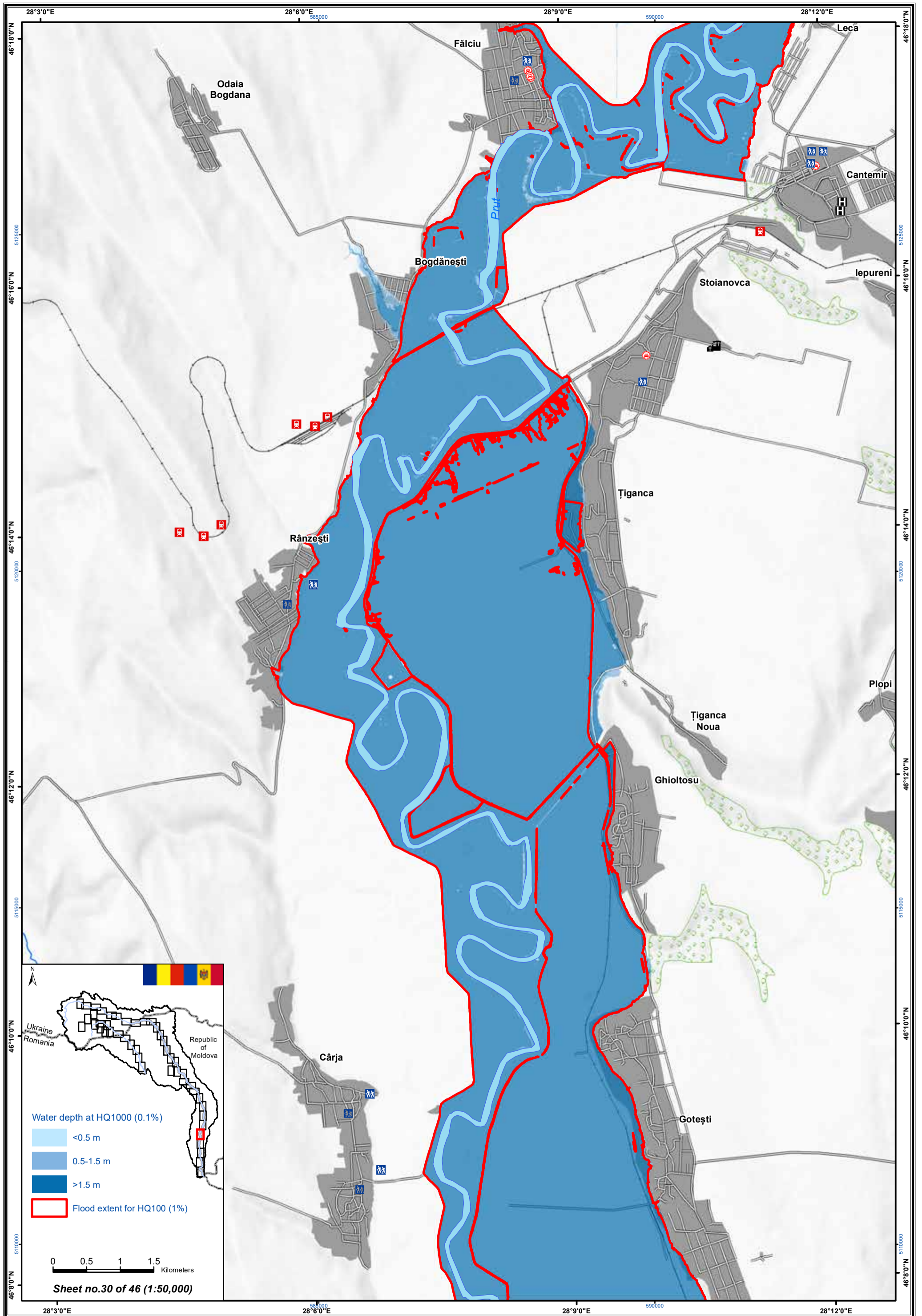
Ukraine

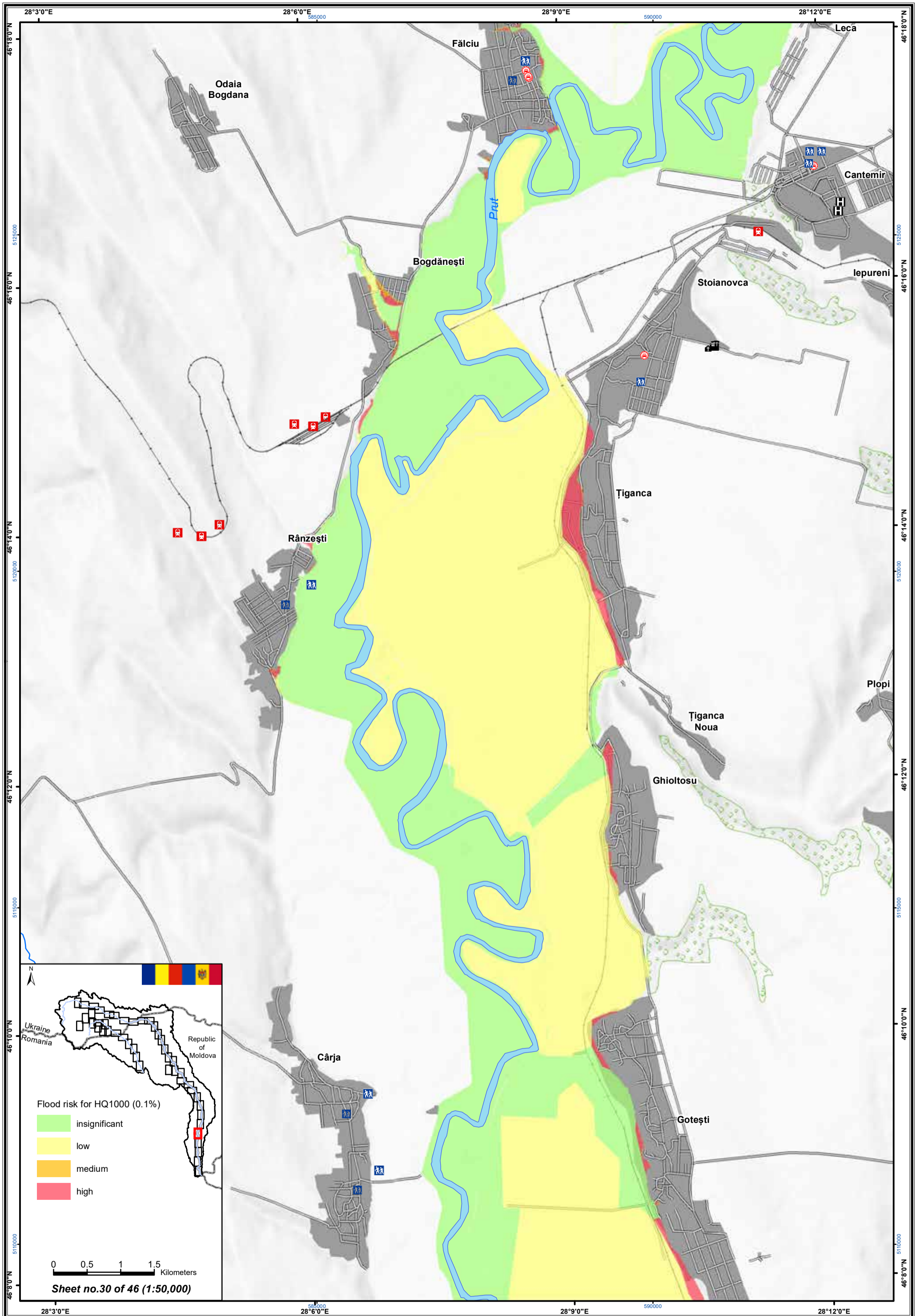
Romania

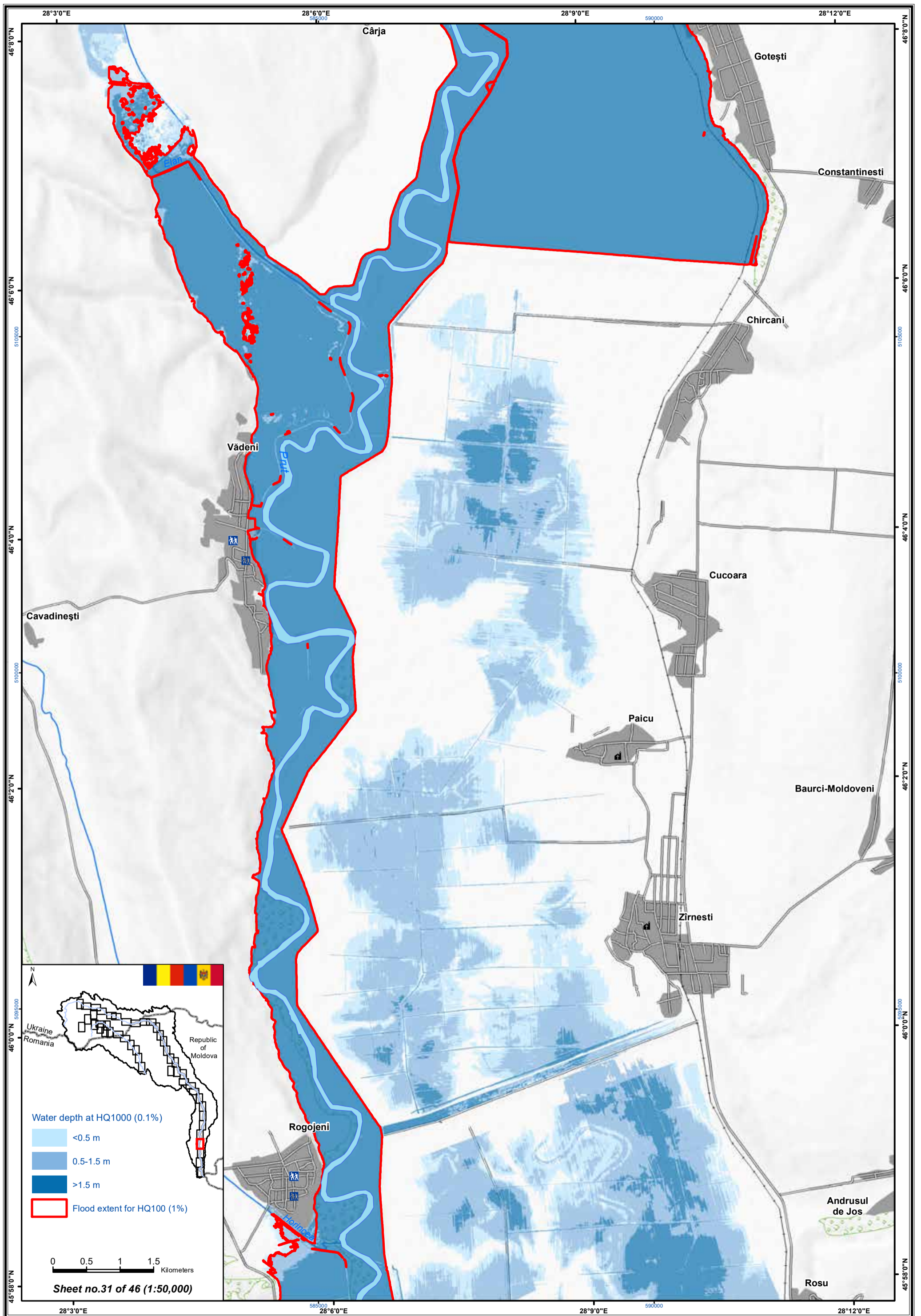
Republic of Moldova

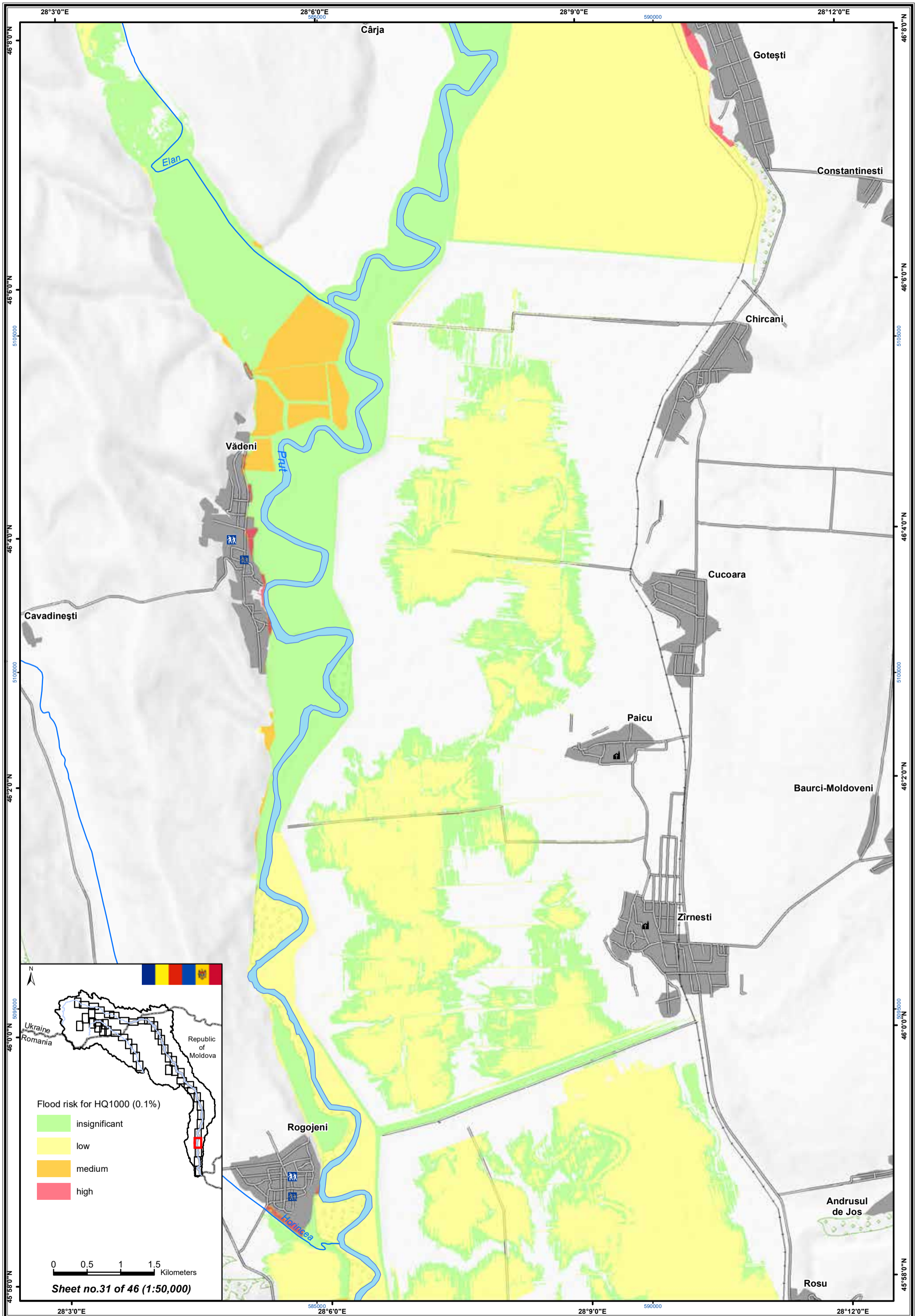


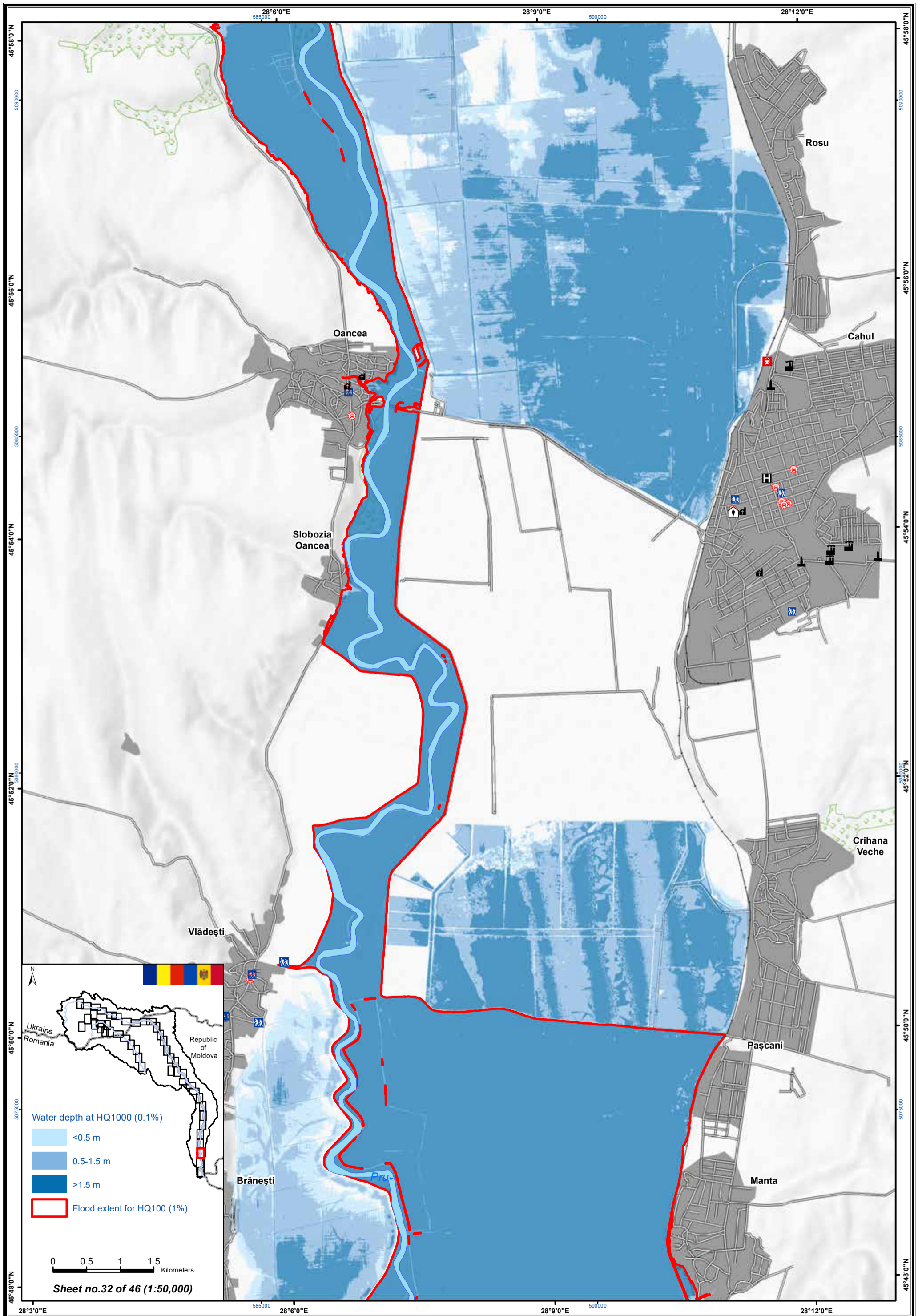




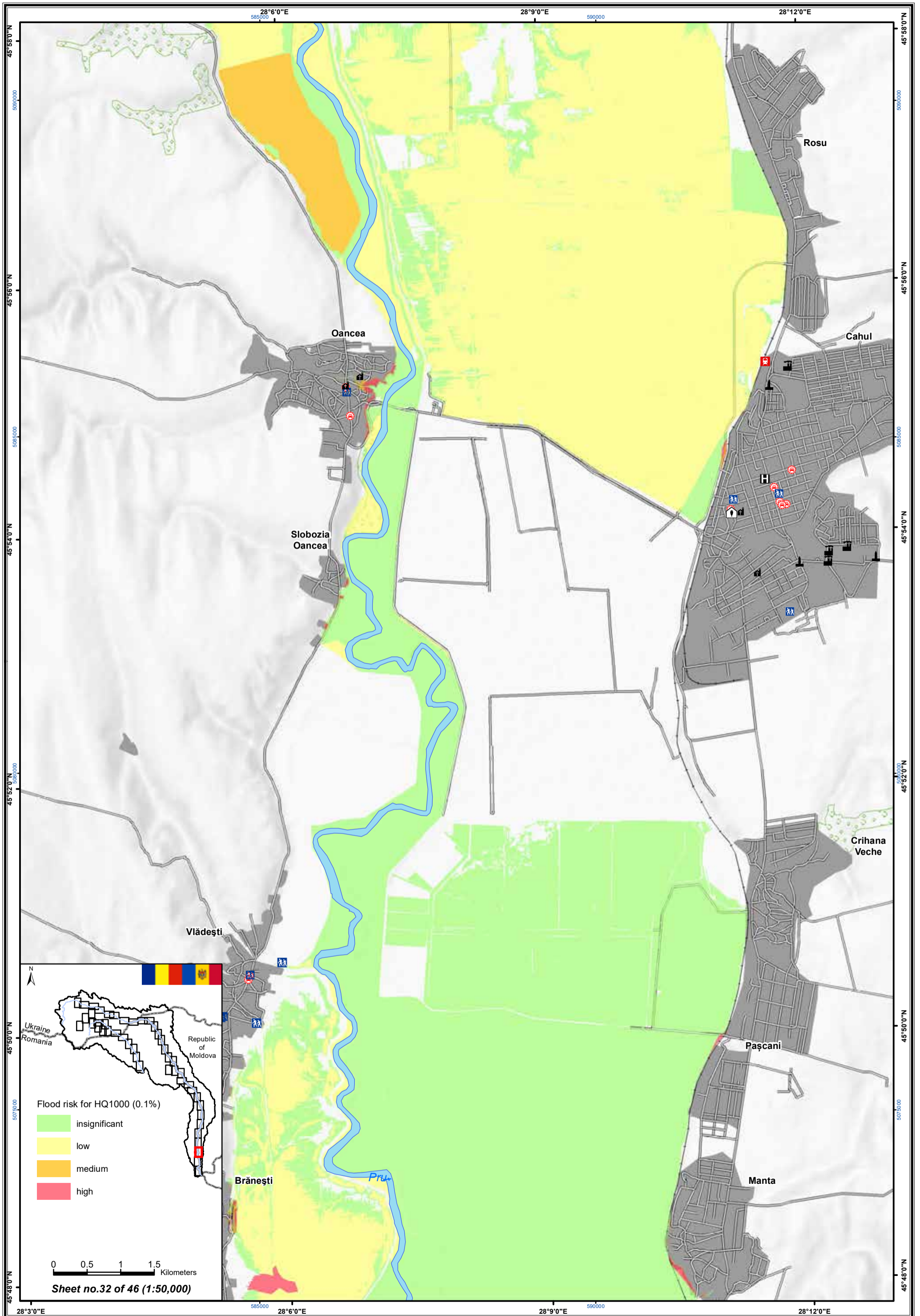


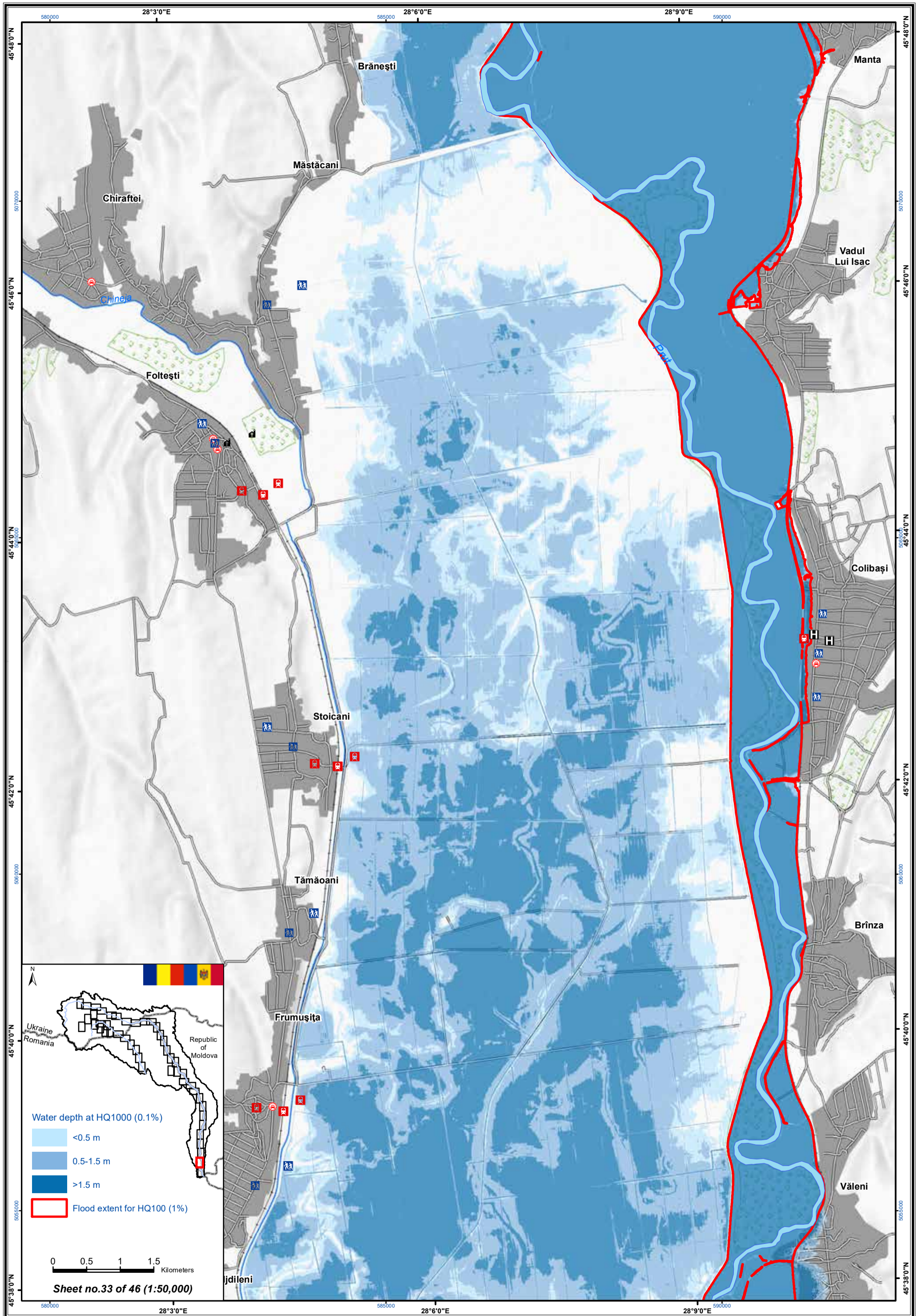


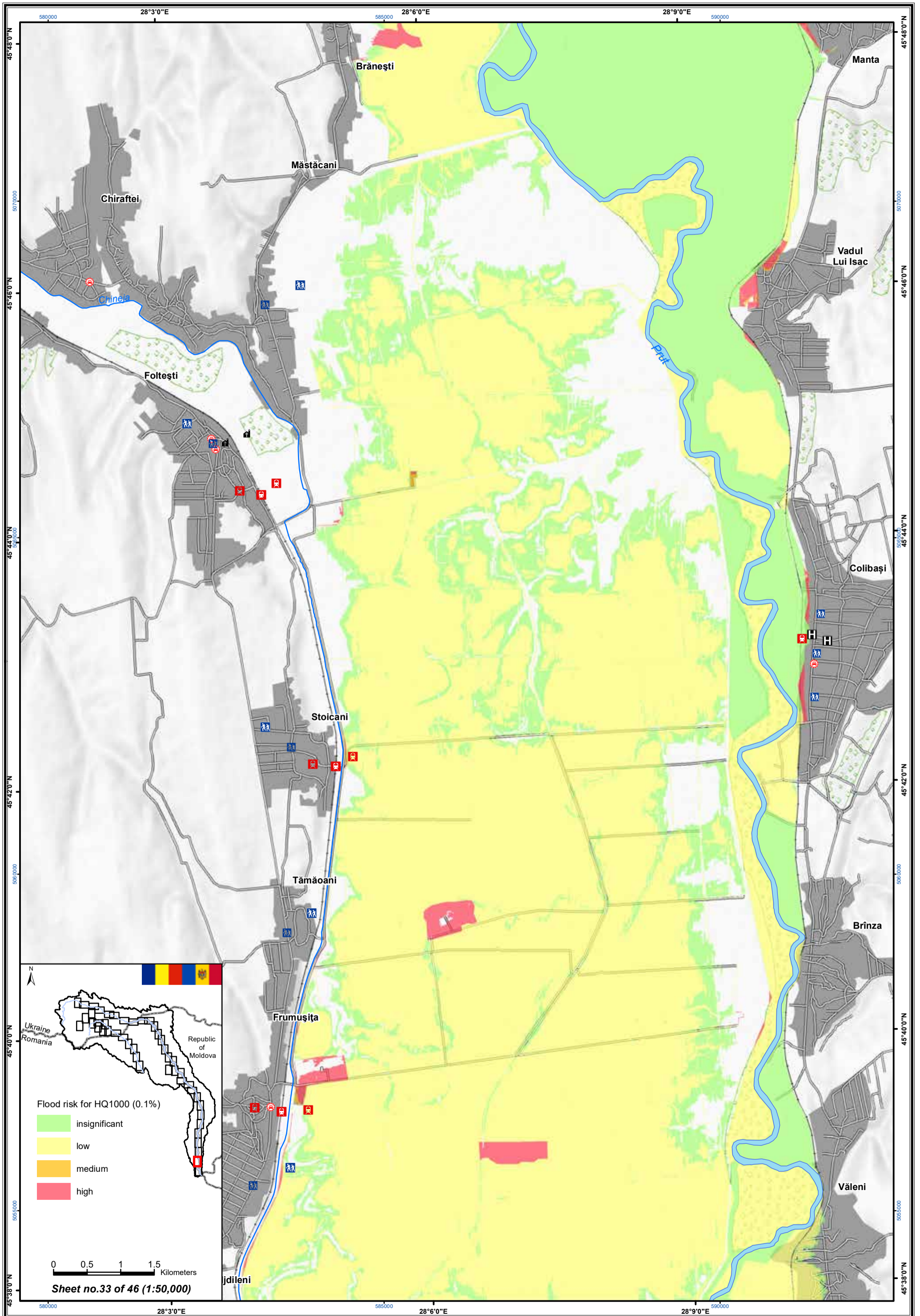










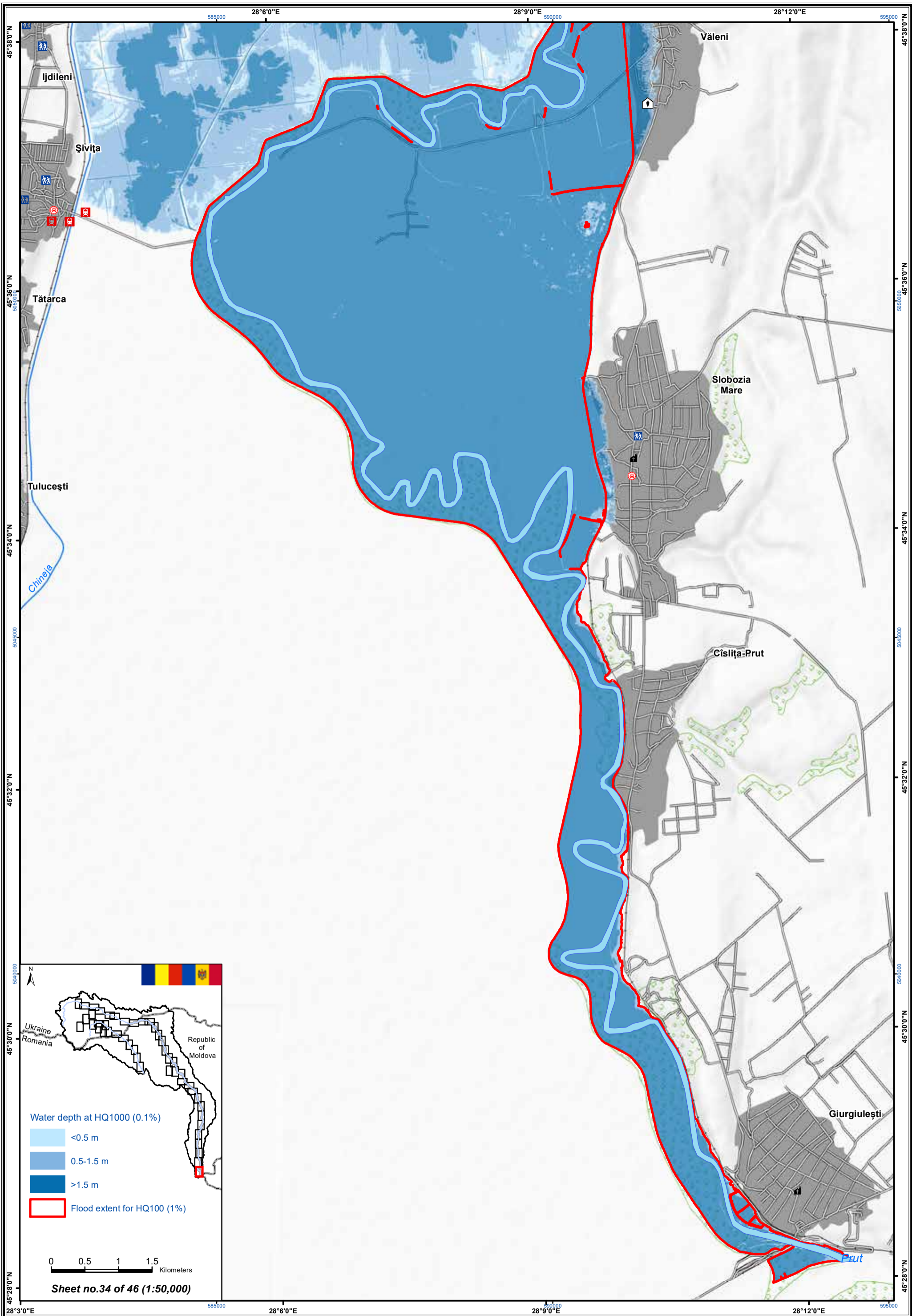


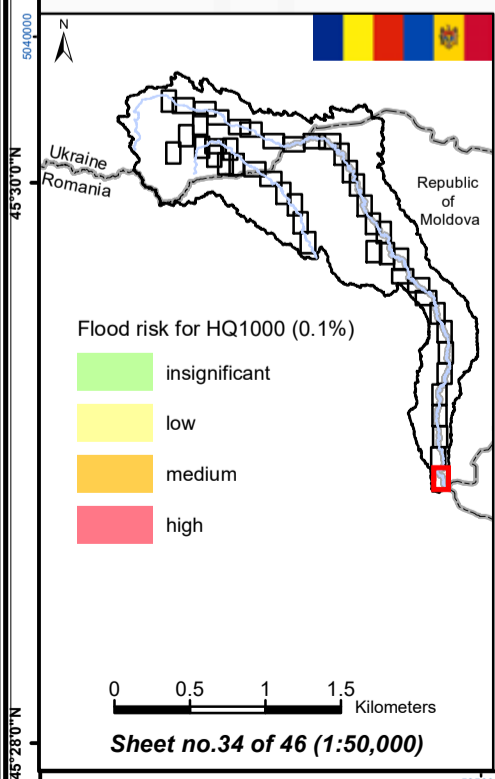
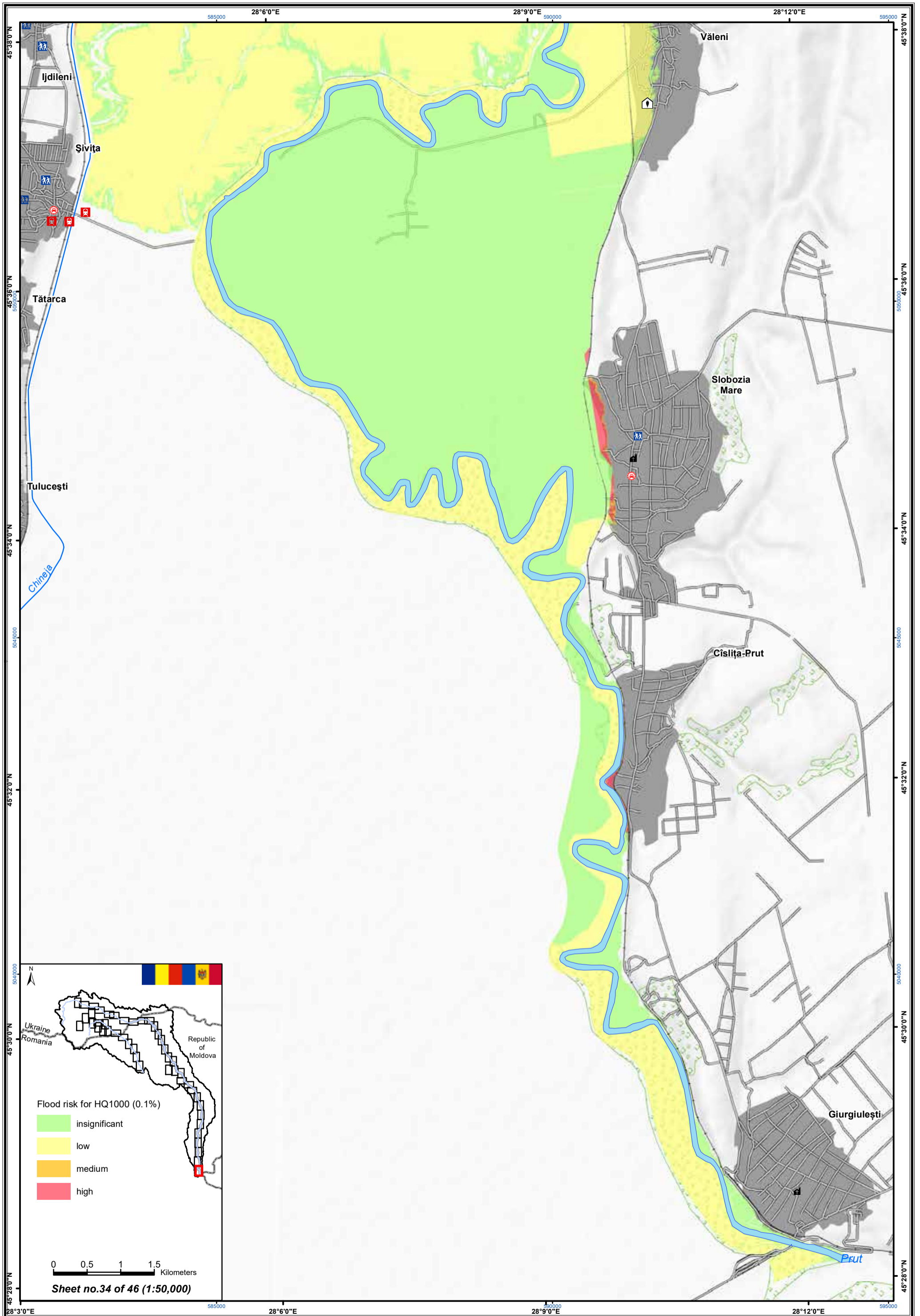
**Flood risk for HQ1000 (0.1%)**

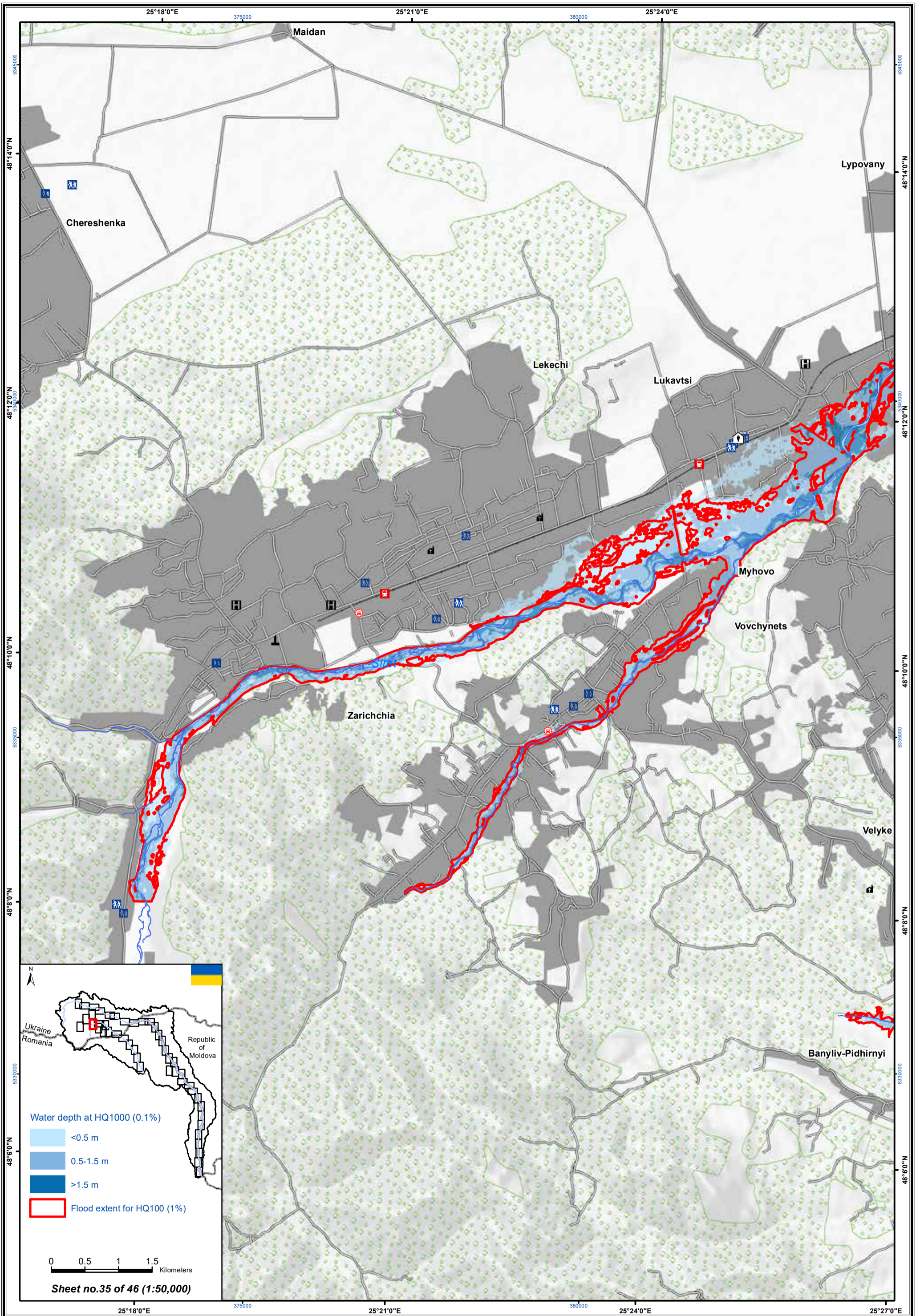
- insignificant
- low
- medium
- high

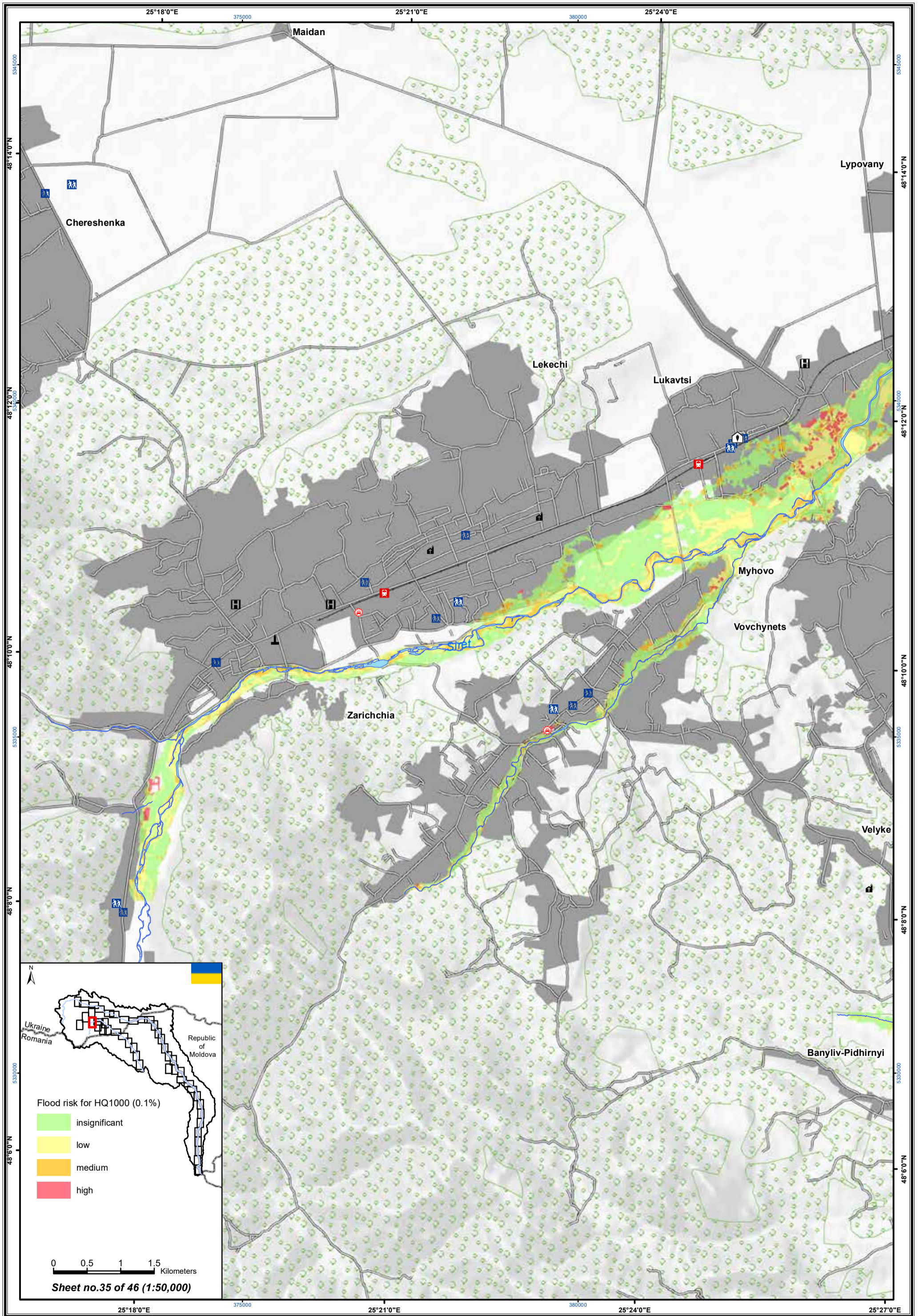
0 0.5 1 1.5 Kilometers

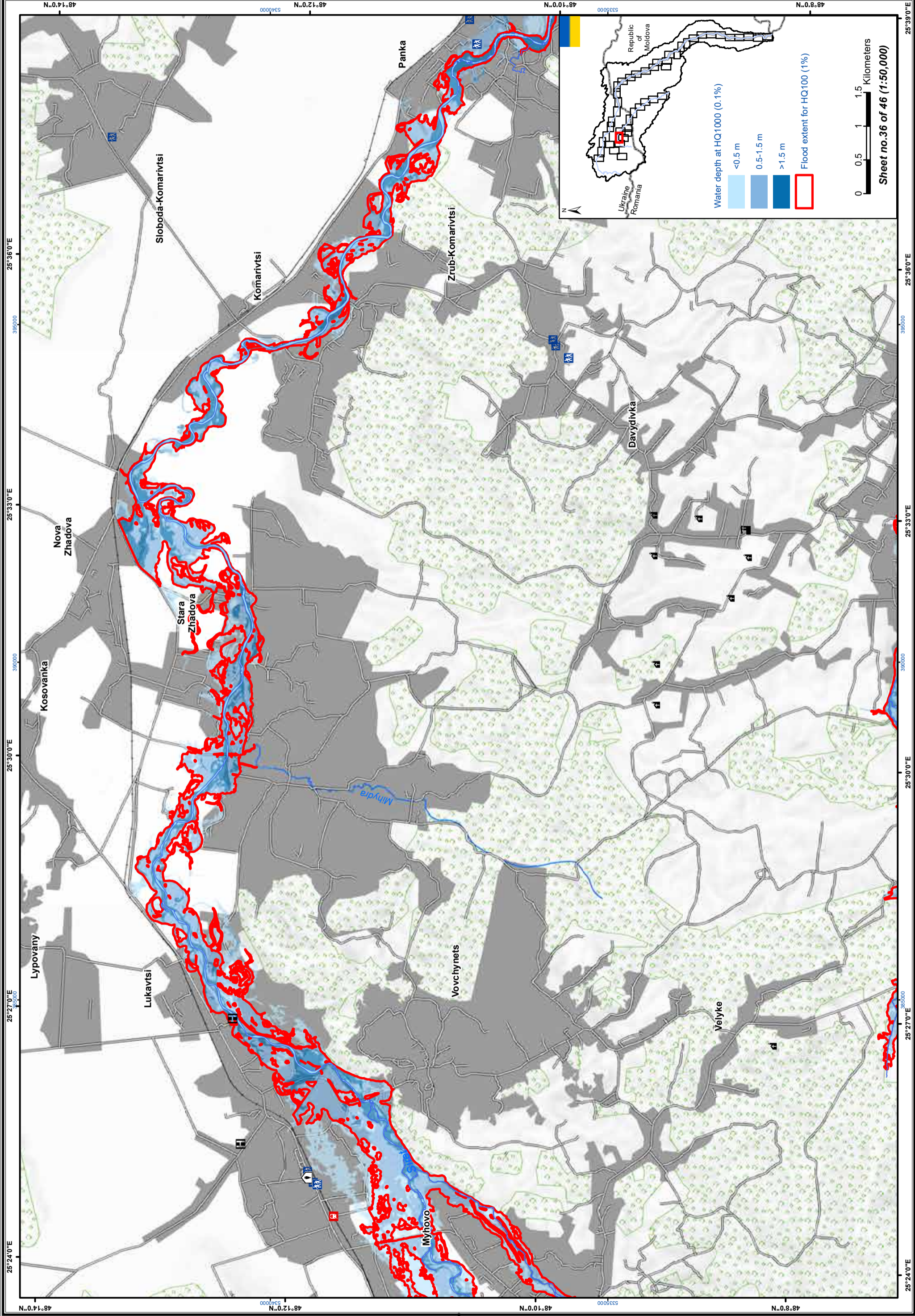
Sheet no.33 of 46 (1:50,000)



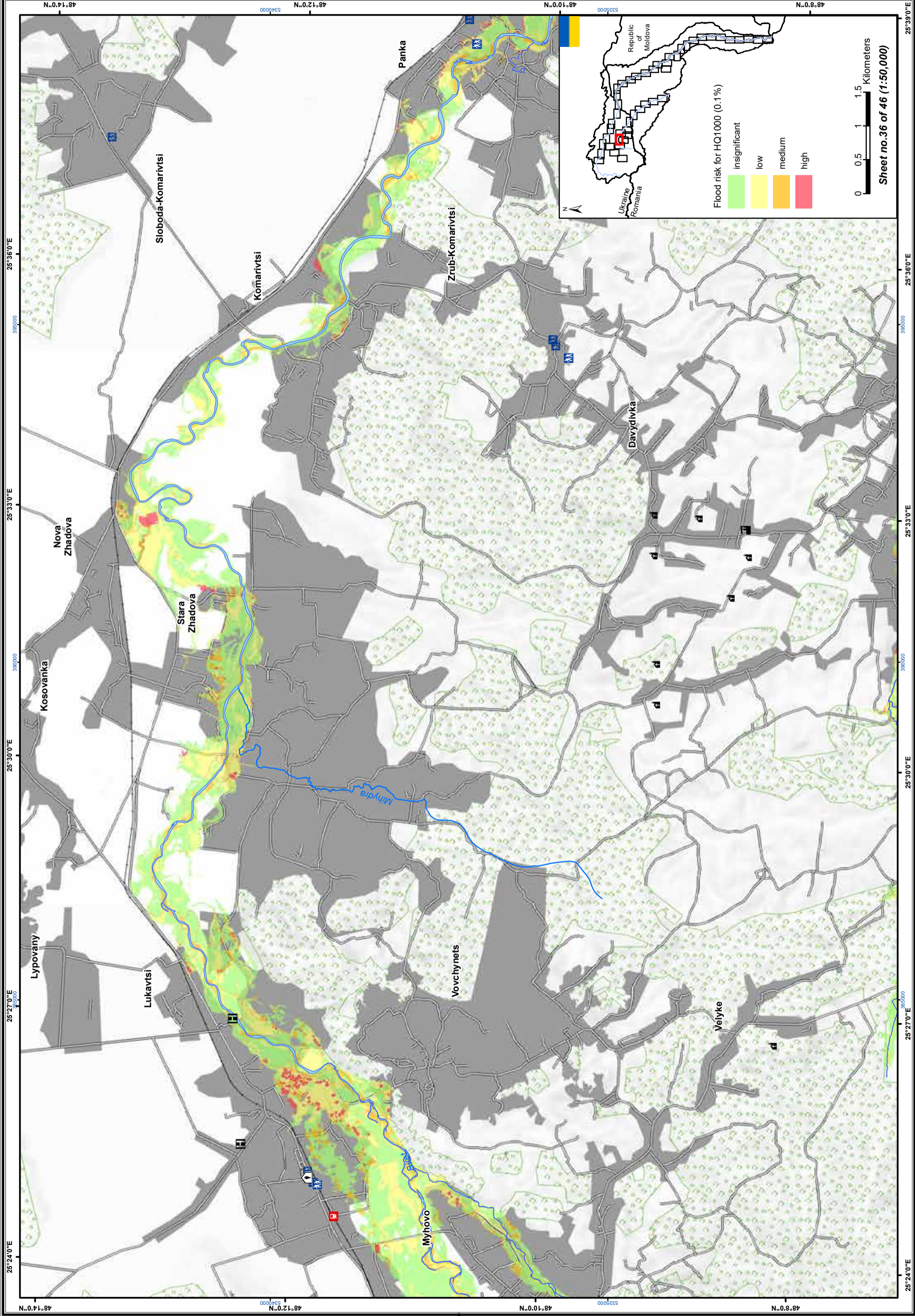




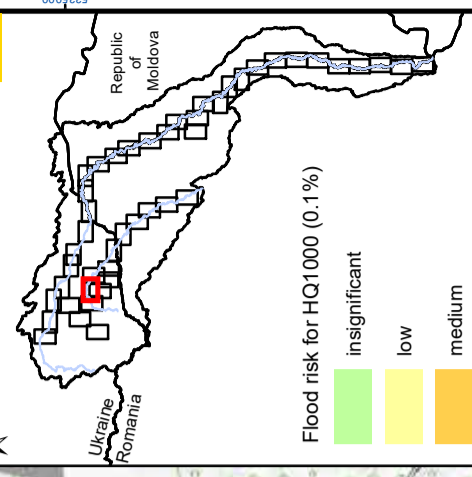
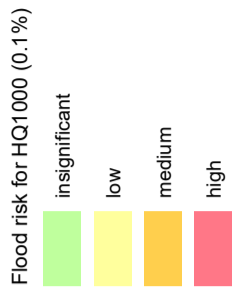


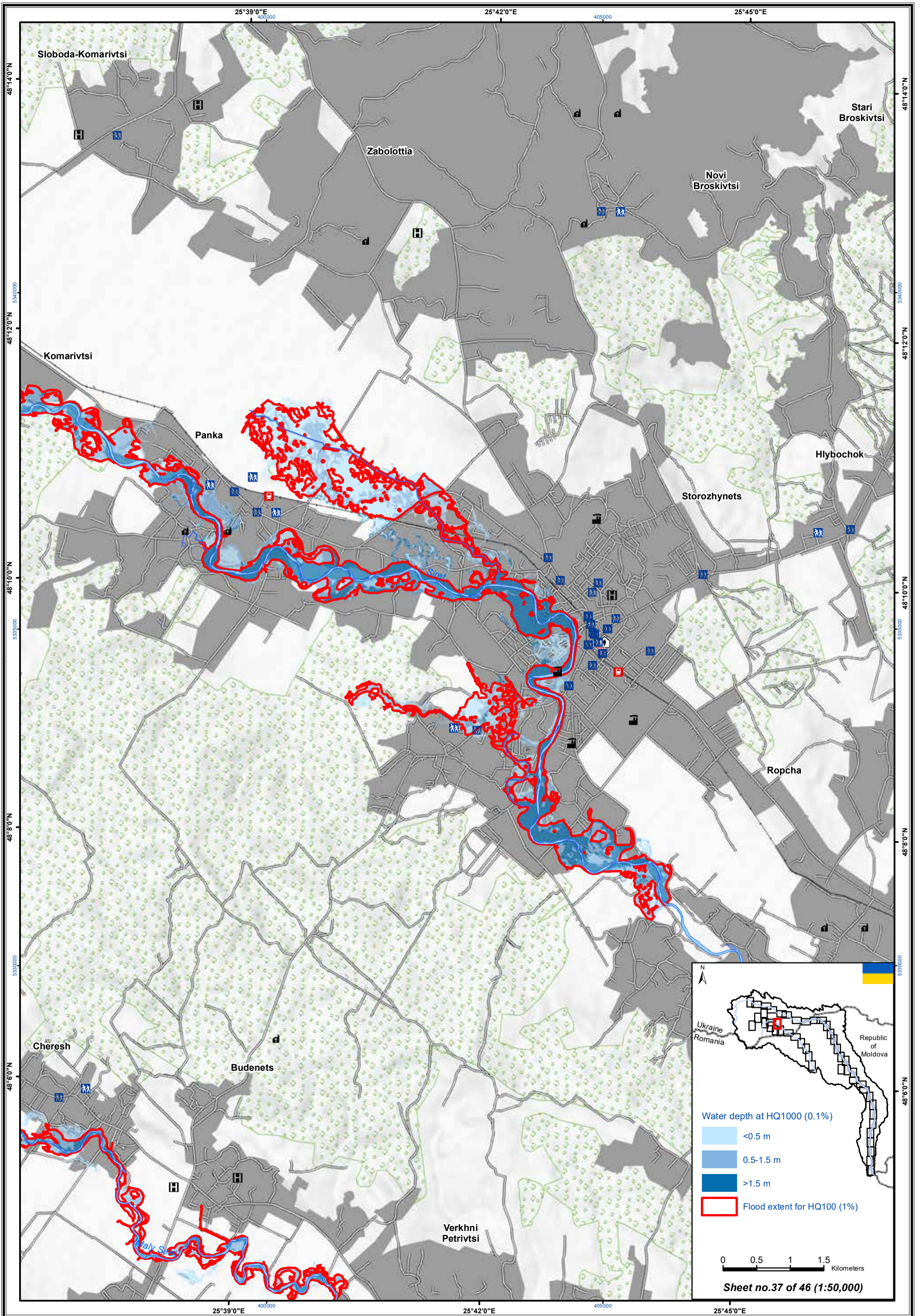


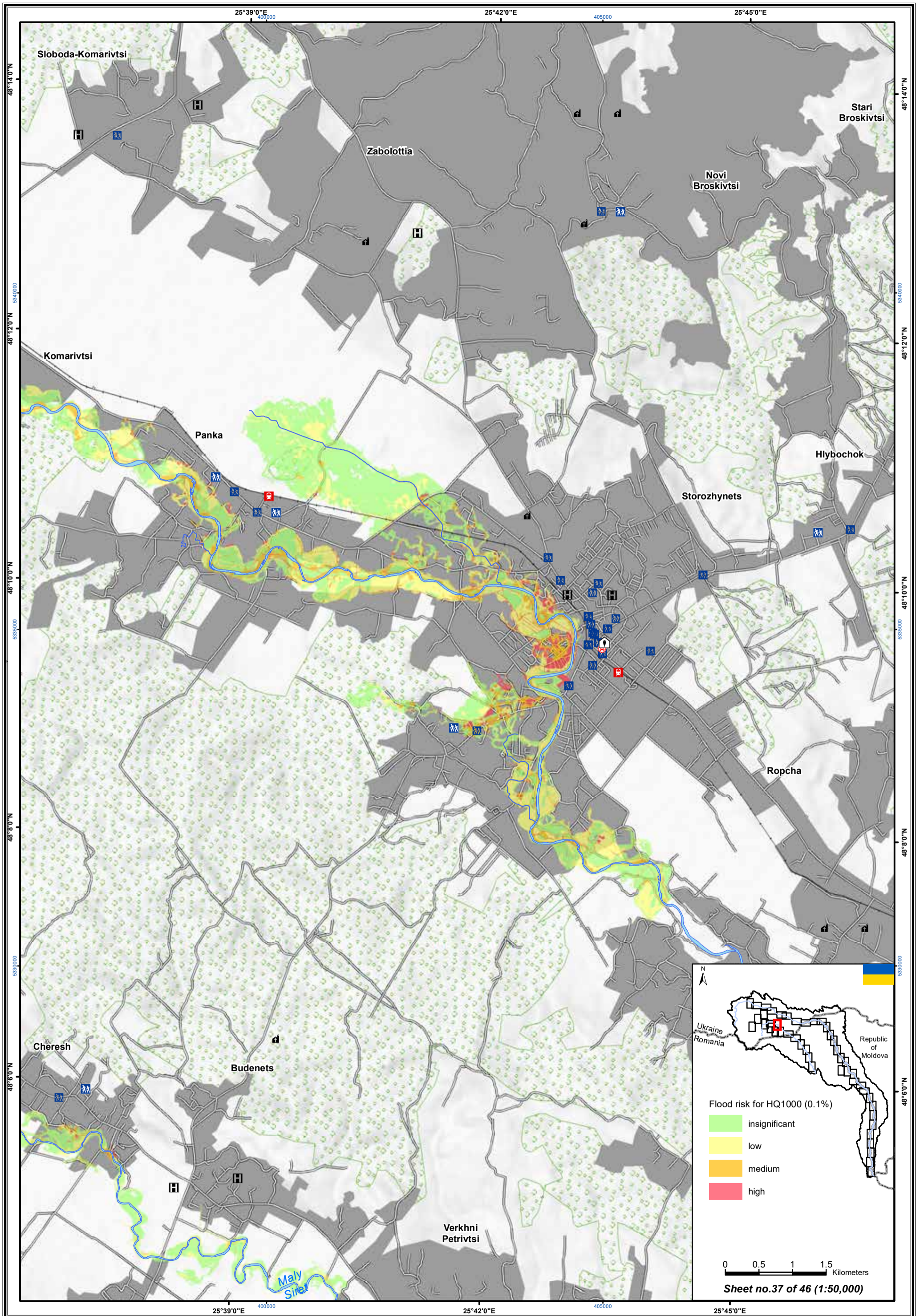




Sheet no.36 of 46 (1:50,000)







Sloboda-Komarivtsi

Zabolottia

Stari Broskivtsi

Novi Broskivtsi

Komarivtsi

Panka

Hlybochok

Storozhynets

Ropcha

Cheresh

Budenets

Verkhni Petrivtsi

Maly Sirek

25°39'0"E

25°42'0"E

25°45'0"E

48°14'0"N

48°14'0"N

48°12'0"N

48°12'0"N

48°10'0"N

48°10'0"N

48°8'0"N

48°8'0"N

48°6'0"N

48°6'0"N

25°39'0"E

25°42'0"E

25°45'0"E

400000

405000

5350000

5350000

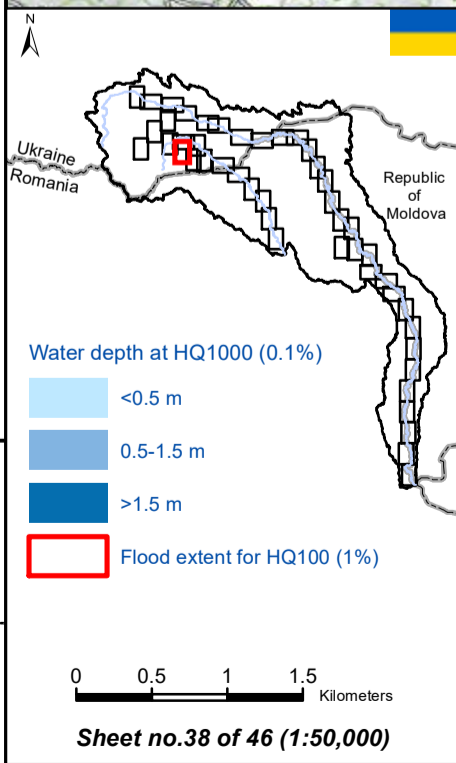
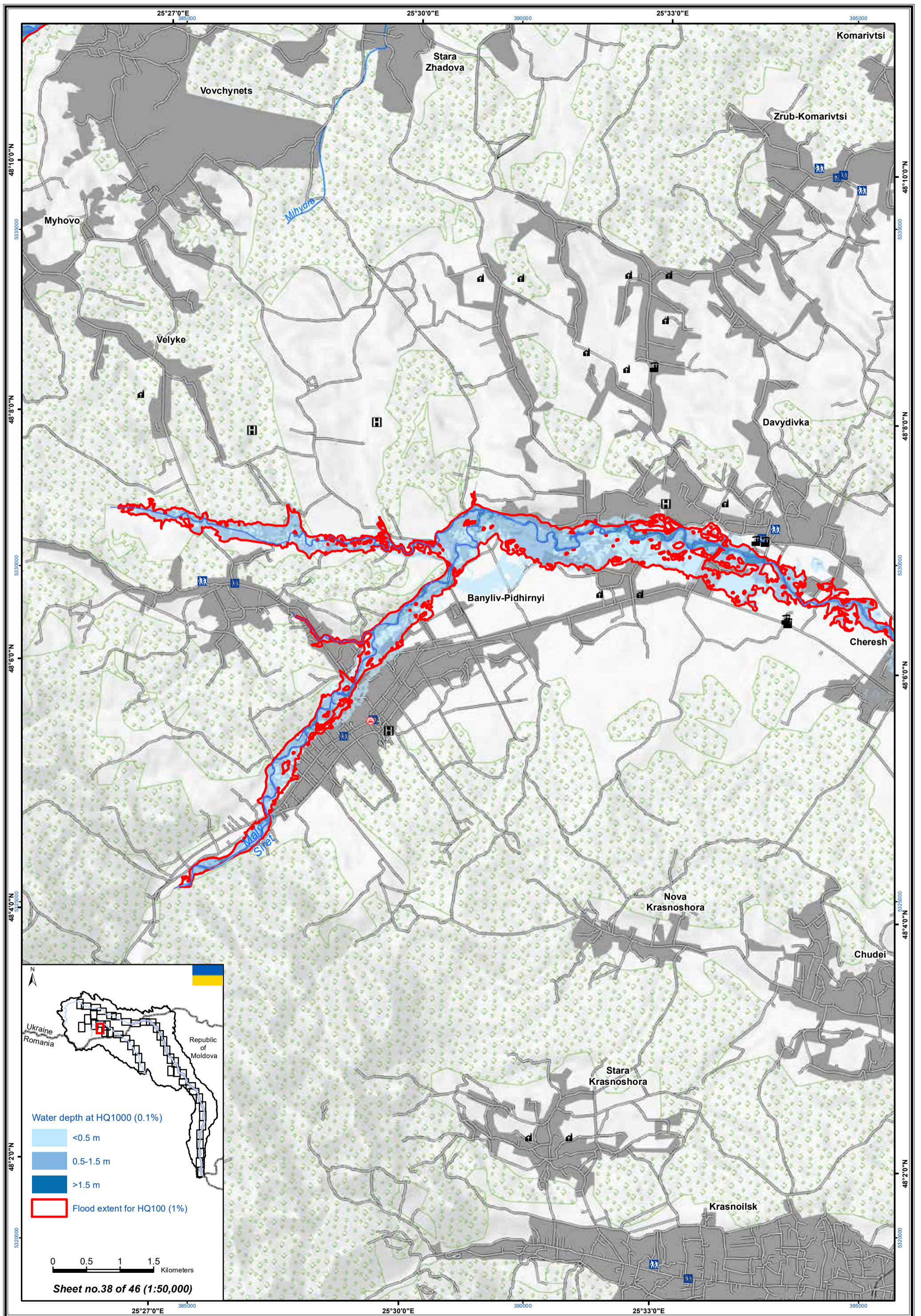
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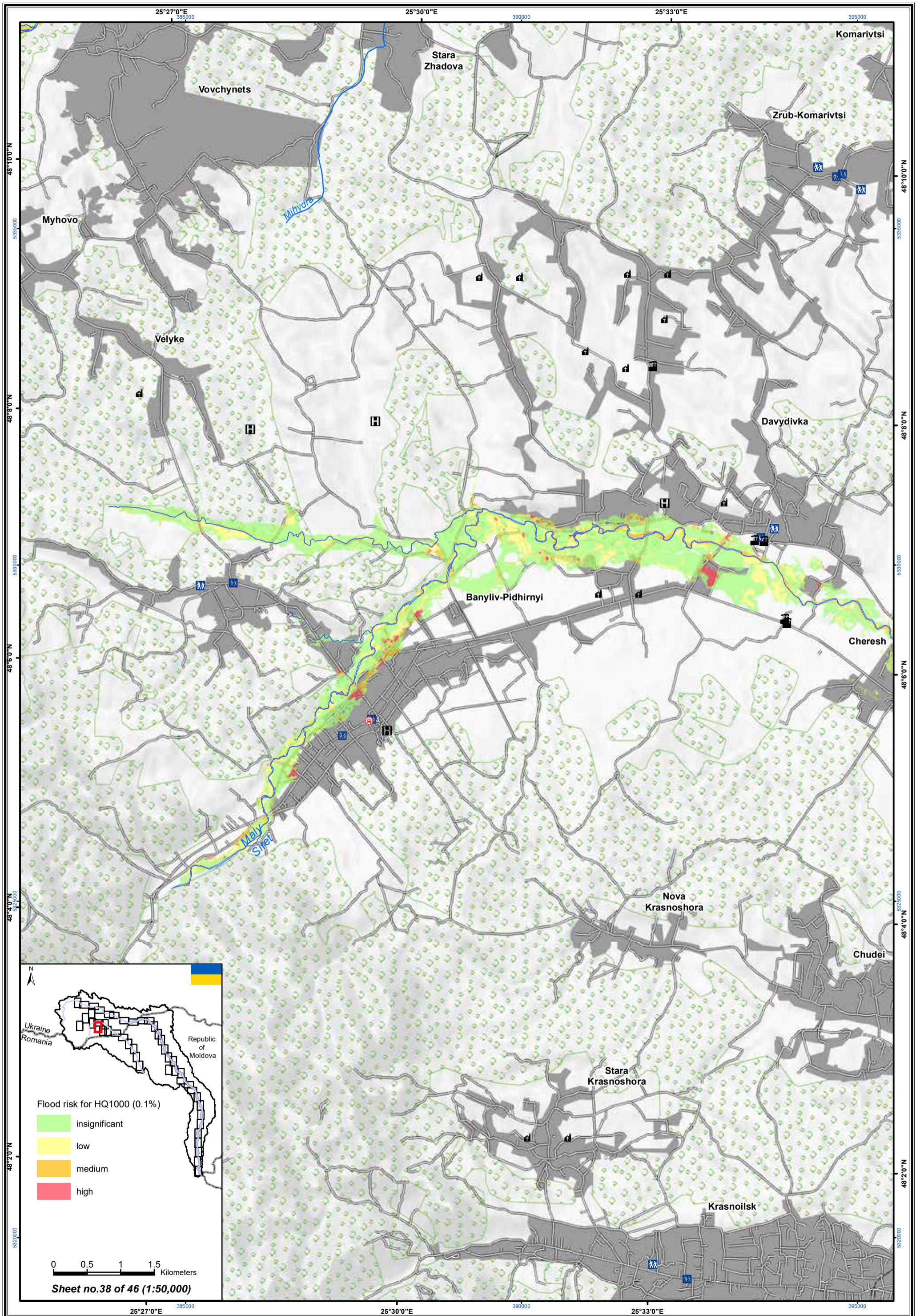
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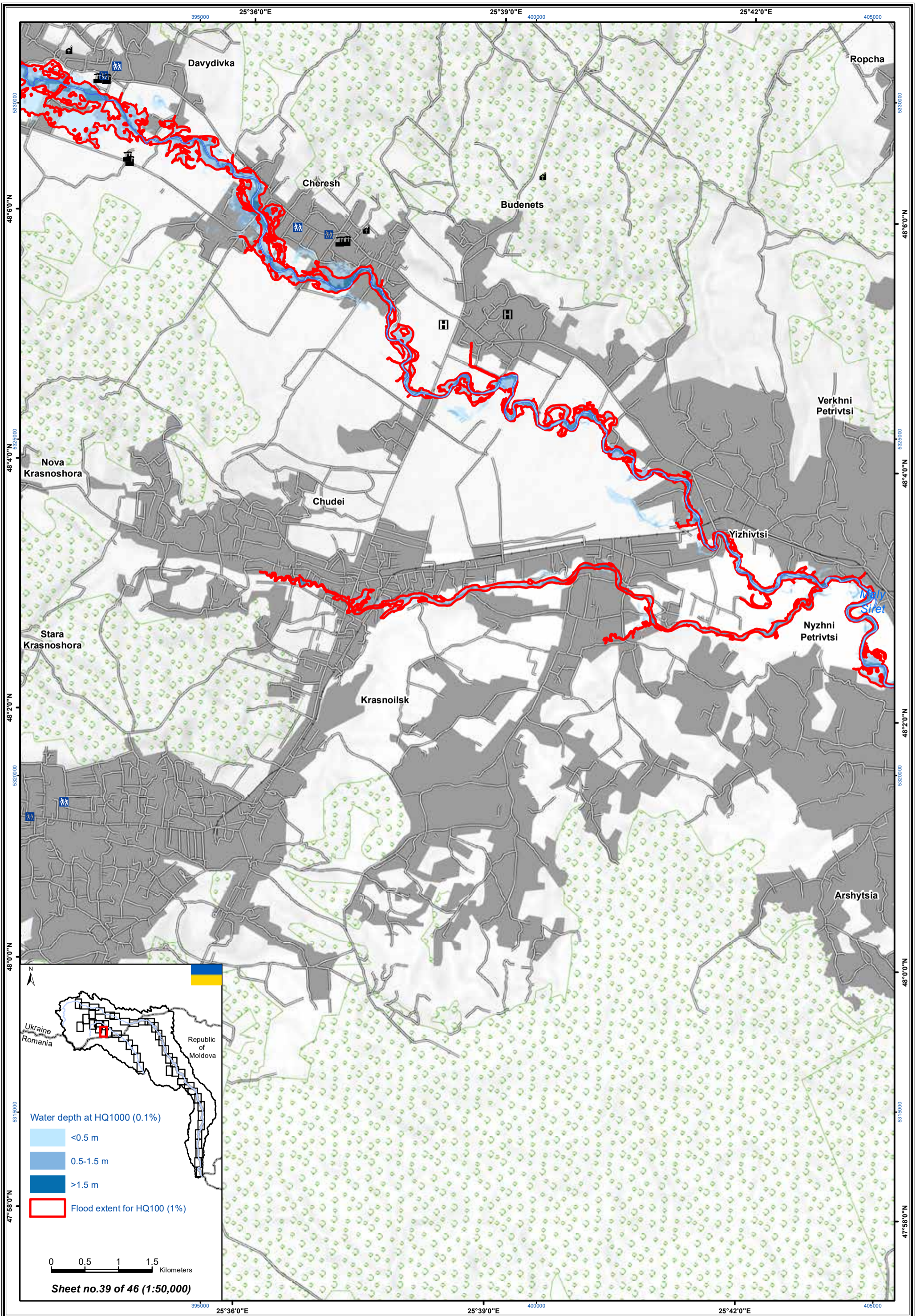
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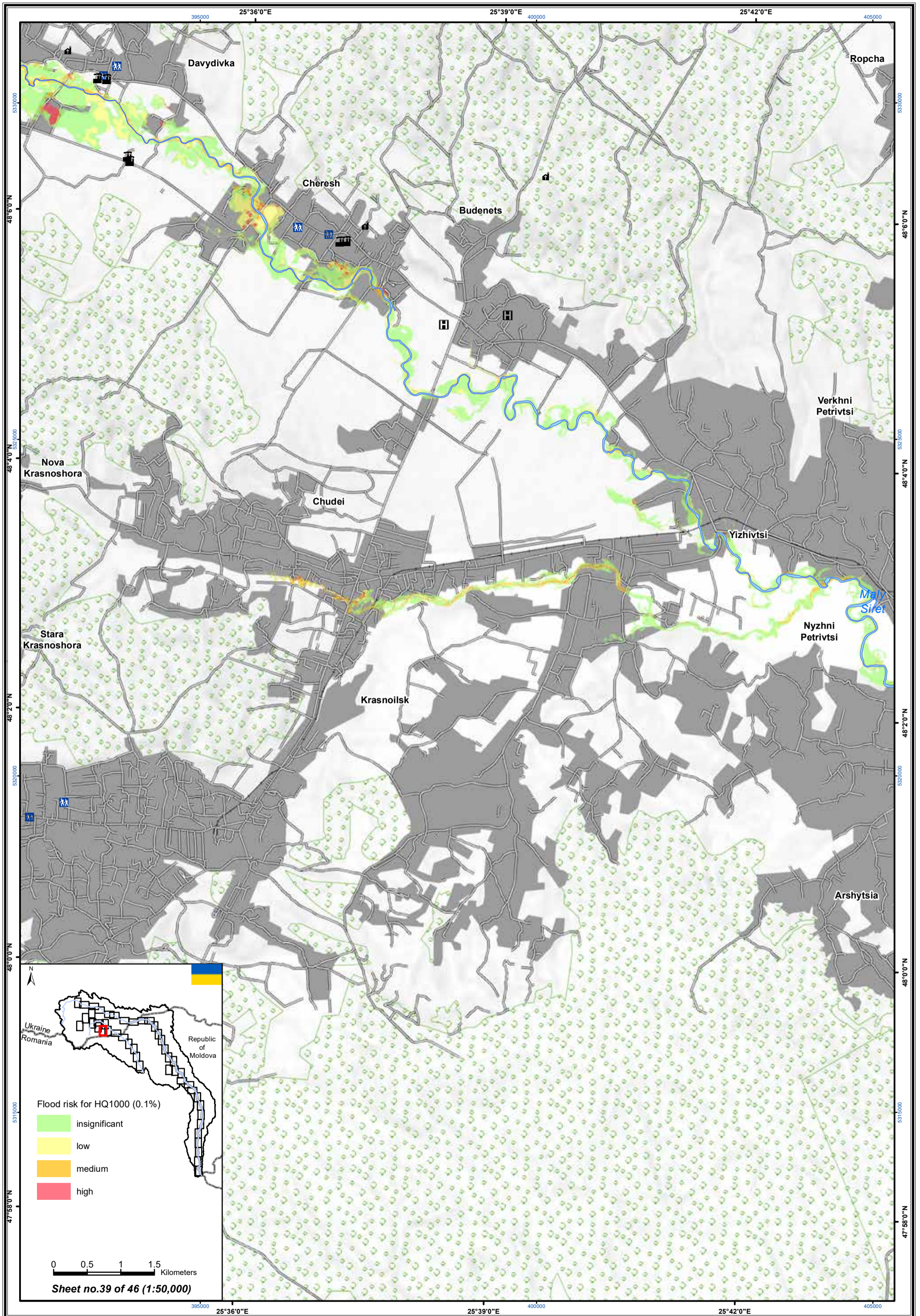
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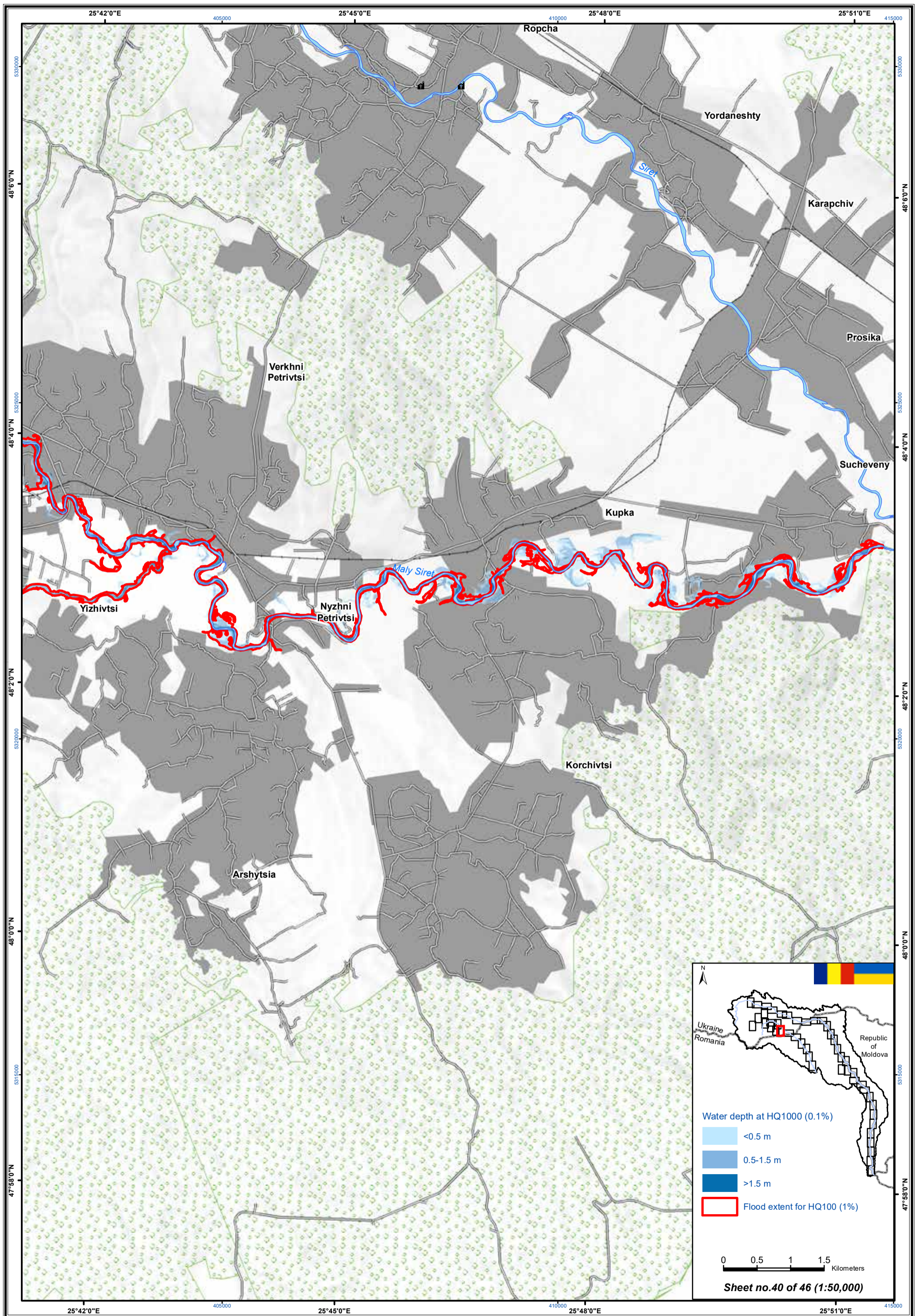
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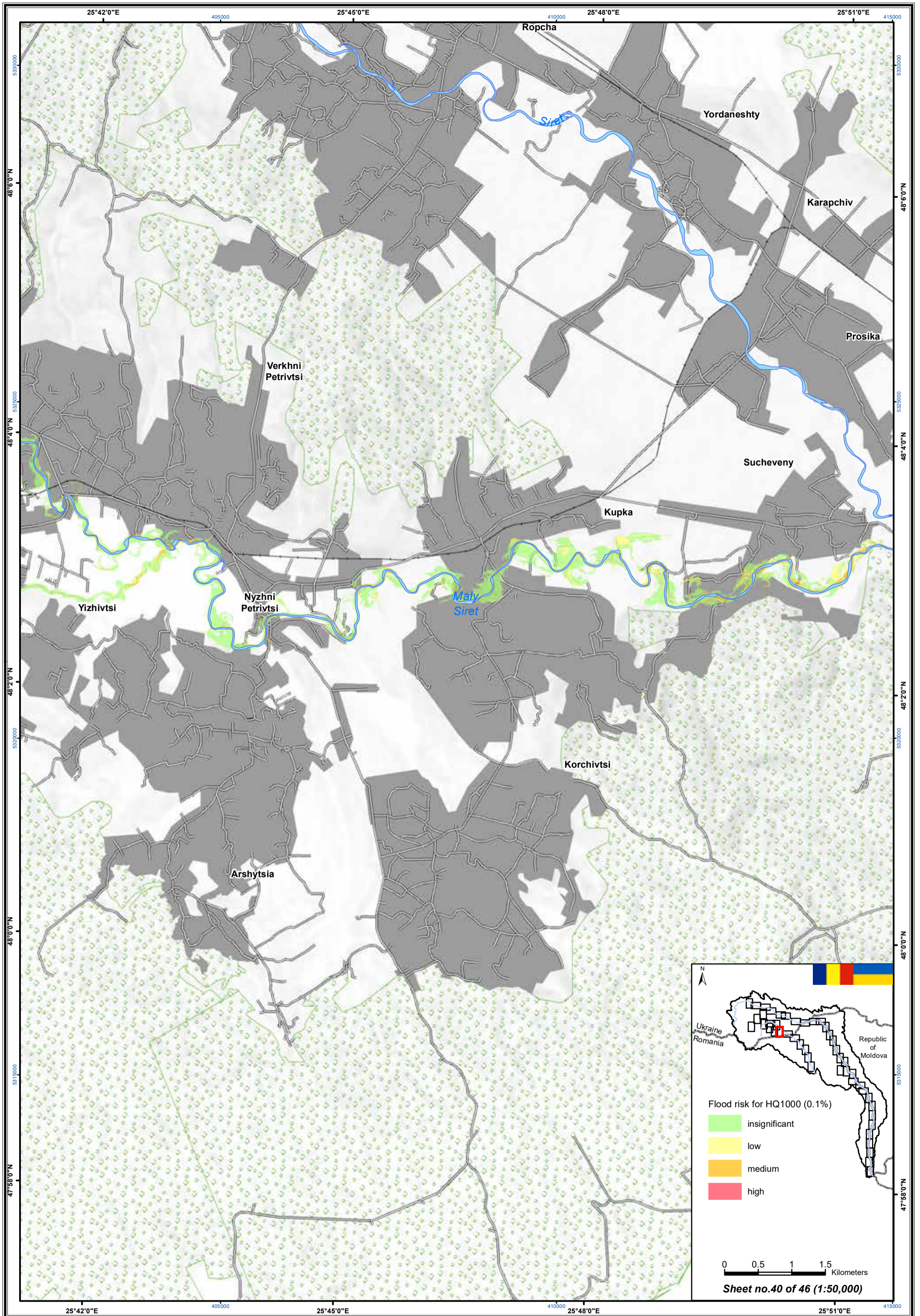


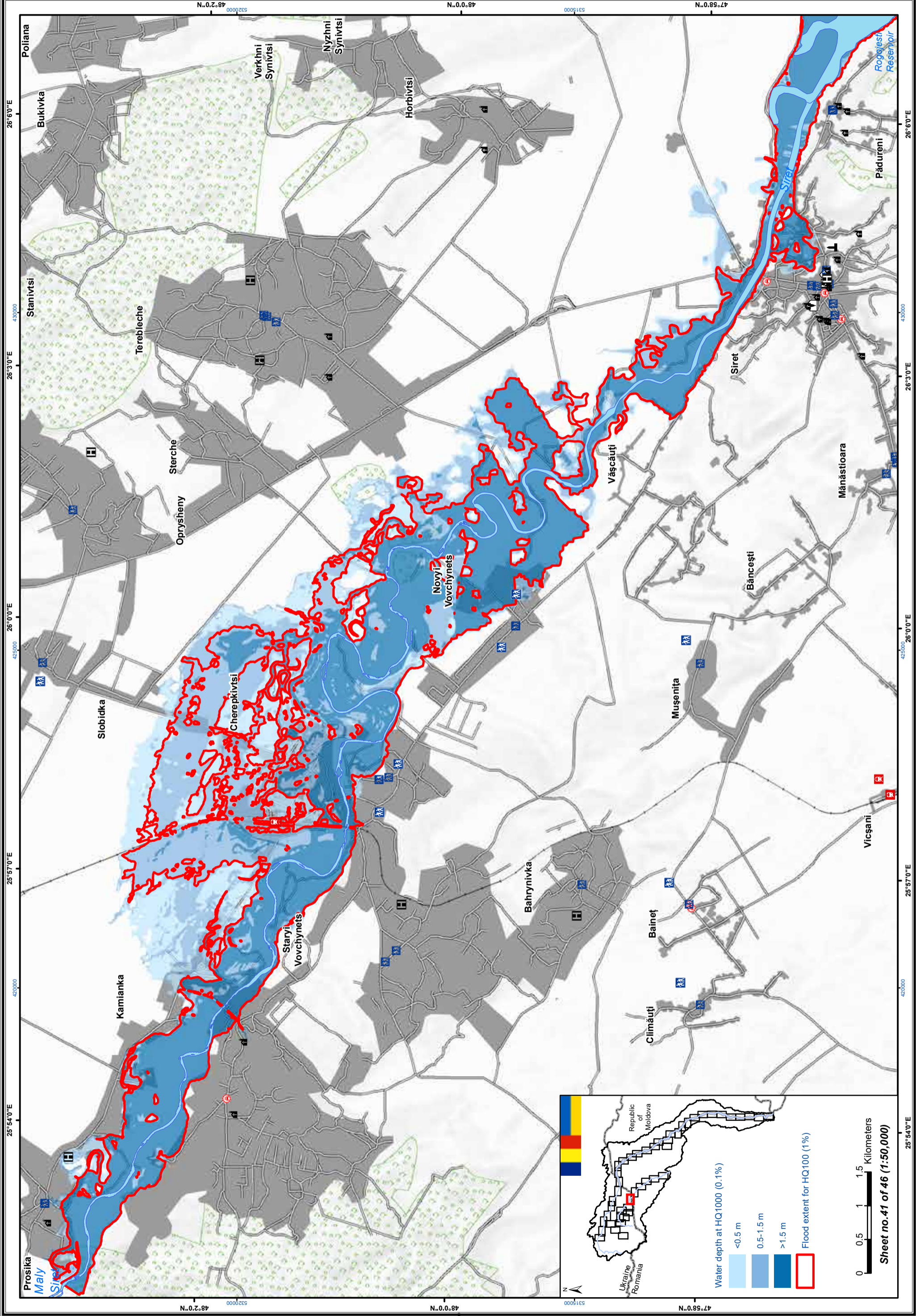








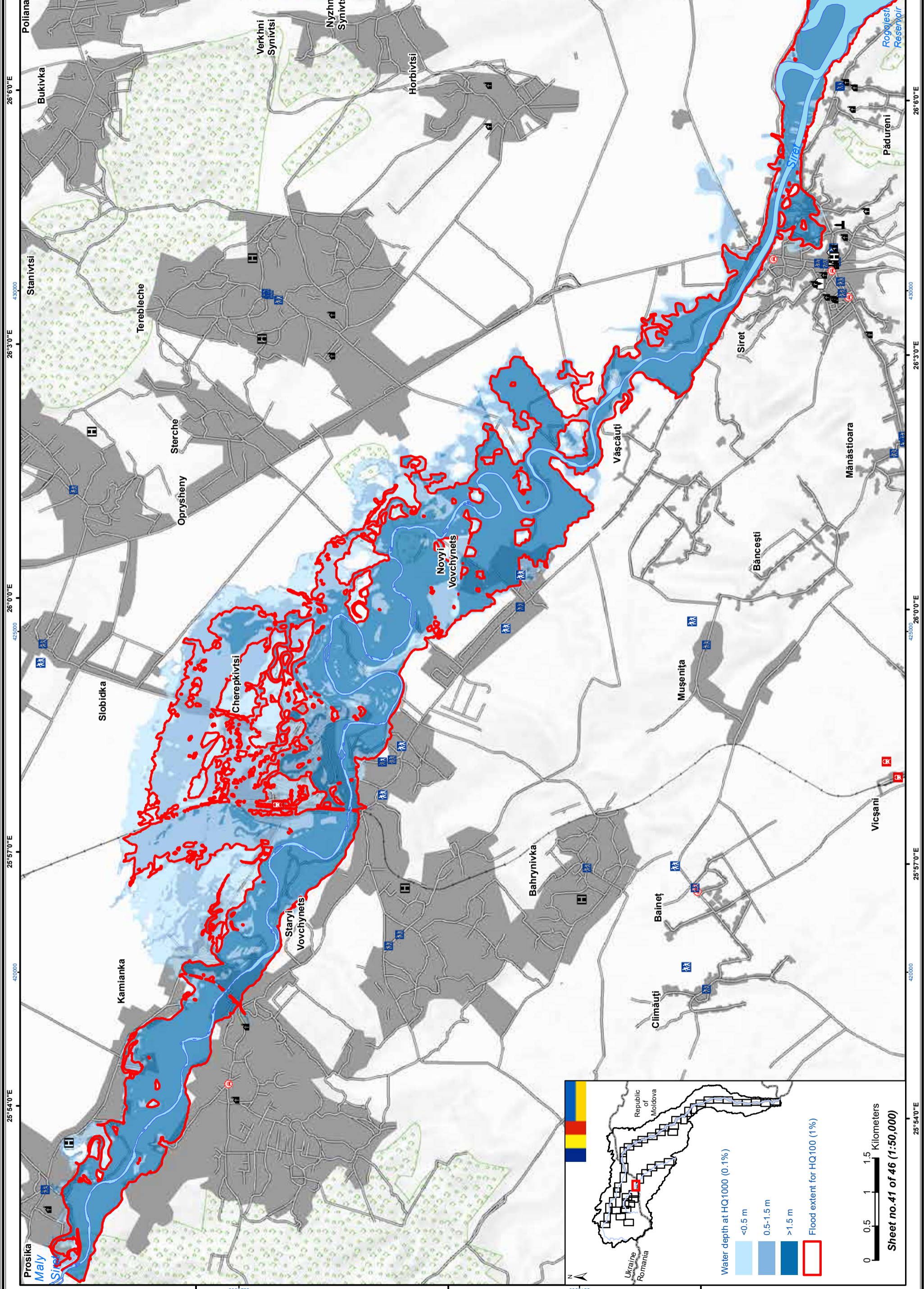


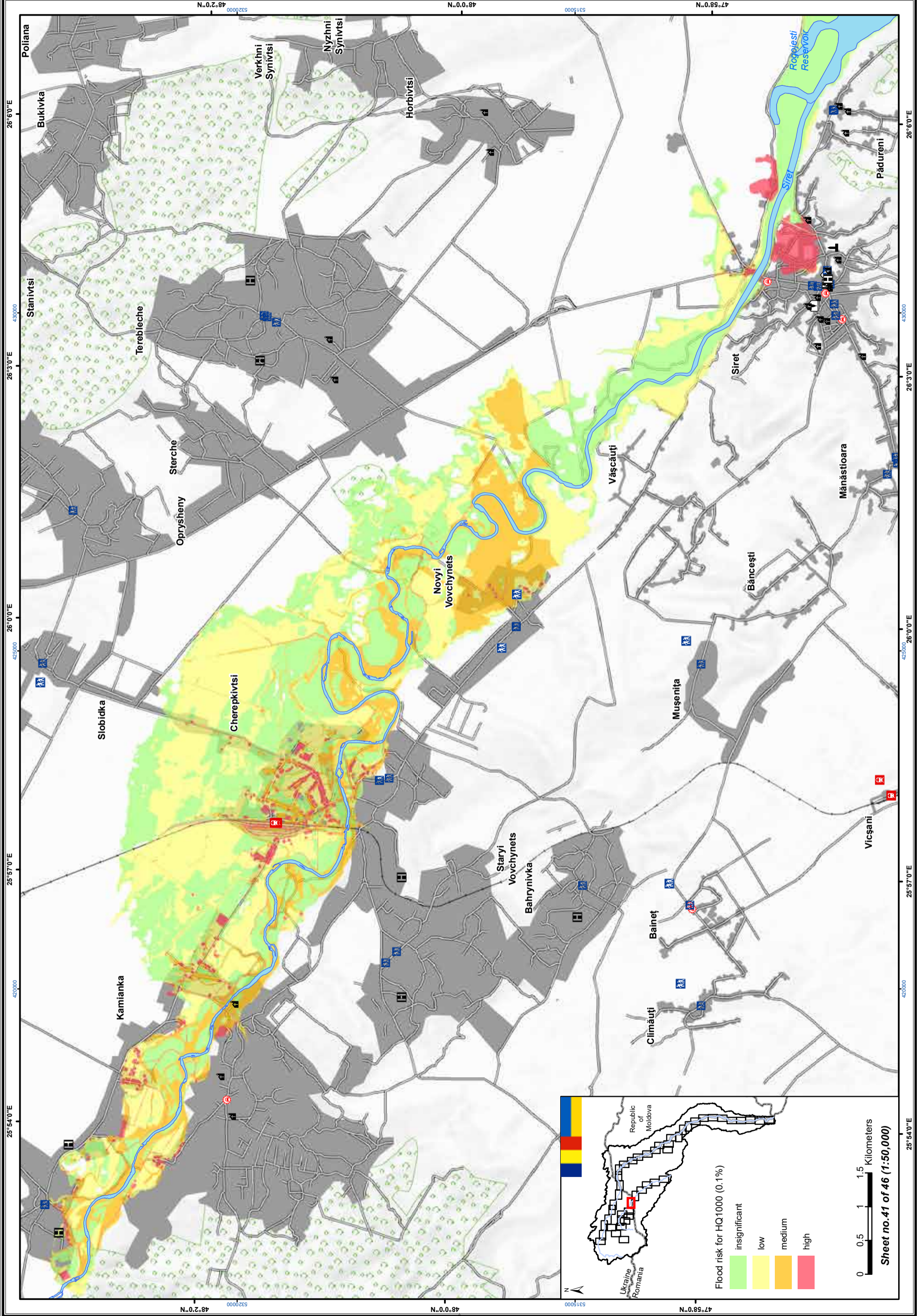


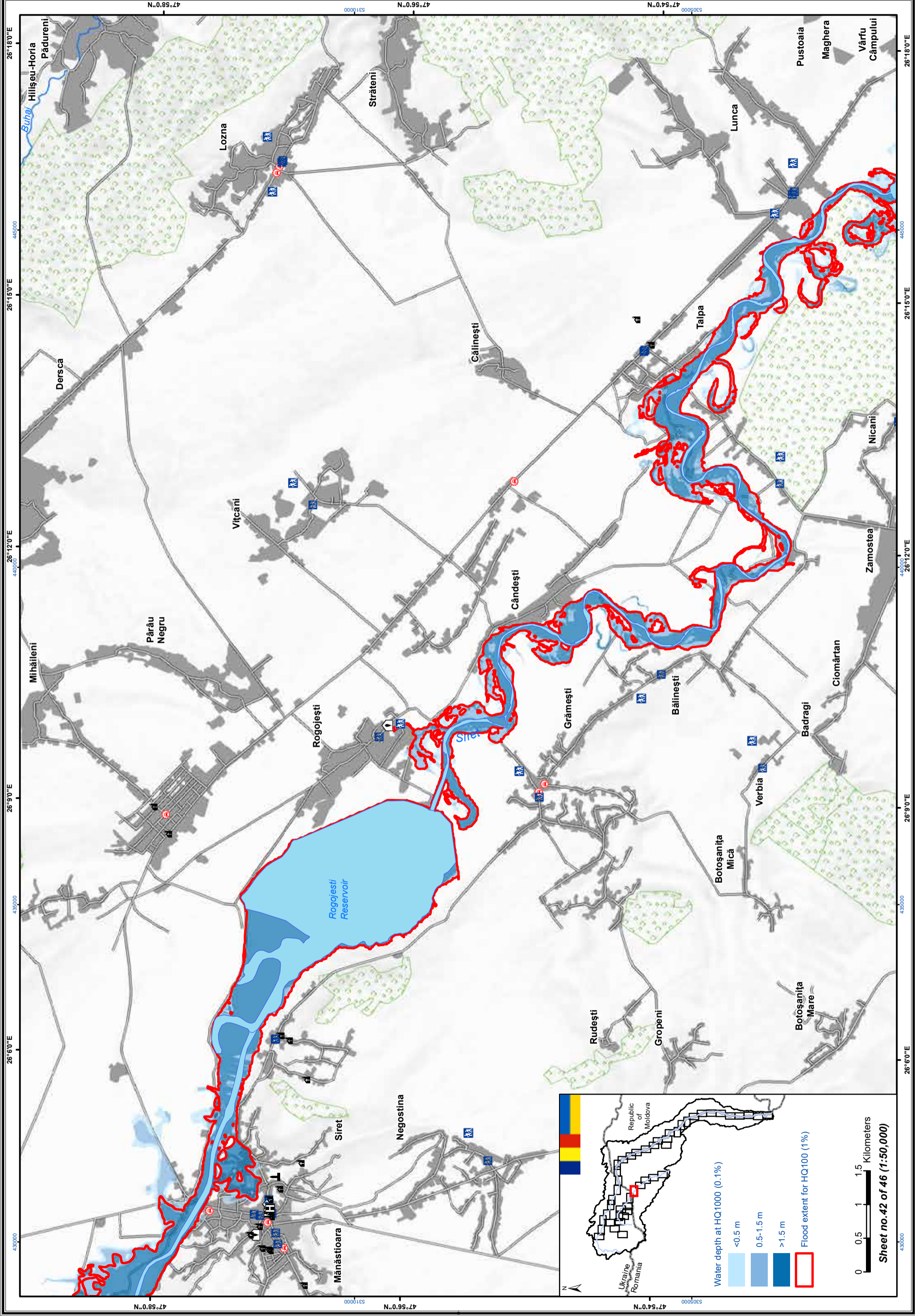
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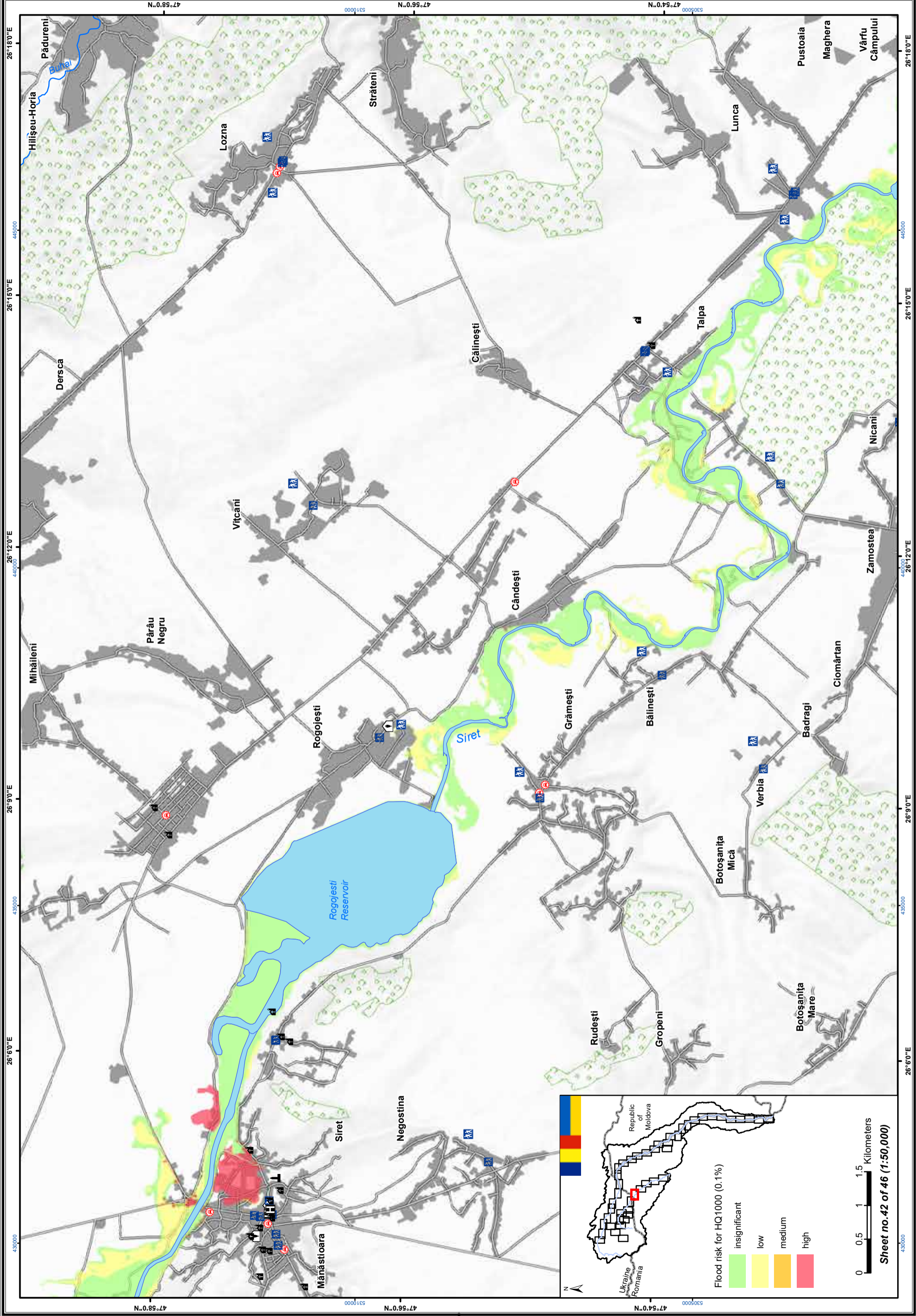
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47°58'0"N 47°56'0"N 47°54'0"N 5305000 5310000

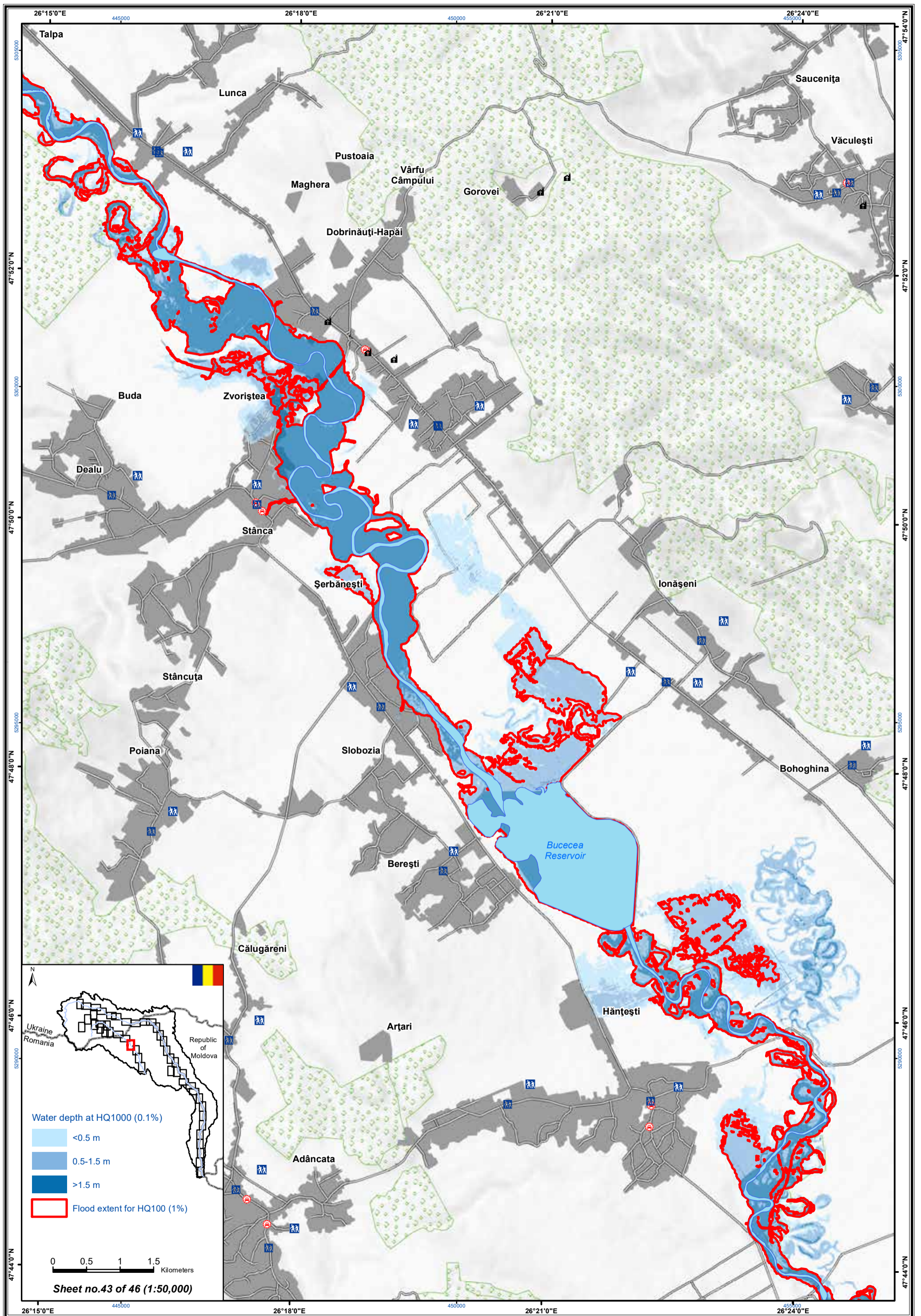
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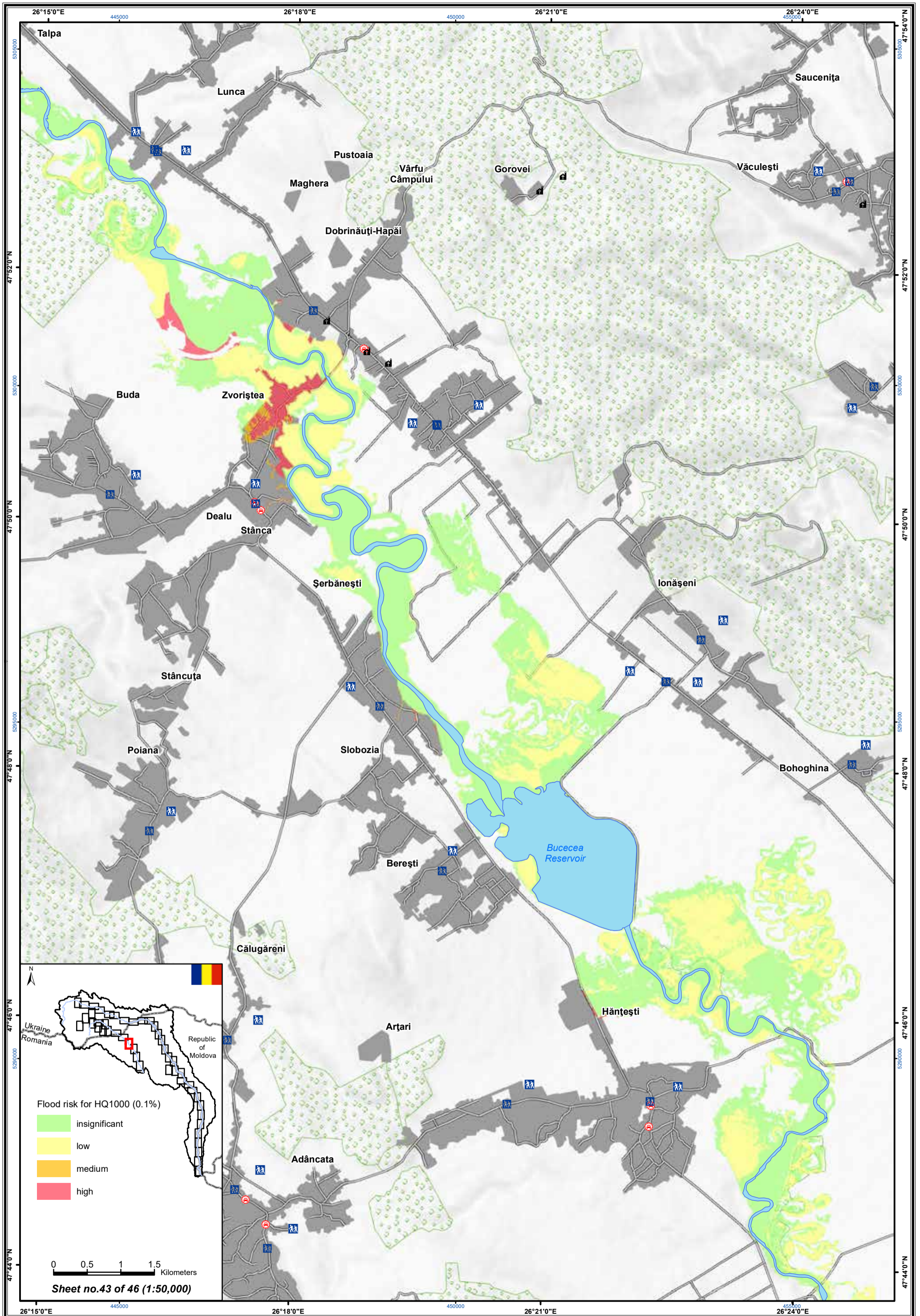
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26°9'0"E 26°6'0"E 435000 430000

Pădureni  
 Hillșeu-Horia  
 Buhai  
 Dersca  
 Mihalieni  
 Pârâu Negru  
 Vîțcani  
 Rogojești  
 Siret  
 Mănăstoara  
 Negostina  
 Străteni  
 Călinești  
 Căndești  
 Grămești  
 Bălănești  
 Rudești  
 Gropeni  
 Talpa  
 Lunca  
 Pustoaia  
 Maghera  
 Vârfu Câmpului  
 Nicani  
 Zamostea  
 Ciomărtan  
 Badragi  
 Verbia  
 Botoșanița Mică  
 Botoșanița Mare





Talpa

Lunca

Pustoaia

Maghera

Vârful Câmpului

Gorovei

Saucenița

Văculești

Dobrinăuți-Hapâi

Buda

Zvoriștea

Dealul

Stânca

Serbănești

Ionășeni

Stâncuța

Poiana

Slobozia

Berești

Bohoghina

Călugăreni

Bucecea Reservoir

Hănțești

Arțari

Adâncata

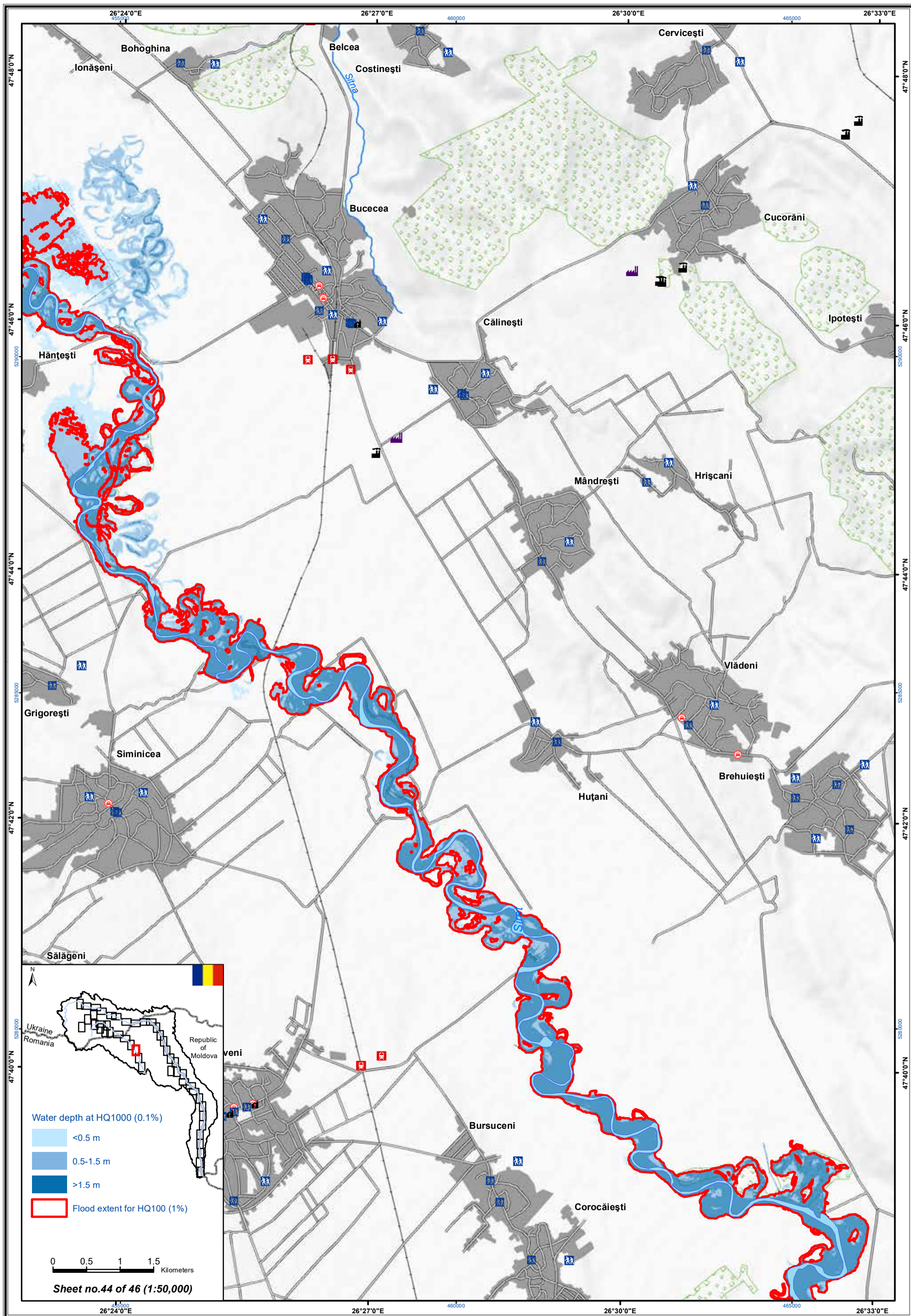
Ukraine

Romania

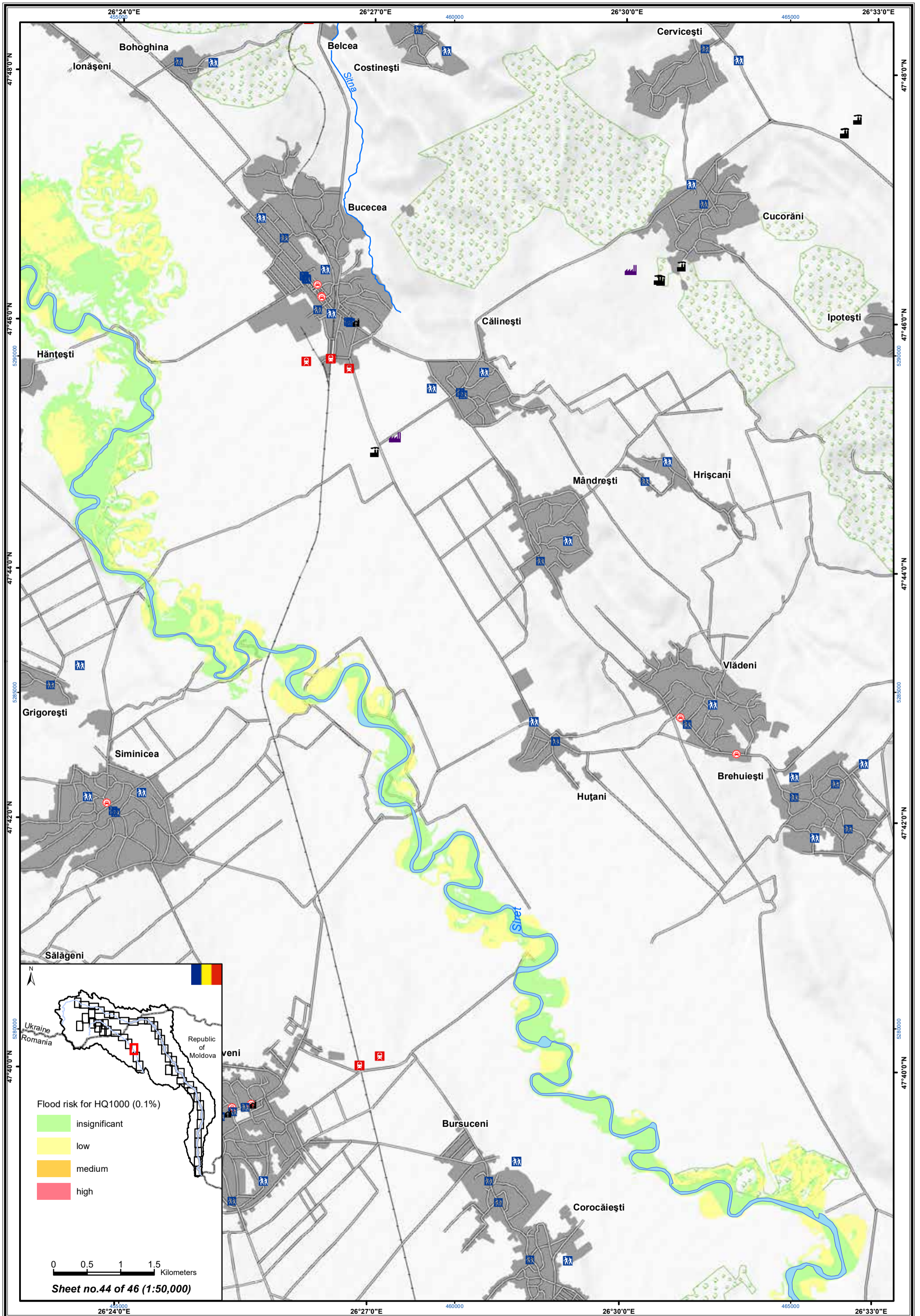
Republic of Moldova

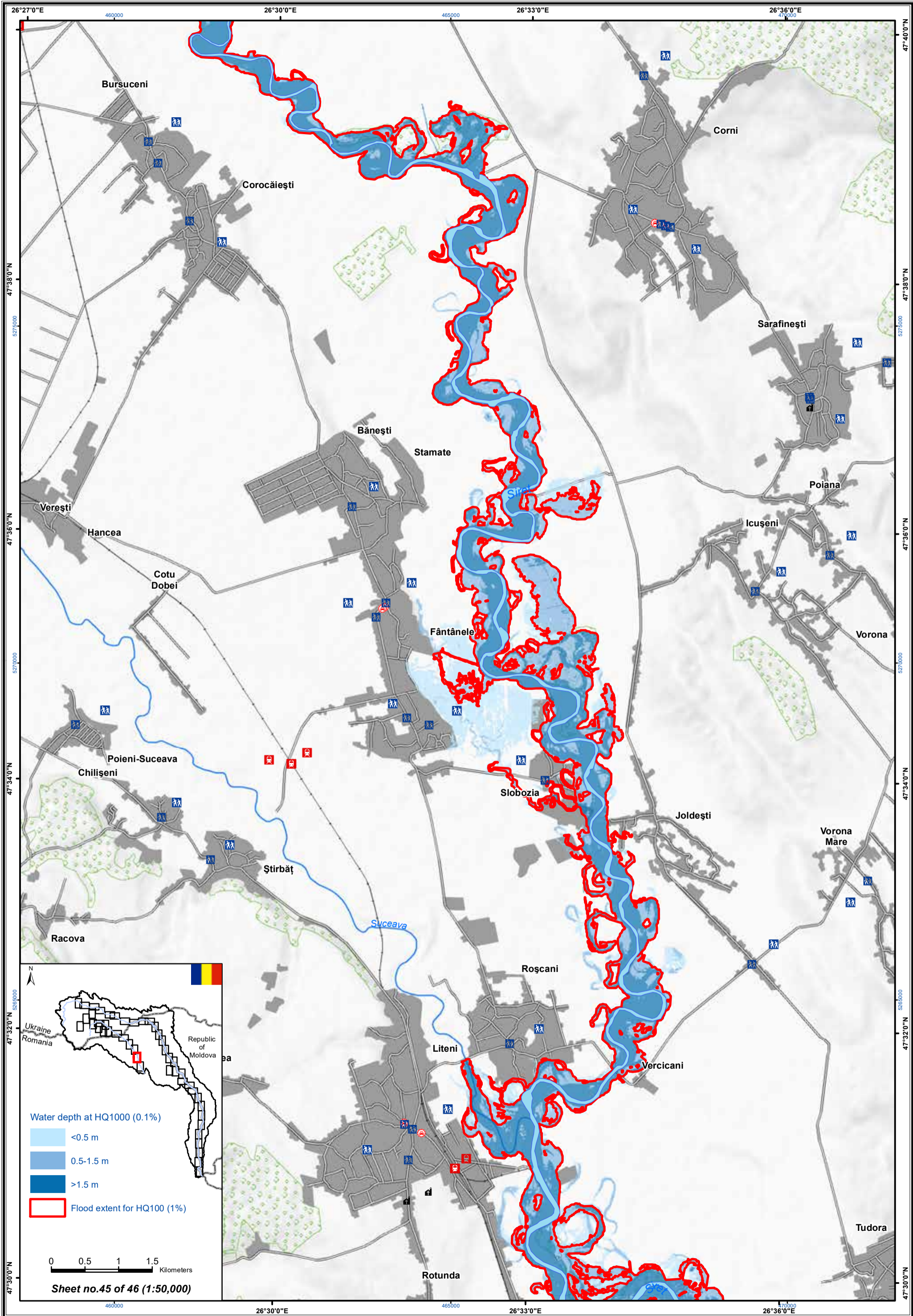
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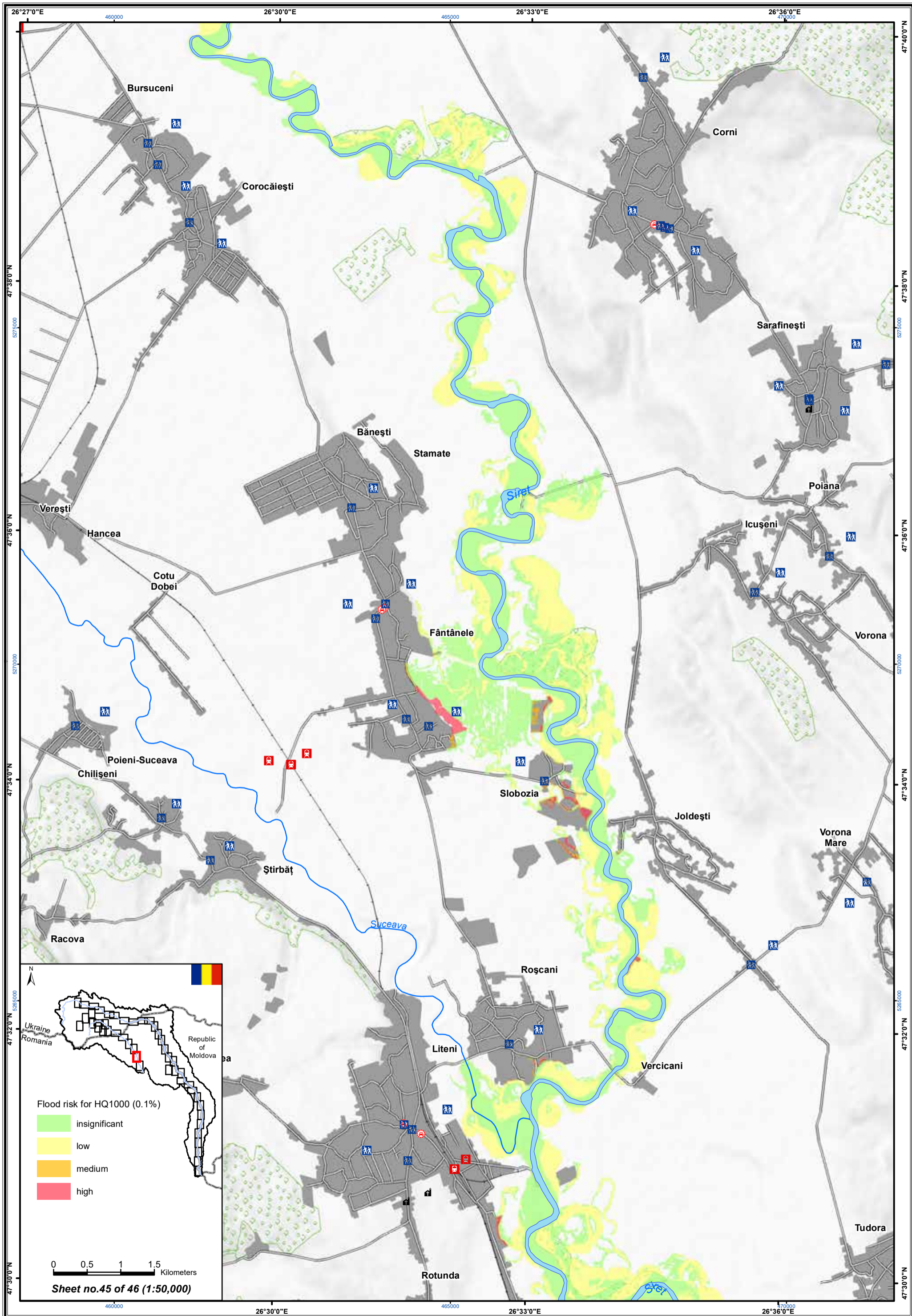
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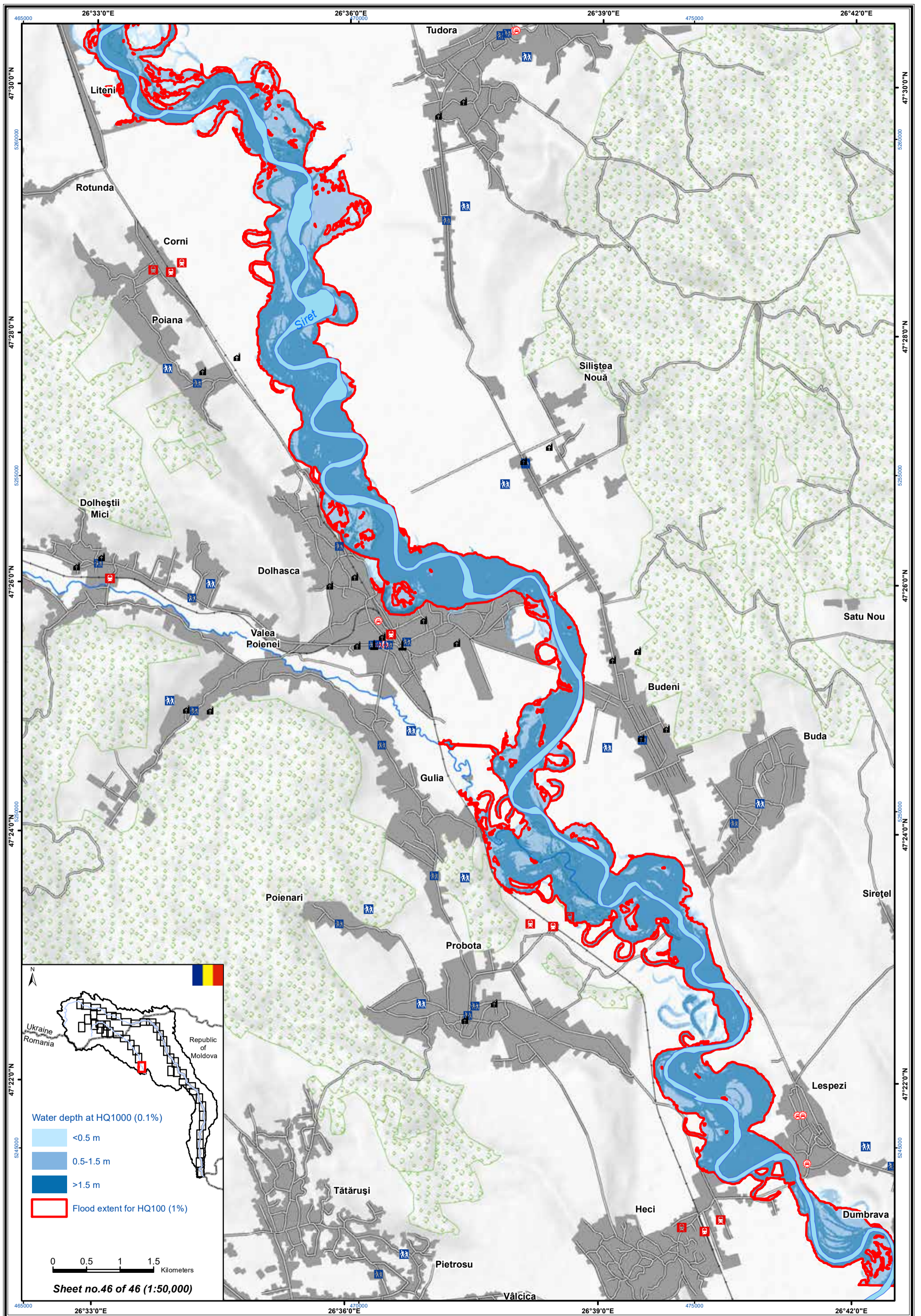


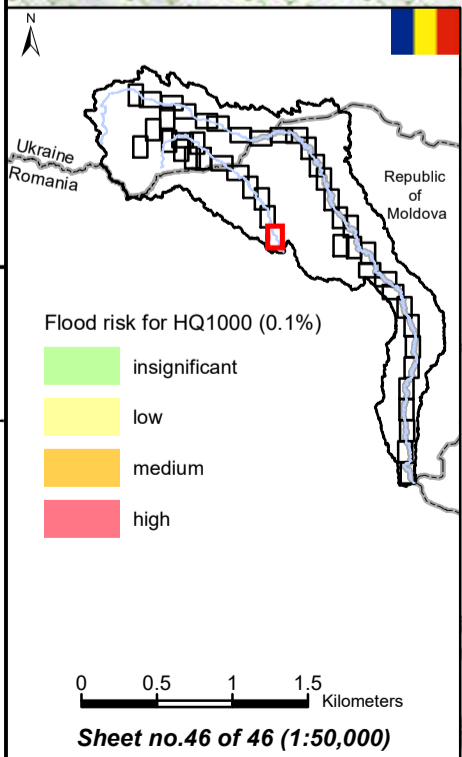
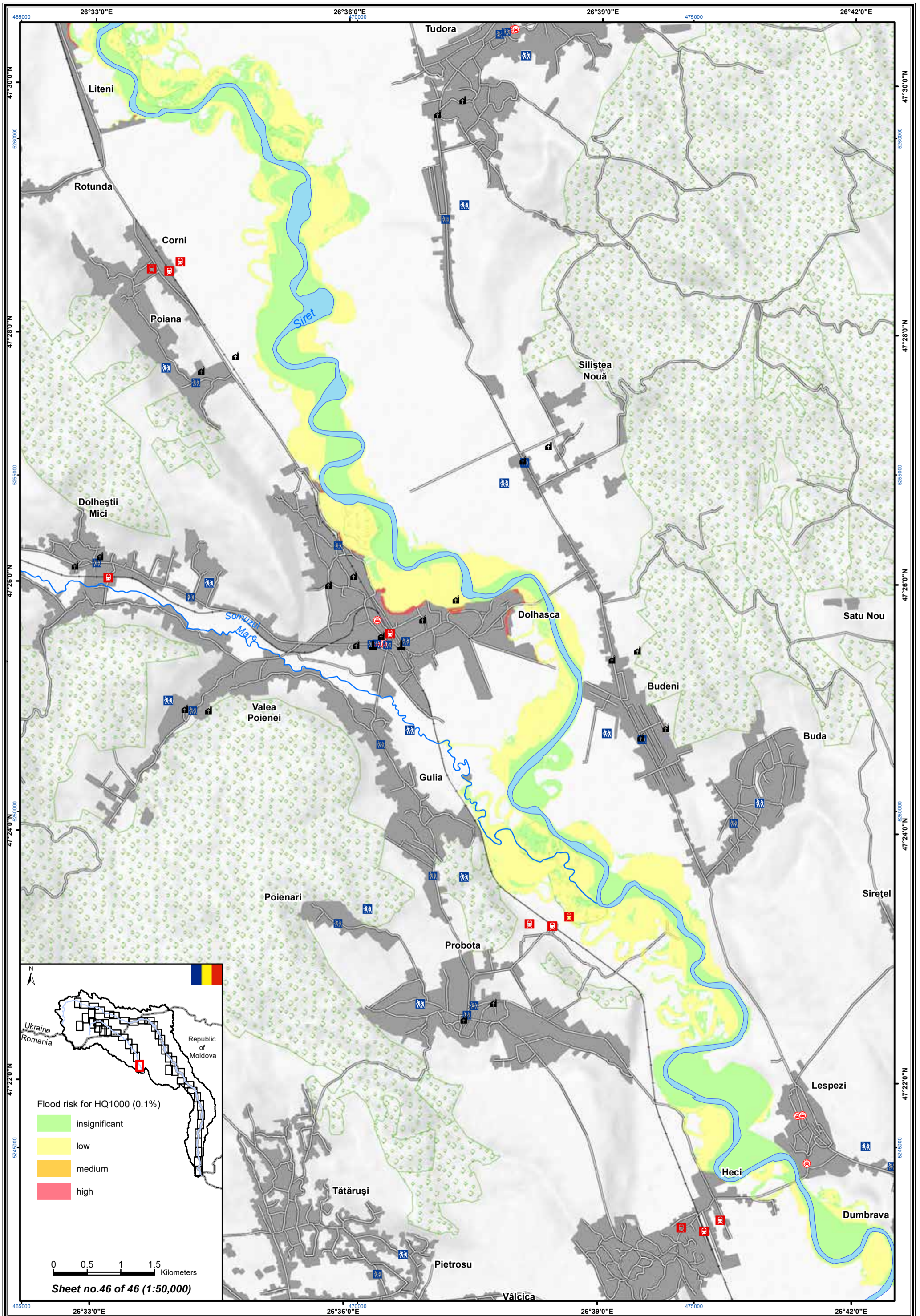
















## THE LIST OF POTENTIAL FLOODED SETTLEMENTS AND THE DEGREE OF RISK FOR POPULATION





### LISTA LOCALITĂȚILOR POTENȚIAL INUNDABILE ȘI GRADUL DE RISC PENTRU POPULAȚIE


Ukraine (UA)

SETTLEMENT	RIVER	TYPE	RISK	
Banyliv	Prut R.B. - Cheremosh	village	 High	
Berehomet	Prut R.B.	village		
Boianivka	Prut R.B.	village		
Borshchiv	Prut R.B.	village		
Buda	Prut R.B.	village		
Cherepkivtsi	Siret R.B.	village		
Chernivtsi	Prut R.B.	city		
Dolishnie Zaluchchia	Prut R.B.	village		
Dranytsia	Prut R.B.	village		
Dubivtsi	Prut R.B.	village		
Dumeny	Prut R.B.	village		
Khutir-Budylyv	Prut R.B.	village		
Kornych	Prut R.B.	village		
Koshuliany	Prut R.B.	village		
Kostychany	Prut R.B.	village		
Kuty	Prut R.B. - Cheremosh	town		
Luzhany	Prut R.B.	town		
Mamaivtsi	Prut R.B.	village		
Mamalyha	Prut R.B.	village		
Marshyntsi	Prut R.B.	village		
Nehryntsi	Prut R.B.	village		
Nepolokivtsi	Prut R.B.	town		
Novoivankivtsi	Prut R.B.	village		
Novoselytsia	Prut R.B.	town		
Novyi Kyseliv	Prut R.B.	village		
Nyzhnii Verbizh	Prut R.B.	village		
Pereryv	Prut R.B.	village		
Piadykivtsi	Prut R.B.	village		
Popelnyky	Prut R.B. - Cheremosh	village		
Prut	Prut R.B.	village		
Semakivtsi	Prut R.B.	village		
Sheparivtsi	Prut R.B.	village		
Shypyntsi	Prut R.B.	village		
Storozhynets	Siret R.B.	town		
Striletskyi Kut	Prut R.B.	village		
Tarasivtsi	Prut R.B.	village		
Vanchykivtsi	Prut R.B.	village		
Vanchynets	Prut R.B.	village		
Vashkivtsi	Prut R.B.	town		
Voskresyntsi	Prut R.B.	village		
Vyzhnytsia	Prut R.B. - Cheremosh	town		
Zaluchchia	Prut R.B.	village		
Zamulyntsi	Prut R.B.	village		
Zavallia	Prut R.B.	village		
Zelenyi Hai	Prut R.B.	village		
Barvinkiv	Prut R.B. - Cheremosh	village		 Medium
Bila	Prut R.B.	village		
Chornohuzy	Prut R.B. - Cheremosh	village		
Chortoryia	Prut R.B.	village		
Dzhuriv	Rybnycya	village		
Hanniv	Prut R.B.	village		
Horishnie Zaluchchia	Prut R.B.	village		
Kamianka	Siret R.B.	village		
Khlibychyn	Prut R.B.	village		
Kniazhdvir	Prut R.B.	village		
Kniazhe	Prut R.B.	village		
Kolomyia	Prut R.B.	town		
Korolivka	Prut R.B.	village		
Lukavtsi	Siret R.B.	village		
Molnytsia	Prut R.B.	village		
Novyi Vovchynets	Siret R.B.	village		
Orshivtsi	Prut R.B.	village		
Panka	Siret R.B.	village		
Prutivka	Prut R.B.	village		
Revne	Prut R.B.	village		
Roztoky	Prut R.B. - Cheremosh	village		
Roztoky	Prut R.B. - Cheremosh	village		
Slobidka	Prut R.B. - Cheremosh	village		
Sloboda-Banyliv	Prut R.B.	village		
Sniatyn	Prut R.B.	town		
Tovmachyk	Prut R.B.	village		
Tulukiv	Prut R.B.	village		
Zapruttia	Prut R.B.	village		




SETTLEMENT	RIVER	TYPE	RISK	
Banyliv-Pidhirnyi	Siret R.B. - Maly Siret	village	 Low	
Budylyv	Prut R.B.	village		
Cheresh	Siret R.B. - Maly Siret	village		
Davydivka	Siret R.B. - Maly Siret	village		
Hlynytsia	Prut R.B.	village		
Illintsi	Prut R.B.	village		
Ispas	Prut R.B. - Cheremosh	village		
Khorotseve	Prut R.B. - Cheremosh	village		
Komarivtsi	Siret R.B.	village		
Kyidantsi	Prut R.B.	village		
Liubkivtsi	Prut R.B.	village		
Lunka	Prut R.B.	village		
Mahala	Prut R.B.	village		
Marynychi	Prut R.B. - Cheremosh	village		
Miliieve	Prut R.B. - Cheremosh	village		
Mlyhovo	Siret R.B.	village		
Oleshkiv	Prut R.B.	village		
Petrychanka	Siret R.B.	village		
Prypruttia	Prut R.B.	village		
Revakivtsi	Prut R.B.	village		
Shpetky	Prut R.B. - Cheremosh	village		
Sopiv	Prut R.B.	village		
Stara Zhadova	Siret R.B.	village		
Sucheveny	Siret R.B. - Maly Siret	village		
Tiudiv	Prut R.B. - Cheremosh	village		
Verkhni Verbizh	Prut R.B.	village		
Vovchikivtsi	Prut R.B.	village		
Vydyniv	Prut R.B.	village		
Zabolotiv	Prut R.B.	town		
Bancheny	Prut R.B.	village		 Insignificant
Biloberizka	Prut R.B. - Cheremosh	village		
Boiany	Prut R.B.	village		
Budenets	Siret R.B. - Maly Siret	village		
Burdei	Prut R.B.	village		
Chudei	Siret R.B. - Maly Siret	village		
Debeslavtsi	Prut R.B.	village		
Horbova	Prut R.B.	village		
Hrushiv	Prut R.B.	village		
Kobaky	Prut R.B. - Cheremosh	village		
Korytne	Prut R.B. - Cheremosh	village		
Kupka	Siret R.B. - Maly Siret	village		
Lekechi	Siret R.B.	village		
Mizhbrody	Prut R.B. - Cheremosh	village		
Myshyn	Prut R.B.	village		
Nyzhni Petrivtsi	Siret R.B. - Maly Siret	village		
Orelets	Prut R.B.	village		
Ostrytsia	Prut R.B.	village		
Ostrytsia	Prut R.B.	village		
Pechenizhyn	Prut R.B.	town		
Petrashi	Prut R.B. - Cheremosh	village		
Pidzakharychi	Prut R.B. - Cheremosh	village		
Rakivchyk	Prut R.B.	village		
Rudnyky	Rybnycya	village		
Rybne	Prut R.B. - Cheremosh	village		
Staryi Vovchynets	Siret R.B.	village		
Troitsia	Prut R.B.	village		
Tsuren	Prut R.B.	village		
Tulova	Prut R.B.	village		
Usteriky	Prut R.B. - Cheremosh	village		
Ust-Putyla	Prut R.B. - Cheremosh	village		
Velykyi Rozhyn	Prut R.B. - Cheremosh	village		
Verkhni Petrivtsi	Siret R.B. - Maly Siret	village		
Vovchynets	Siret R.B.	village		
Vyzhenka	Prut R.B. - Cheremosh	village		
Yizhivtsi	Siret R.B. - Maly Siret	village		
Zamostia	Prut R.B. - Cheremosh	village		
Zarichchia	Siret R.B.	village		
Zeleniv	Prut R.B.	village		

Romania (RO)

SETTLEMENT	RIVER	TYPE	RISK
Bosia	Prut	village	 High
Cilibiu	Prut	village	
Frăsuleni	Prut	village	
Golăiești	Prut	village	
Grădinari	Prut	village	
Icușeni	Prut	village	
Luceni	Prut	village	
Mânzătești	Prut	village	
Oprîșeni	Prut	village	
Podu Jijiei	Prut	village	
Rădăuți-Prut	Prut	village	
Ripiceni	Prut	village	
Scoposeni	Prut	village	
Sculeni	Prut	village	
Tuțora	Prut	village	
Ungheni	Prut	village	
Victoria	Prut	village	
Bălteni	Prut	village	 Medium
Baranca	Prut	village	
Coadă Stâncii	Prut	village	
Cotu lui Ivan	Prut	village	
Petrești	Prut	village	
Probotă	Prut	village	
Românești	Prut	village	
Sadoveni	Prut	village	
Șendreni	Prut	village	
Siret	Siret	town	
Trifești	Prut	village	
Zvoriștea	Siret	village	
Bădiuți	Prut	village	 Low
Bobulești	Prut	village	
Bogdănești	Prut	village	
Cârnăceni	Prut	village	
Cotu Morii	Prut	village	
Cristești	Prut	village	
Dancu	Prut	village	
Focșa	Prut	village	
Gorban	Prut	village	
Hermeziu	Prut	village	
Horia	Prut	village	
Larga-Jijia	Prut	village	
Medeleni	Prut	village	
Rediu	Prut	village	
Slobozia	Siret	village	
Stânca	Prut	village	
Ștefănești	Prut	town	
Tomești	Prut	village	
Albița	Prut	village	 Insignificant
Bădărăi	Prut	village	
Bălinești	Siret	village	
Berza	Prut	village	
Bivolari	Prut	village	
Borșa	Prut	village	
Brănești	Prut	village	
Broscoșești	Prut	village	
Budeni	Siret	village	
Bumbăta	Prut	village	
Cândești	Siret	village	

SETTLEMENT	RIVER	TYPE	RISK
Chiperești	Prut	village	 Insignificant
Condrea	Prut	village	
Costuleni	Prut	village	
Cotu Miculinți	Prut	village	
Crasnăleuca	Prut	village	
Cuzlău	Prut	village	
Darabani	Prut	town	
Dolhasca	Siret	town	
Drânceni	Prut	village	
Fălciu	Prut	village	
Fântânele	Siret	village	
Foltești	Prut	village	
Frumușița	Prut	village	
Grozești	Prut	village	
Gulia	Siret	village	
Gura Bohotin	Prut	village	
Hănțești	Siret	village	
Heci	Siret	village	
Horodiștea	Prut	village	
Iași	Prut	city	
Joldești	Siret	village	
Lespezi	Siret	village	
Liteni	Siret	town	
Liveni	Prut	village	
Loturi	Prut	village	
Lunca	Siret	village	
Lunca	Siret	village	
Lunca Veche	Prut	village	
Manoleasa	Prut	village	
Manoleasa-Prut	Prut	village	
Mihail Kogălniceanu	Prut	village	
Mitoc	Prut	village	
Oancea	Prut	village	
Oroftiana	Prut	village	
Oțetoaia	Prut	village	
Păun	Prut	village	
Prisăceni	Prut	village	
Rânzești	Prut	village	
Rediu Mitropoliei	Prut	village	
Rogojeni	Prut	village	
Rogojești	Siret	village	
Roșcani	Siret	village	
Satu Nou	Prut	village	
Șerbănești	Siret	village	
Slobozia Oancea	Prut	village	
Soloneț	Prut	village	
Tabăra	Prut	village	
Talpa	Siret	village	
Țigănași	Prut	village	
Țipilești	Prut	village	
Vădeni	Prut	village	
Vârful Câmpului	Siret	village	
Vășcăuți	Siret	village	
Vetrișoaia	Prut	village	
Vlădești	Prut	village	
Vladomira	Prut	village	
Zabolteni	Prut	village	
Zamostea	Siret	village	


Republic of Moldova (MD)

SETTLEMENT	RIVER	TYPE	RISK
Cotul Morii	Prut	village	 High
Criva	Prut	village	
Cuconeştii Vechi	Prut	village	
Drepcăuţi	Prut	village	
Semeni	Prut	village	
Zagarancea	Prut	village	
Bisericani	Prut	village	 Medium
Blindeşti	Prut	village	
Branişte	Prut	village	
Costuleni	Prut	village	
Măcăreşti	Prut	village	
Nemţeni	Prut	village	
Obileni	Prut	village	
Pogăneşti	Prut	village	
Pruteni	Prut	village	
Sărăteni	Prut	village	
Ţiganca	Prut	village	
Ungheni	Prut	town	
Văleni	Prut	village	
Avrămeni	Prut	village	
Badragii Noi	Prut	village	 Low
Badragii Vechi	Prut	village	
Balatina	Prut	village	
Călineşti	Prut	village	
Chetriş	Prut	village	
Cioara	Prut	village	
Dumeni	Prut	village	
Duruitoarea Nouă	Prut	village	
Goteşti	Prut	village	
Grimeşti	Prut	village	
Grozeşti	Prut	village	
Lipcani	Prut	town	
Medeleni	Prut	village	
Movileni	Prut	village	
Reteni	Prut	village	
Reteni-Vasileuţi	Prut	village	
Sărata-Răzeşi	Prut	village	
Sculeni	Prut	village	
Sirăuţi	Prut	village	
Vadul lui Isac	Prut	village	
Valea Mare	Prut	village	

Village - sat;

Town – oraş;

City - reşedinţă de judeţ, reşedinţă de raion etc.

SETTLEMENT	RIVER	TYPE	RISK
Antoneşti	Prut	village	 Insignificant
Barboieni	Prut	village	
Brînza	Prut	village	
Buzduganii de Jos	Prut	village	
Cahul	Prut	town	
Cisliţa-Prut	Prut	village	
Colibaşi	Prut	village	
Corpaci	Prut	village	
Crihana Veche	Prut	village	
Cuhneşti	Prut	village	
Cuzmenii Vechi	Prut	village	
Dancu	Prut	village	
Drujineni	Prut	village	
Duruitoarea	Prut	village	
Gherman	Prut	village	
Gioltosu	Prut	village	
Giurgiuleşti	Prut	village	
Hănăsenii Noi	Prut	village	
Hîncesti	Prut	village	
Horodişte	Prut	village	
Leca	Prut	village	
Leova	Prut	town	
Leuşeni	Prut	village	
Manta	Prut	village	
Moara Domnească	Prut	village	
Paşcani	Prut	village	
Pererita	Prut	village	
Slobozia Mare	Prut	village	
Taxobeni	Prut	village	
Teţcani	Prut	village	
Toceni	Prut	village	
Tochile-Răducani	Prut	village	
Unteni	Prut	village	
Varatic	Prut	village	
Viişoara	Prut	village	
Zberoaia	Prut	village	





The European Union is made up of 28 Member States who have decided to gradually link together their know-how, resources and destinies. Together, during a period of enlargement of 50 years, they have built a zone of stability, democracy and sustainable development whilst maintaining cultural diversity, tolerance and individual freedoms.

The European Union is committed to sharing its achievements and its values with countries and peoples beyond its borders.

The Joint Operational Programme Romania-Ukraine-Republic of Moldova 2007-2013 is financed by the European Union through the European Neighborhood and Partnership Instrument and co-financed by the participating countries in the programme.



<b>Lead Partner:</b>	<b>Ministry of Environment</b> Romania
<b>Partner 2:</b>	<b>Prut-Barlad Water Basin Administration</b> Romania
<b>Partner 3:</b>	<b>Siret Water Basin Administration</b> Romania
<b>Partner 4:</b>	<b>National Institute of Hydrology and Water Management</b> Romania
<b>Partner 5:</b>	<b>“Apele Moldovei” Agency</b> Republic of Moldova
<b>Partner 6:</b>	<b>Dnister-Prut Basin Department of water resources</b> Ukraine
<b>Partner 7:</b>	<b>Chernivtsi Regional Centre on Hydrometeorology</b> Ukraine
<b>Partner 8:</b>	<b>State Scientific and Technical Centre for inter-sectorial&amp;regional problems of the Environmental Safety and Resources Conservation “EcoResources”</b> Ukraine

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