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ANNUAL WORLD BANK CONFERENCE ON LAND AND POVERTY
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RESEARCH ON ACCESS AND USE OF GEOGRAPHIC INFORMATION IN MOLDOVA

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Abstract

Norwegian support to the land sector in Moldova has started in 2006, and since then, a number of projects have been successfully implemented delivering tangible results, bringing new technologies and establishing professional and technical capacity to ensure sustainability and efficient use of the delivered products and transferred knowledge. The main development goal of the Norwegian support to the land sector in Moldova is to achieve economic growth supported by a functioning land market.

The Norwegian Mapping Authority – NMA, and the Agency for Land Relations and Cadastre of Moldova – ALRC, have jointly implemented Norwegian funded projects aimed at supporting efficient, secure and transparent real estate registration and providing access to geospatial information throughout Moldova. The projects have provided crucial support for sustainable land management as well as for other matters in public and private sectors. Good co-operation between NMA and ALRC has been vital for successful completion of all projects.

During the last twelve years, NMA has assisted with production and delivery of geospatial information: Orthophoto, Digital Terrain Model and Base map to support the ongoing property privatization and registration program in Moldova, with up – to – date mapping data. The correct maps enhance the quality of registration and the quality of information to the public and professional users of land information, thus also reducing the possibility for errors, manipulation and corruption in land matters. Up – to – date maps needed for correct registration of previously registered properties and for a wide range of other usage, such as land use planning, land reform, improvements to infrastructure, environmental protection, etc. The assistance from Norway has significantly contributed to improvement of public services providing open access to geospatial data on the Internet.

Norway as a donor was concerned that the geospatial data produced with Norwegian funding were used and maintained effectively. After twelve years of successful co-operation, there was a desire to assess the achieved results. In a common understanding that the delivered geospatial data is crucial for the country, NMA and ALRC have designed and executed a research on the access and use of the geospatial information funded by Norway, in public and private sectors of Moldova.

The main objective of the study was to investigate with a selected number and types of potential users of the geospatial information in different regions of Moldova whether they were aware of the available data and whether they have been using the data. This paper describes the findings of the study with emphases on the measures to improve the use of available geodata by a wider range of users in Moldova, as well as to indicate the target areas for potential support from Norway and other donors.

Key Words: geodata, geospatial information, spatial data, development cooperation



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1. Norwegian support to Land Sector in Moldova

The Republic of Moldova, formerly a part of the USSR gained its independence in August 1991. The country's territory is ca. 34000 sq.km and 62% is agricultural lands. In 1997 – 2006, Moldova made a good progress with land privatization process during the First Cadastre Project with support from the World Bank and other donors.

Norwegian support to the land sector in Moldova has started in 2006, and since then, a number of projects have been successfully implemented delivering tangible results, bringing new technologies and establishing professional and technical capacity to ensure sustainability and efficient use of the delivered products and transferred knowledge. The main development goal of the Norwegian support to the land sector in Moldova is to achieve economic growth supported by a functioning land market.

Norway is a donor – country that allocates annually more than 1% of gross national income to the official development assistance – ODA, mainly through the Norwegian Ministry of Foreign Affairs. Following political priorities, the Ministry establishes assistance programs for respective geospatial or thematic areas. One of the programs that supports democratic development in the Eurasian region, provides grants to ODA – eligible OSCE¹ countries including Moldova.

The grant scheme assumes the presence of an implementation agency from Norway and a cooperating partner in Moldova. The Norwegian Mapping Authority – NMA, and the Agency for Land Relations and Cadastre of Moldova – ALRC, have jointly implemented Norwegian funded projects aimed at supporting efficient, secure and transparent real estate registration and providing access to geospatial information throughout Moldova. The projects have provided crucial support for sustainable land management as well as for other matters in public and private sectors. Good cooperation between NMA and ALRC has been vital for successful completion of all projects.

During the last twelve years, NMA has assisted with production and delivery of geospatial information: Orthophoto, Digital Terrain Model and Base map to support the ongoing property privatization and registration program in Moldova, with up – to – date mapping data. The correct maps enhance the quality of registration and the quality of information to the public and professional users of land information, thus also reducing the possibility for errors, manipulation and corruption in land matters. Up – to – date maps needed for correct registration of previously registered properties and for a wide range of other usage, such as land use planning, land reform, improvements to infrastructure, environmental protection, etc. The assistance from Norway has significantly contributed to improvement of public services providing open access to geospatial data on the Internet.

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¹ Organization for Security and Co-operation in Europe www.osce.org



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for the country, NMA and ALRC have designed and executed a research on access and use of the geospatial information funded by Norway in public and private sectors of Moldova.

2. Research on access and use of the geospatial information in Moldova

The main objective of the study was to investigate with a selected number and types of users of the geospatial information in different regions of Moldova whether they were aware of the available data and whether they have been using the data.

In 2017, in Moldova, there was no formal framework for sharing geographic information between public institutions. However, data sharing is somewhat established between several organizations, with ALRC in the lead as the custodian of several fundamental datasets provided with support from Norway, such as orthophotos, administrative boundaries, elevation data, etc. ALRC also provides this data including base maps in different scales, through web-based services, which are extensible and could be used by other agencies.

To display the data of public entities, the ALRC has established a provisional geoportal *geoportalinds.gov.md* based on an open – source solution *GeoNetwork*. This metadata portal will be functional until a permanent geoportal is set up within the framework of a Norwegian funded project.

2.1 Users of geospatial data in Moldova

Although there is no established national policy or standards on production, use and maintenance of geospatial information in Moldova, the up – to – date geospatial data, such as aerial imagery, orthophotos, digital terrain model, topographic and thematic maps are publicly available on the Internet. ALRC run and maintain web-portals *Moldova – map.md*, *geoportalinds.gov.md* and *geoportal.md*.

The key data user of geographic information in Moldova is undoubtedly ALRC. A list of other interested Moldavian public and private parties, which benefit greatly from having access to the geographic information as orthophotos, digital terrain model and base maps includes central and local public authorities, private sector, academia research institutions, non – commercial organisations and public in general.

Table 1 presents main users of geospatial information in Moldova.

Table 1: Main users of geospatial information in Moldova

#	Users	Responsibilities	Web resources
	Public sector – Governmental and central public agencies (status in March 2017)		
1.	Agency for Land Relations and Cadastre and their subordinate institutes	<ul style="list-style-type: none"> – Reference Systems – Aerial imagery – Orthophoto – Base map 	<ul style="list-style-type: none"> arfc.gov.md moldova-map.md geoportal.md citymap.md ipot.md



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		<ul style="list-style-type: none"> – Geographical Names – Administrative Units – Addresses – Cadastre map – Transport Networks – Hydrography – Protected Sites – Soil 	geoportalinds.gov.md
2.	E-Government Centre	<ul style="list-style-type: none"> – Information and public services for authorities to ensure transparent governance 	egov.md data.gov.md servicii.gov.md
3.	Ministry of the Environment	<ul style="list-style-type: none"> – Environmental protection and rational use of natural resources – Biodiversity conservation – Geological resources – Hydrological resources – Water resources – Water supply and sanitation – Regulation of nuclear and radiological state ecological control – Hydrometeorology 	gis.mediu.gov.md
4.	Ministry of Transport and Road Infrastructure	<ul style="list-style-type: none"> – Transport and road infrastructure 	mtid.gov.md
5.	Ministry of Regional Development and Construction	<ul style="list-style-type: none"> – Land use planning – Architecture, – Construction design and planning – Production of construction materials and housing 	mdrc.gov.md
6.	Ministry of Culture	<ul style="list-style-type: none"> – Management and protection of national and World Heritage sites 	mc.gov.md
7.	State Agency “Moldsilva”	<ul style="list-style-type: none"> – Forestry and hunting – Rural development – Rural employment – Sustainable forestry development 	moldsilva.gov.md



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		<ul style="list-style-type: none"> – Forest and wildlife protection – Maintenance and conservation of biodiversity 	
8.	State Agency for Energy Efficiency	– Energy resources	ae.md
9.	Ministry of Agriculture and Food Industry and Agriculture Information Centre	– E – Agriculture	cia.md
10.	Agency for Emergency Response	– Emergency response	dse.md
11.	National Bureau of Statistics	– National statistics	statistica.md
12.	State Hydrometeorological Service	– Hydrometeorology and weather forecast	meteo.md
13.	Agency of Geology and Mineral Resources	– Geology and mineral resources	mediu.gov.md
14.	Ministry of Tourism	– Tourism	turism.gov.md
15.	Agency of Water resources “Apele Moldovei”	– Water resources	apelemoldovei.gov.md
Public sector – Local public authorities (status in March 2017)			
#	Users	Responsibilities	Comments
16.	Local public authorities in <ul style="list-style-type: none"> – 32 districts – 2 municipalities – 2 autonomous territorial units 	<ul style="list-style-type: none"> – Land use planning – Territory administration – Development plans – Property taxation – Addresses – Cadastre etc. 	ALRC provides free access to all available geodata
Private sector and non-commercial organizations			
#	Users	Responsibilities	Comments
17.	Local organization of chartered surveyors	<ul style="list-style-type: none"> – Geodetic surveying – Cadastral surveying – Research and development 	2 local organizations
18.	Private geodetic and surveying companies	<ul style="list-style-type: none"> – Geodetic and engineering surveying – Cadastral surveying 	150 companies
Academia, universities and research institutions (status in March 2017)			
19.	The Academy of Science	– Post – graduate studies and training	ALRC provides free access to all available geodata



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20.	The Academy of Public Administration	– Post – graduate studies and training	ALRC provides free access to all available geodata
21.	Centre of International Projects of the Academy of Science	– Managerial, technical, financial and legal assistance to members of Moldovan scientific community, including consulting activities, seminars, trainings and other activities	ALRC provides free access to all available geodata
22.	The State Technical University	– Geodesy, photogrammetry – GIS applications – Real Estate and Cadastre – CORS and positional services	ALRC provides free access to all available geodata
23.	The State Agrarian University	– GIS technology in agriculture	ALRC provides free access to all available geodata
24.	The State Institute of Chemistry of the Academy of Sciences (Laboratory of Ecological Chemistry)	– Natural zeolites in water protection	ALRC provides free access to all available geodata
25.	Institute of Pedology, Agrochemistry and Soil Protection	– GIS applications	ALRC provides free access to all available geodata

The situation with the use of geographic information by state authorities, public organizations at central level, ministries and academia is satisfactory. ALRC is a geo – data coordinator in Moldova responsible for implementation of the National Spatial Data Infrastructure. Twelve public authorities participate in the NSDI co – operation and geo – data exchange.

On the other hand, NMA encourage ALRC to promote a much broader and wider use of geospatial information by local public authorities for territory administration, land use planning etc.

For the study, NMA and ALRC selected 43 users – contacts at different levels of public administration as well as in private sector. The primary target group was 20 local public authorities – municipalities in cities and communes in villages in different parts of Moldova.

Table 2 shows a complete list of respondents to the questionnaire and interviews, which took place in spring 2017.



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Table 2: List of respondents

#	Respondents	Contact information
Governmental and central public agencies – 16 respondents		
1.	Ministry of the Environment and Agency of Water resources “Apele Moldovei”	5 Gheorghe Tudor street Chisinau agentia_am@apele.gov.md
2.	Ministry of Regional Development and Construction	9 Constantin Tanase street Chisinau sergiupopovici1986@gmail.com
3.	Ministry of Transport and Road Infrastructure	162 Stefan cel Mare Street Chisinau igor.tulbure@mtid.gov.md
4.	Ministry of Defence/Topographic Centre	3 Petrarilor str, Chisinau sergiu.chirilov@army.md
5.	Ministry of Information Technology and Communication	134 Blvd. Stefan cel Mare si Sfint Chisinau vitalie.boboc@mtic.gov.md
6.	Ministry of Agriculture and Food Industry	162 Stefan cel Mare street Chisinau vasile.nemtanu@maia.gov.md
7.	National Bureau of Statistic	206 Grenoble street Chisinau lilian.galer@statistica.md
8.	National Archaeological Agency	50 Mihai Eminescu street Chisinau sergiupopovici1986@gmail.com
9.	State Hydrometeorological Service	134 Grenoble street Chisinau cercetare@meteo.gov.md
10.	Agency for Geology and Mineral Resources	156 Mitropolit Dosoftei street Chisinau geofond@agrm.gov.md
11.	State Institute of Urban Design	9 C Tanase street Chisinau urban.proiect@urbanproiect.md
12.	Air Traffic Authority “MoldATSA”	80/4 Dacia street Chisinau nicolae.bolfosu@moldatsa.md
13.	State Agency “Moldsilva”	69 Calea Iesilor street Chisinau gcojocar@yandex.ru
14.	National Radio Frequency Centre	28/2 Drumul Viilor street Chisinau agavrasi@cnfr.md



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15.	State Enterprise Cadastru	47 Puskin street Chisinau ala.chetraru@isc.cadastre.md
16.	State Institute for Land Management	100 B Ialoveni street Chisinau cnicolaescu@ipot.md
Local authorities (municipalities – in cities and communes – in villages) – 20 respondents		
17.	Municipality of Chisinau	83 Stefan cel Mare street Chisinau cnagorneac@gmail.com
18.	Municipality of Florești	30 A Stefan cel Mare Street Florești dimagalusca@mail.ru
19.	Municipality of Taraclia	128 Lenin street Taraclia primaria_taraclia@mail.md
20.	Municipality of Criuleni	12 Biruintei bld. Criuleni iurii.rocofiiev@mail.ru
21.	Municipality of Cahul	6 Piața Independenței Cahul tatiromaniuc@yahoo.com
22.	Municipality of Leova	22 Unirii street Leova primaria@mtc-lv.md
23.	Municipality of Bălți	1 Independenței street Bălți adin83@bk.ru
24.	Municipality of Vulcănești	75 Lenin street Vulcănești viktor-p-74@mail.ru
25.	Municipality of Soroca	5 Stefan cel Mare street Soroca gtudos@mail.ru
26.	Municipality of Briceni	28 Independentei street Briceni siman.mli@mail.ru
27.	Municipality of Edinet	30 Octavian Cirimpoi street Edinet primariaedinet@gmail.com
28.	Municipality of Drochia	15 a Independentei street Drochia alina.stina@mail.ru



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29.	Commune of Chetrosu	13 Central street Chetrosu eugenia.zuza@mail.ru
30.	Municipality of Comrat	36 Tretiacova Comrat primaria.comrat@mail.ru
31.	Municipality of Cimișlia	14 Stefan cel Mare street Cimislia specialistfunciar@cimislia.md
32.	Municipality of Hincesti	132 Mihail Hincu street Hincesti primaria.hincesti@mail.ru
33.	Municipality of Orhei	160 Vasile Mahu Street Orhei primaria@orhei.md igor.cernei@orhei.md
34.	Commune of Mitoc	Village of Mitoc District of Orhei primariamitoc@gmail.com
35.	Municipality of Anenii Noi	6 Suvorov street Anenii Noi primar@anenii-noi.com
36.	Commune of Ciorescu	17 Alexandru cel Bun street Village of Ciorescu info@ciorescu.md
Academia, universities and research institutions – 4 respondents		
37.	Academy of Sciences	1 Academiei street Chisnau geomorphology@mail.ru
38.	State Technical University	41 Dacia bvd Chisinau vasile.chiriac@gcg.utm.md
39.	State Agrarian University	42 Mircesti street Chisinau o.potinga@uas.md
40.	Environmental College	70 Burevista street Chisinau stefanlu@mail.ru
Private sector and non-commercial organizations – 3 respondents		
41.	Geo Prim S.R.L	22 Puskin street Chisinau iacovlev@gmail.com



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42.	GIS Atlas S.R.L	15 Nicolae Milescu-Spataru street Chisinau monin1958@mail.ru
43.	Union of Surveyors, Geo-technicians and Cadastre Engineers	22 Puskin street Chisinau iacovlev.andrei@gmail.com

2.2 Data collection

The study commenced with the data collection through the questionnaires and interviews. The idea was to investigate if and how the selected contacts were informed about the availability of the geospatial data; about ways and terms of access to the data or any obstacles to accessing and using the data. The contacts, which have been using the data, were asked about the data format they have used; how data was delivered to the contacts; what the data actually have been used for; and whether the contacts were satisfied with the quality of the data.

The questionnaire ‘How does your organization use geospatial information?’ consisted of five thematic parts with questions related to each of the parts.

Table 3: Overview of the questionnaire on use of geospatial information

Part 1	Availability of geospatial data	<ul style="list-style-type: none"> – Are you informed about the availability of geospatial information? – How are you informed about the availability of geospatial data – Are you well informed about the ways and terms of access to the geospatial data? – If there are any obstacles to accessing and using geospatial data, please identify – In what format have you used the geospatial data (digital or on paper) – Is your organization satisfied with the quality of the data?
Part 2	Geospatial data formats	<ul style="list-style-type: none"> – Do you use aerial imagery, orthophoto, digital terrain model, digital maps? – What formats is the data stored? – How often do you use the data? – What database platform is in use?
Part 3	Geospatial data use	<ul style="list-style-type: none"> – Who are the main providers of your geospatial data? – In case you received data in digital form, what kind of local GIS system does your organization have? – What are conditions of access to geospatial data – Pricing



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Part 4	Technology	<ul style="list-style-type: none"> - What is the primary hardware platform for geospatial data and technology? - What would you like to see improved in the technology area? - Who is responsible for the geospatial data, IT infrastructure and services in your organization? - Do you have geospatial data infrastructure in your organization?
Part 5	People	<ul style="list-style-type: none"> - How many geospatial information specialists work in your organization? - Is the number of geospatial information specialists sufficient to meet your organization's needs? - Are the available skills for geospatial information management in your organization sufficient to meet your organization's needs? - How would you rate the level of staff turnover for geospatial specialists in your organization?

2.3 The questionnaire responses

Based on the responses to Part 1 of the questionnaire, 95% of the contacts, or 41 of 43 respondents, knew about the availability of the geospatial data. Multiple choice was possible:

- 19 respondents used searchable online catalogues to access the data;
- 28 respondents downloaded the data from Internet or via web-services
- 10 respondents ordered online and received the data by e-mails;
- 15 respondents ordered the data by sending letters on paper.

83% of the respondents, or 34 of 41, were aware of the ways and terms of access to the data. Thirty of them had access to the data free of charge, and four users had subscription agreements with ALRC. In addition, two respondents used the data from creative commons sources.

33% of the contacts, or 14 of 43 respondents, indicated the obstacles in accessing the data, such as lack of specific GIS software, lack of technical and professional capacity etc.

16 respondents uses data in both digital form and on paper, while 27 respondents uses only digital data. 38 respondents or 88% were satisfied with the quality of the data.

The responses to Part 2 of the Questionnaire indicated that the most popular and regularly used data was:

- Digital terrain model (DTM) and elevation – 26 of 41 respondents used the elevation data;
- Aerial imagery and orthophoto – 25 of 41 respondents used aerial imagery and orthophoto.



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10 respondents or 24% used digital maps; however, 86 % of those reported that they used the data regularly. The same result – for use of DTM and elevation data, while aerial imagery and orthophoto data was frequently used by 90% of the respondents.

It was sensational to find out that only few of the respondents used databases for their spatial data. The majority – 80% of the respondents used file systems for storage and data management. Only three respondents used ArcGIS application, three respondents used QGIS software and two respondents used MapInfo.

In Part 3 of the questionnaire, 78% of the respondents indicated ALRC as a main provider of geospatial data; 76% indicated State Enterprise CADASTRU, which in 2017 was a part of ALRC, responsible for cadastre and property registration. 20 % of the respondents indicated INGEOCAD, which is a geodetic institute and a subordinate part of ALRC. Two respondents respectively used either their own data or the data provided by other data provides.

In Part 4 related to technology, the respondents answered that 29 of them used desktops, 28 – had servers, 8 respondent used mobile applications and two – used web-cloud.

It has become evident that only eight respondents had their IT departments responsible for geospatial data maintenance and management; and only five users had infrastructure dedicated to geospatial data.

Part 5 related to human resources, showed that only 51% of the respondent had a sufficient number of specialist qualified to work with spatial data; 42% were partly satisfied and 7% were not satisfied. However, only 23% of the respondents considered that their staff working with geospatial data had professional skills sufficient to meet their company's needs. 70% were partly satisfied, while the rest – 7% were not sure.

2.4 Interview findings

During spring 2017, the interviews with respondents from 20 local public authorities took place either in person or by telephone. The respondents were asked to describe their needs in geospatial data, how satisfied they were and what obstacles they experienced.

The respondents, who did not know, were informed that ARLC provides geographic data to public authorities at all levels free of charge, particularly the data delivered to Moldova in the Norwegian funded projects:

- Orthophoto 2007, 2011 and 2016 available on moldova-map.md
- DTM 2017 and 2016

In addition, ALRC deliver:

- Administrative boundaries;
- Addresses;
- Cadastre map with property boundaries;
- Topographic map in scale 1:50000



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- National base map in scale 1:5000

The respondents indicated main obstacles to start using geospatial data as follows:

- Lack of knowledge on what data were available, where and how one could access them;
- Lack of human resources, especially in smaller communes;
- Lack of technical capacity – hardware and appropriate software;

Public authorities at central and local level hold a large amount of geospatial information, which they do not share with each other. There is definitely a lack of awareness among local public authorities on what data is available.

ARLC as a geodata coordinator has to take real action to improve the situation and to promote use of geospatial data by local public authorities for good land management, land use planning, public works and cadaster.

Lack of professional human resources is a serious challenge in Moldova in general, and in smaller communes in particular. Professional capacity could be enhanced by providing basic training on use of maps.

Lack of technical capacity could be addressed temporarily by delivering orthophotos and maps as paper copies to communes where no computers are available at all.

Involving local public authorities into use of geospatial data is essential for informed decision – making. Geospatial data together with a national population data are also critical for monitoring the Sustainable Development Goals' achievement at all levels.

3. Conclusions and way forward

The study and interview results were somewhat expected, but yet sensational. While the situation with use of geographic information is satisfactory at the central level, the local public authorities lack proper capacities to access and efficiently use the data.

NMA and ALRC decided to address the issue and jointly with the Congress of Local Authorities of Moldova, to run an information campaign particularly targeting local public authorities. In addition, in 2019, NMA and ALRC will undertake a pilot capacity – building project in two selected public authorities – municipality of Orhei and Mitoc commune.

NMA has also applied for funding of a new project, which will focus *inter alia* on the measures to ensure constant and stable access to and efficient use of geographic information by various groups of users on the Internet, on paper and/or electronic copies.

Technical solution for mapping data distribution at ALRC was established in 2011. In the new project, a substantial improvement and upgrade to both storage and distribution capacities at ALRC is envisaged. It is also planned necessary improvements to orthophoto geoportal and the development of a national NSDI portal.



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The project will pay particular attention to building up capacity at local administrations on use of maps for different purposes. Jointly with the Congress of local authorities of Moldova, NMA will provide technical and professional support to a number of local municipalities to enable efficient use of maps. Taking into account that, at the largest, local municipalities in Moldova do not have access or trained staff to use special mapping software, NMA and ALRC will produce and distribute maps to local municipalities on hard or electronic copies.

As the previous projects supported by Norway, the new project will substantially help ALRC to fulfil their mandate as the Moldavian national mapping authority and geodata coordinator, both domestically and in exchanging data with neighboring countries for flood prevention and other cross border issues, which is the aim of the EU Inspire directive.