NATIONAL SPATIAL DATA INFRASTRUCTURE IN REPUBLIC OF MOLDOVA

Ivan DANII, Agency for Land Relations and Cadastre of Republic of Moldova
Viorica MOCREAC, State Agrarian University of Moldova
Maria OVDII, Agency for Land Relations and Cadastre of Republic of Moldova
Pavel IVANCENCO, Agency for Land Relations and Cadastre of Republic of Moldova
Dumitru COTOVICI, Agency for Land Relations and Cadastre of Republic of Moldova

***Abstract**: This article introduces the results of investigation and implementation of a National Spatial Data Infrastructure at the central and local levels. Adjusted spatial data, metadata and services created in accordance with ISO/TC211 standard. Creation of an NSDI Geoportal at the national level, and publication of the metadata catalogue for spatial data sets and network services.*

***Keywords:** Spatial data, Public entity, NSDI Geoportal, Metadata, Network services, Standards*

1. Introduction

To implement a National Spatial Data Infrastructure in Republic of Moldova, the Agency for Land Relations and Cadastre benefited from the assistance of European Union by means of a Twinning project implemented during the years 2014-2016.

Altogether, twelve state institutions and two local public administration bodies of 1st and 2nd level from Orhei district were involved in the establishment of the National Spatial Data Infrastructure. The pilot project carried out in Orhei town and Mitoc village aimed to join together the spatial data held by 1st and 2nd level local authorities with the spatial data held by central public authorities.

2. Material and method

Within the framework of this study, the spatial data of various central and local public authorities have been researched with a view to identify their accuracy and compliance with ISO/TC211 standards, as well as responsibility of spatial data holders. Additionally, research, statistical and analytical methods have been used.

3. Results and discussions

In order to establish a National Spatial Data Infrastructure at the country level, it is necessary to ensure the accomplishment of the following 8 components.

1. Legal framework. The Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) has been studied and transposed at the national level by means of a Law on National Spatial Data Infrastructure, as well as a Strategy for developing the National Spatial Data Infrastructure during the years 2016-2026.

The draft Law on National Spatial Data Infrastructure sets the duties of NSDI Coordinating authority, the role of public entities responsible for spatial data and subjects.

The Strategy is accompanied by a Plan for implementation and development of National Spatial Data Infrastructure for the years 2016-2016.

2. Spatial data. Similar data as foreseen by the Directive, which are part of the draft Law on National Spatial Data Infrastructure, were taken and investigated with a view to determine their accuracy and compliance with ISO/TC211 standards, as well as the public entity responsible for their creation.

As a result of spatial data examination, it was detected that the majority of them are on hardcopy, and those which are in digital form lack metadata and have been created in different standards.

3. Standards. The set of standards from ISO/TC211 series has been studied, it incorporates a lot of standards for spatial data, metadata, network services, geoportal and others.

Basing on this standard, a Profile for spatial data specifications has been created, the usage of which will enable the interoperability of spatial data from different public entities.

4. Metadata. They stand for the description of spatial data – when they were created, last amended or completed, resolution, and the public entity responsible for spatial data, etc.

To create metadate, a National Metadata Profile was approved for spatial data sets and network services. At the same time, a guideline to fill in metadata profiles was produced.

5. Collaboration. The fulfilment of objectives set for the pilot area was possible only owing to the collaboration with institutions from various levels. For this purpose, the Coordinating authority concluded a Collaboration Agreement with different institutions, and namely:

- **Agency for Land Relations and Cadastre (hereinafter referred to as ALRC):**
    - State Enterprise "Institute for Geodesy, Technical Surveys and Cadastre" (hereinafter referred to as S.E. "INGEOCAD")
    - State Enterprise "Cadastru"
    - State Enterprise "Planning Institute of Land Management" (hereinafter referred to as "IPOT")
- **Ministry of Transport and Roads Infrastructure:**
    - State Enterprise "State Roads Administration"
- **Ministry of Environment:**
    - Agency Moldsilva, Institute for Forestry Research and Planning;
    - Agency "Apele Moldovei"
- **Academy of Sciences:**
    - Institute for Ecology and Geography
- **Ministry of Economy:**
    - Agency for Energy Efficiency
- **National Bureau of Statistics**
- **Ministry of Domestic Affairs:**
    - Service for Civil Protection and Emergency Situations
- **Orhei City Hall**
- **Mitoc Village Hall**

The schedule for task implementation for pilot zone can be seen in table 1.

Table 1 - Schedule for task implementation for pilot zone

No. order	Description	Deadline for implementation	Responsible organization												
			ALRC (Coordinating authority)	S.E. "Cadastru"	S.E. "IPOT"	S.E. „INGEOCAD"	**Ministry of Transport and Road Infrastructure,** State Roads Administration	**Ministry of Environment,** Agency Moldsilva	**Ministry of Economy**, Agency for Energy Efficiency*	**National Bureau of Statistics**	**Ministry of Environment**, Agency „Apele Moldovei" (AAM)	**Ministry of Environment**, Academy of Sciences, Institute for Ecology and Geography	**Ministry of Domestic Affairs**, Service for Civil Protection and Emergency Situations	**Orhei Town Hall**	**Mitoc village hall**
1	Development of the NSDI geoportal.														
	Catalogue	1 June 2016	√												
	Portal	1 September 2016	√												
2	Establishment of the NSDI unit within the Coordinating authority (informal)	1 December 2015	√												
3	Proposal of the metadata profile prepared by the Coordinating authority	1 April 2016	√												
4	Metadata profile agreed by the Parties	1 May 2016	√	√	√	√	√	√	√	√	√	√	√	√	√
5	Metadata tool prepared by the Coordinating authority	31 August 2016	√												
6	View services developed for minimum agreed data sets listed in Article 5 by Parties	1 March 2016	√	√	√	√	√	√	√	√	√	√	√	√	√
7	Development of download services – if possible (if possible)	1 August 2016	√	√	√	√	√	√	√	√	√	√	√	√	√
8	Metadata developed by Parties for datasets and network services	1 June 2016	√	√	√	√	√	√	√	√	√	√	√	√	√
9	Metadata for datasets and network services published on the NSDI Geoportal by Parties	1 September 2016	√												
10	Development of draft business model by Parties	1 August 2016	√	√	√	√	√	√	√	√	√	√	√	√	√
11	Public presentation of Spatial Data Infrastructure for Orhei pilot area	September 2016	√												

6. Competences. The coordinating authority together with Twinning project experts have trained the public entities on:

- INSPIRE and National Spatial Data Infrastructure;
- Standards and metadata;
- Geoportal;
- Network services;
- Legislation;
- Business model and agreements;
- Cooperation;
- Training of trainers (coordinating role);
- Data harmonisation;
- Production of data specifications.

7. Geoportal. It is a portal which includes the metadata catalogue, containing metadata created by the public entities to describe their data and services.

To display the results of public entities, the Coordinating authority, with the help of Swedish and Croatian experts, has established a provisional geoportal ,,geoportalinds.gov.md” based on open-source solution ,,GeoNetwork”, and this will be functional until a permanent geoportal is set up within the framework of a different project.

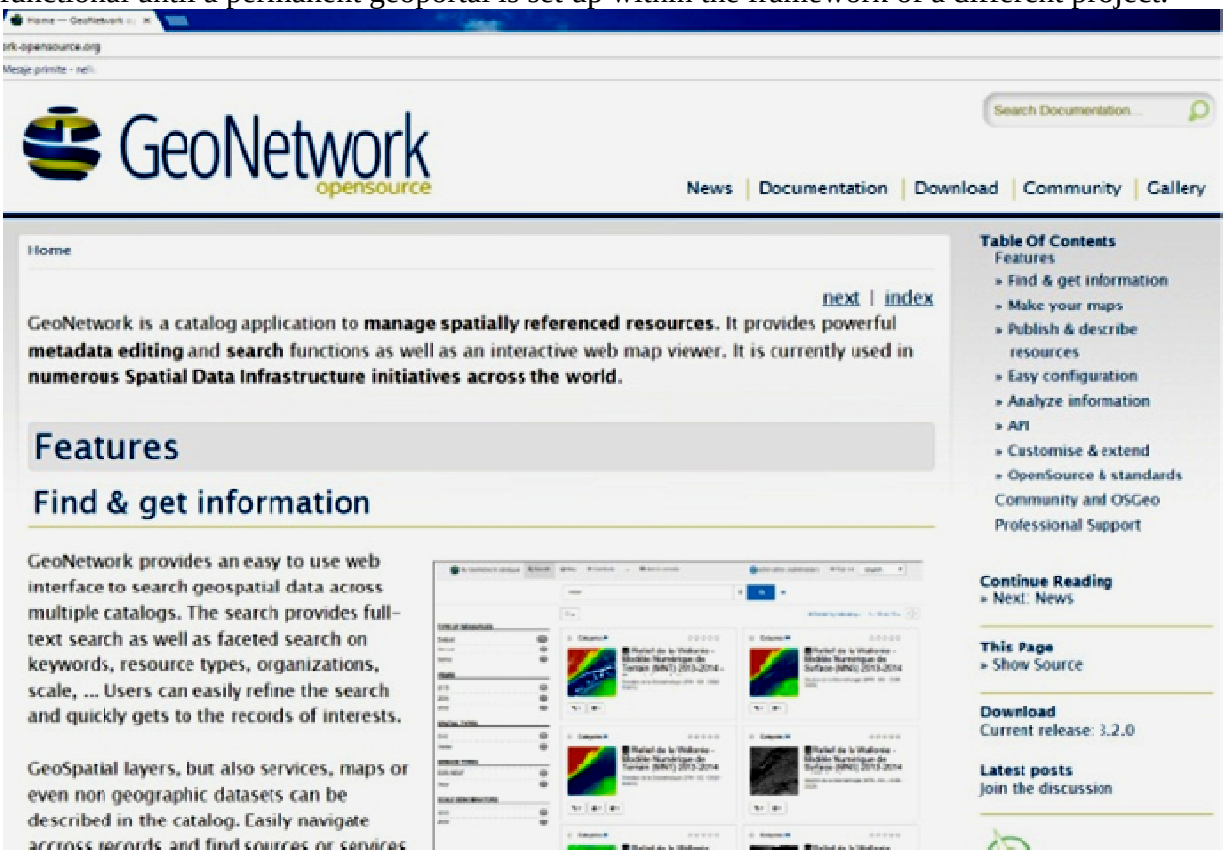

Fig. 1 GeoNetwork

The NSDI Geoportal was filled in with 33 metadata records for datasets and 13 metadata records for network services, all produced by public entities.

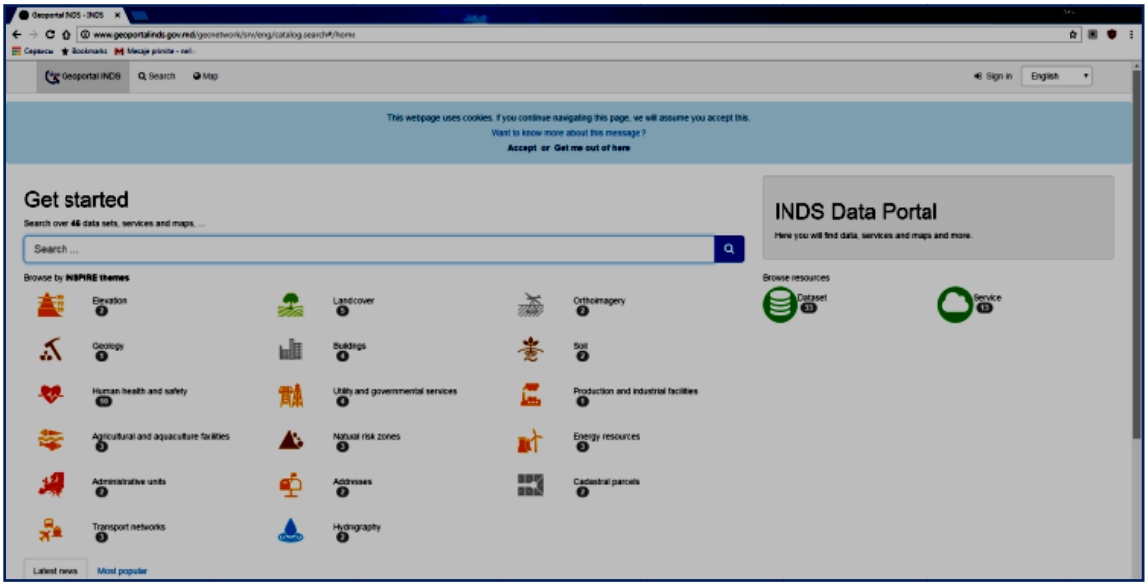

Fig. 2 NSDI Geoportal

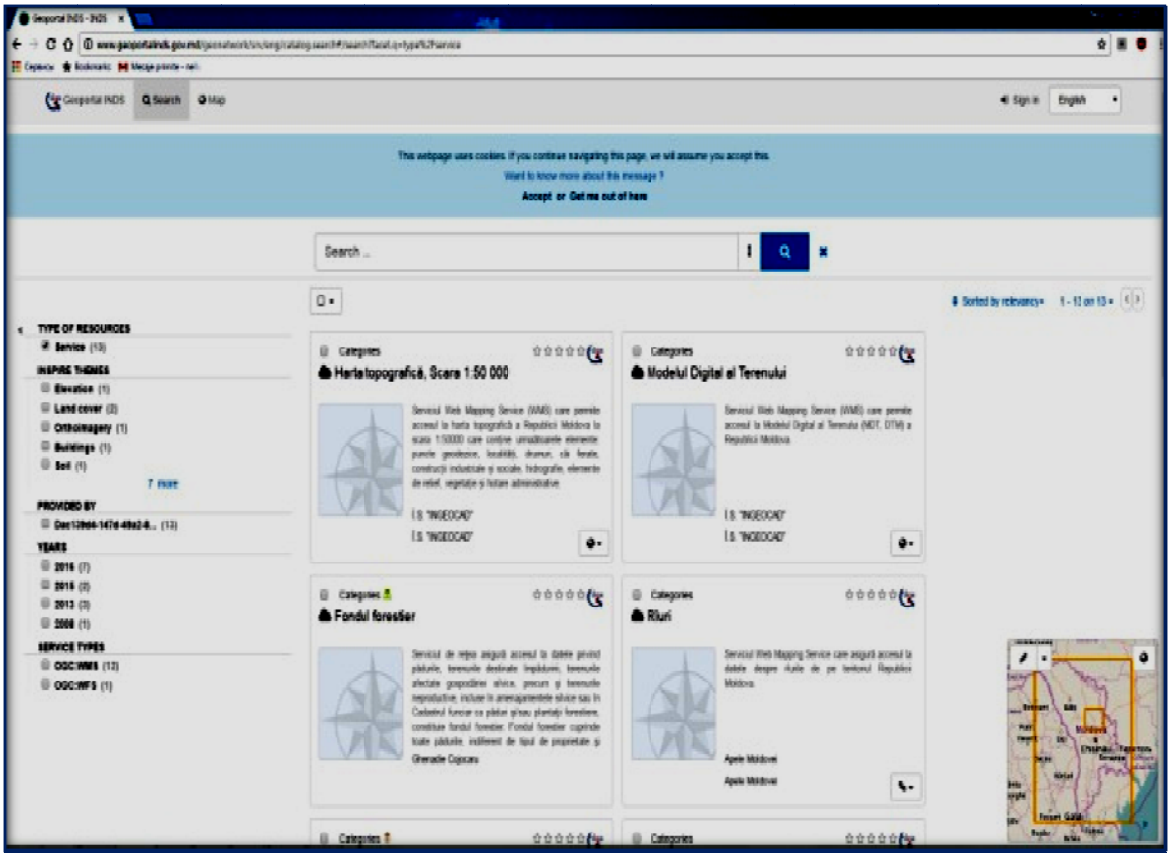

Fig. 3 Metadata for spatial data

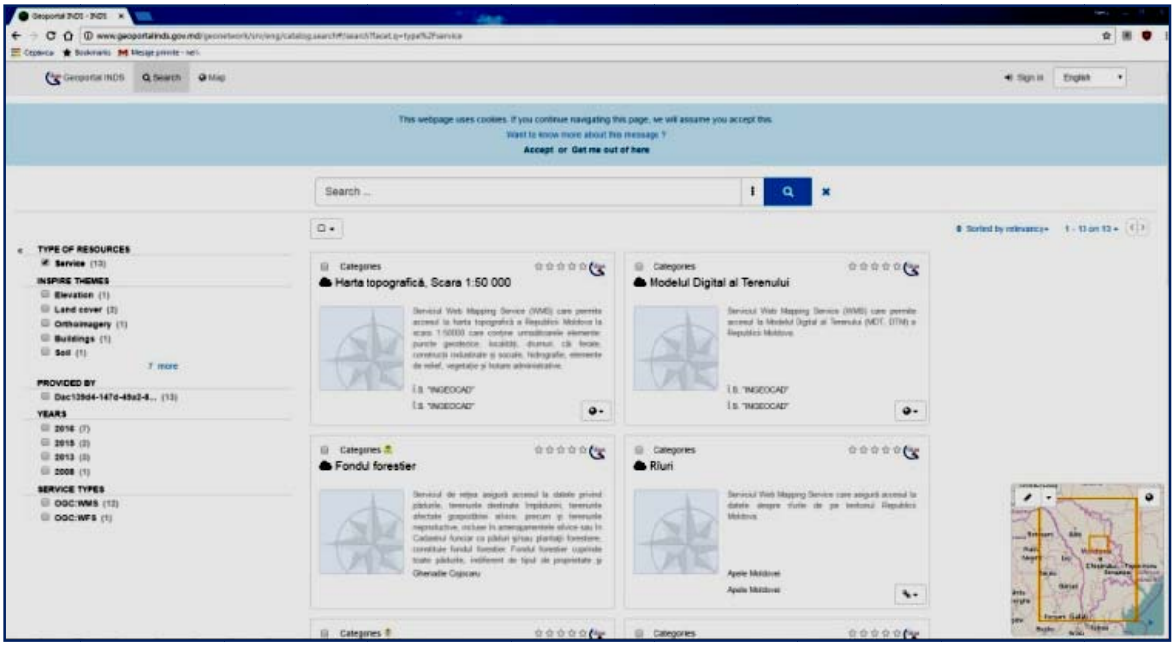

Fig. 4 Metadata for network services

NSDI geoportal makes it possible to view harmonised spatial data in a unique standard, which enables the interoperability of various datasets from different public entities, such as: dataset ,,Soils” of S.E. IPOT with datasets ,,Aerial orthophoto”, ,,Digital terrain model” and ,,Topographic map 1:50000” of S.E. INGEOCAD.

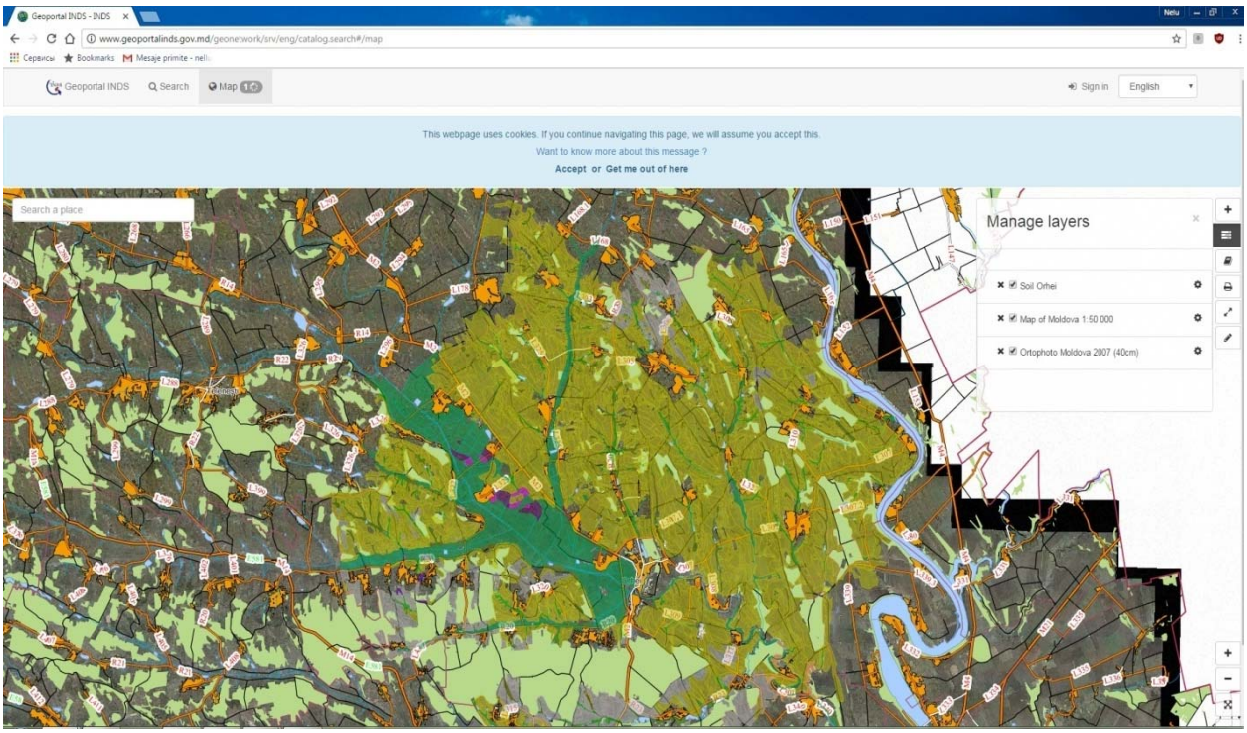

Fig. 5 Spatial data - interoperable via network services
Soils, Aerial orthophoto and Topographic map 1:50000

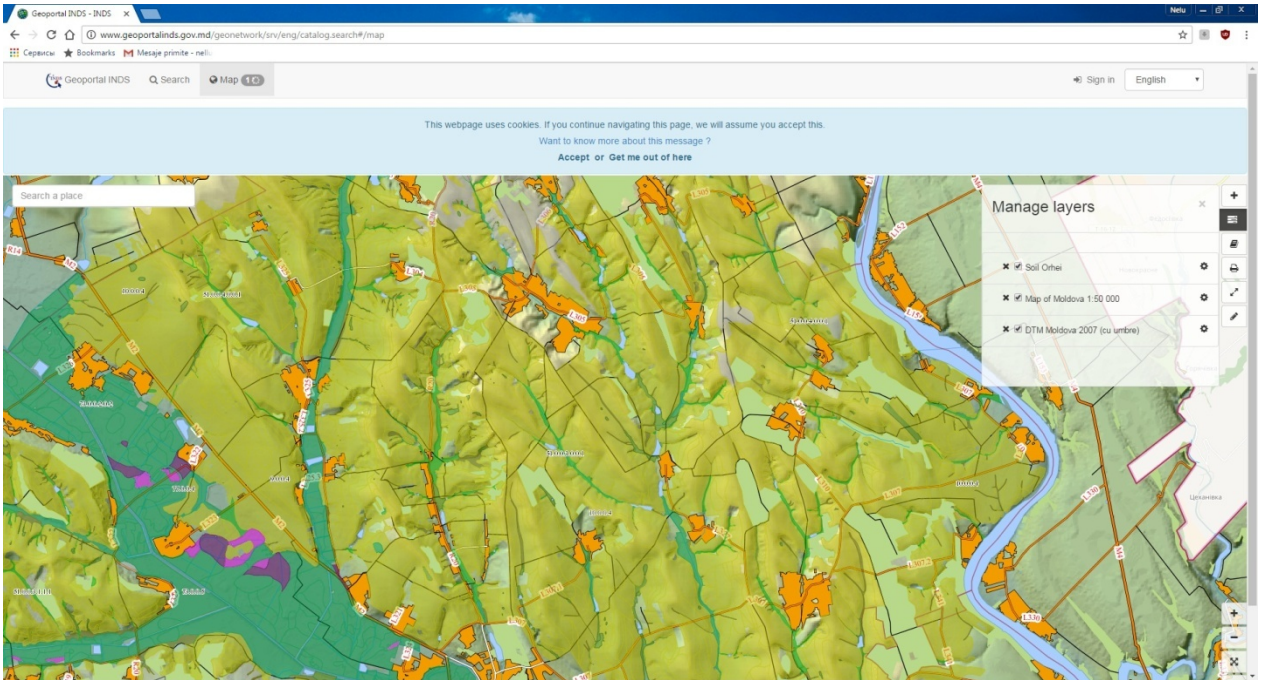

Fig. 6 Spatial data - interoperable via network services
Soils, Digital terrain model and ,Topographic map 1:50000

At the same time, the Coordinating authority has created a website ,,www.inds.gov.md" to promote and inform the public authorities and the general public about the ongoing of National Spatial Data Infrastructure implementation.

8. Network services. These services are: discovery/search, view, download and transformation. However, most public entities do not have network services. In the case of those authorities which had them, their services were not compliant with standards.

All network services were examined by the public institutions. The existing services were adjusted to comply with ISO/TC211 standard. The entities which lack services were provided with the possibility to use the "MCloud" platform of E-Government Centre free of charge.

Having this ,,MCloud" platform of E-Government Centre as a storage option, the virtual machine ,,GeoNode" was devised for network services.

At the same time, a user's manual for creation of network services was produced. This manual, plus the virtual machine ,,GeoNode", can be used free of charge by public entities.

4. Conclusions

Benefits of a National Spatial Data Infrastructure are:

- Spatial data are well described and available through a common metadata catalogue;
- On the internet there will be a portal of spatial data, where the data can be found and assessed;
- Spatial data are harmonized basing on common standards;
- Spatial data are accessible through standard Internet services;
- Spatial data are accessed directly from the source instead of copies stored locally (up-to-date and accurate);

- More spatial data are available for use.

Benefits for the society:

- A common understanding of location;
- Better and safer decisions about selection of spatial data;
- Increased cooperation and transparency in the use of spatial data;
- More efficient use of resources for creation of other spatial data;
- More efficient administration at lower costs for spatial data;
- Driving force for technical development;
- Benefits for citizens, authorities and public sector as regards the use of qualitative and accurate spatial data.

5. Bibliography

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