



Spatial Data Infrastructures in Hungary: State of play Spring 2005

Country report on SDI elaborated in
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Executive Summary

Building the information society was acknowledged as a priority by the Hungarian Government already in the early 1990's. The Co-ordination Office on Informatics at the Prime Minister's Office formulated and advocated Hungary's National Informatics Strategy. Under this strategy an Action Plan for the establishment of a National Spatial Data Infrastructure was formulated in 1996. This Action Plan was the basis for the Prime Minister's Office, several ministries, national institutions and the GIS Foundation HUNGIS to formulate in 1997 a National Spatial Data Strategy (NSDS). In 2002 the responsibilities with respect to the NSDS and NSDI have been transferred from the Prime Minister's Office to the Ministry of Informatics and Communication.

The key executive player in the elaboration of the NSDI is the Institute of Geodesy, Cartography and Remote Sensing (FÖMI). FÖMI is operating a website which aims at providing access to metadata, some geodatasets and some other spatial data services.

FÖMI is subordinate to the Ministry of Agriculture and Regional Development which is the main producer of GI in Hungary. Besides the FÖMI, the Ministry's institutional network includes 136 District and County Land Offices. The Hungarian Institute for Town and Regional Planning, which also belongs to the Ministry of Agriculture and Regional Development, is responsible for data related to regional development, an increasingly important area of policy in all the accession countries. Other key providers of spatial data are the Mapping Agency of the Home Defense Forces, the Central Statistical Office, and the Ministry of Environmental and Water Management.

Hungary has a national Association for Geo-Information, HUNAGI (www.hunagi.hu), which is a non-profit, interdisciplinary umbrella association.

All surveying, mapping and related activities in Hungary are governed by a single Act, i.e. Act LVXXI of 1996 on land surveying and mapping activities and GIS. **Some European Directives have been transposed in Hungarian Law: Directive 2001/29 on copyright in the information society and Directive 2002/58 on privacy and electronic communications.**

During last years both the hardware and software environment of the Hungarian permanent GPS network have considerably been developed. The network development (geometry, services) is focusing on the full coverage of the country with real-time services (GPSNET.HU).

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Abbreviations and acronyms

ABDS	Administrative Boundary Data Services
CT	Core Thematic Data
DAT	Digital Base Map Standard
DEM	Digital Terrain Model
DLM	Department of Land and Mapping
DP	Data Protection
DTA	Digital Topographic Base Map
EC	European Commission
EU	European Union
ESA	European Space Agency
EOMA	Uniform National Height System
EOVA	Uniform National Horizontal Network
EUROGI	European Umbrella organisation for geographical information
FIR	Further Investigation Required
FNT	Database of Geographical Names (Földrajzinév-tár)
FOI	Freedom of Information
FÖMI	Institute of Geodesy, Cartography and Remote Sensing
GEOX	Hungarian Private Company Ltd. Name
GI	Geographical Information
GINIE	Geographic Information Network in Europe
GIS	Geographical Information System
GMES	Global Monitoring for Environment and Security
GPS	Ground Positioning System
GSDI	Global Spatial Data Infrastructure
HAS	Hungarian Academy of Sciences
HCSO	Hungarian Central Statistical Office
HSO	Hungarian Statistical Office
HUNAGI	Hungarian Association for Geo-Information
ICCIS	Coordination Committee on Information Society
INSPIRE	INfrastructure for SPatial InfoRmation in Europe
MADOP	Hungarian Digital OrtoPhoto
MoARD	Ministry of Agriculture and Rural Development
MoEWM	Ministry of Environment and Water Management
MIT	Ministry of Informatics and Telecommunication
MKH	Hungarian Administrative Boundary Database
MoD	Ministry of Defense

NSDI	National Spatial Data Infrastructure
NSDS	National Spatial Data Strategy
OGPSH	National GPS Network
PMO	Prime Ministers Office
PPP	Public-Private Partnerships
PSI	Policy and legislation on access to public sector information
REF	Reference data
SABE	Seamless Administrative Boundaries of Europe
SDI	Spatial Data Infrastructures
SGO	Satellite Geodetic Observatory

1 GENERAL INFORMATION

1.1 Method

This report is summarizing the review of the SDI in Hungary, and reflects the degree to which the SDI situation in Hungary is similar to the ideas set out in the INSPIRE position papers¹ and in the more recent INSPIRE scoping papers.

The report is based on the analysis of various documents, project references and web sites readily accessible in English.

The 2003 version of the report has further been completed by the integration and consolidation of comments received from representatives of the NSDI initiatives. Those comments were provided either in written form or through interviews organized in the framework of Activity 2 of the State-of-Play project.

The updates to the 2003 report, as presented in this document, are based mainly on the presentation of Mr. Gábor Remetey-Fülöpp (MoARD) and Mr. Pál Bozó (MoEWM) during the workshop on INSPIRE for enlargement countries held in JRC in May 2004. **The update of 2005 is based on input from the Hungarian Authorities.**

1.2 The Hungarian GI-scene: NSDS and NSDI

In Hungary a National Spatial Data Strategy has been formulated to define the lines along which a nation-wide SDI, dominated by the public sector, is currently being elaborated. Several specific SDI-initiatives are being undertaken or have already been realised.

The National Spatial Data Strategy was formulated by a working group composed of representatives of the Prime Minister's Office, several ministries, national institutions and the GIS Foundation, HUNGIS. It involved the elaboration of the concept of the NSDS, a survey of the current situation both at national and international level, the specification of requirements, the elaboration of potential ways of development and of variants of strategy and the elaboration of detailed action plans. Six issues were addressed in detail:

- Macro-economic relationships;
- Legal issues related to mapping data and map-based information;
- Regulatory issues;
- Spatial data management issues;
- Quality-assurance and related standards;
- Marketing and PR issues.

¹ INSPIRE position papers, final versions: RDM, ETC, DPLI, ASF, IST, IAS (latest version).

Based on the implementation plan for the NSDS, the Hungarian SDI is becoming operational but will be further developed and will integrate more and more stakeholders from the national up to the local level.

The Hungarian SDI can be considered to consist of a series of building blocks including data and metadata initiatives, services and the like. The complete list of ongoing initiatives is listed in Section 3.1. Regional and local initiatives are integrated in and are part of the national initiative.

In addition, a myriad of GIS-projects (in various qualities) exist in Hungary which to a certain extent are integrated in the NSDI.

Key providers of GI in Hungary are the Ministry of Agriculture and Rural Development, the Ministry of Informatics and Communication, the Mapping Agency of the Ministry of Home Defence Forces, the Central Statistical Office and the Ministry of Environmental Protection and Water Management, the Hungarian State Geological Institute and the Eötvös Loránd Institute of Geophysics. Some supporting institutions behind certain ministries are owners or users of thematic reference data, e.g. the Environment Management Institute, the State Road Centre, the National Water Management Office and the Hungarian Office for Mining.

The driving forces for the development of the Hungarian SDI are related to Lands and Mapping, Location Based Services and Environment. A lot of effort has been devoted to intra-community and inter-community coordination and co-operation through the Inter-ministerial Coordination Committee on Information Society (ICCIS). This Committee has several subcommittees: Policy on InfSo Development, Strategic Planning, e-Government / Public Administration, EU integration, Public Net, e-Content, Information security and Satellite navigation.

In the course of 2003, regional planning moved to the Prime Minister's Office. The branches of Environment and Water management were merged under the roof of the Ministry of Environment and Water Management. **The Ministry of Environment and Water (MoEW) is playing an important role in the construction of the NSDI. Together with the MoARD, the MoEW is implementing the SDI components in the field of environment including applications and projects on agri-environmental issues, Natura 2000, disaster management, quality water management, etc. The MoEW developed a website to allow access to data of the MoEW.**

All the mentioned institutions are data-producers, transformers, and data users at the same time, being authorities, research institutes and entrepreneurs as well. In this field, there exist a lot of parallel activities and also competence-division. It can be stated that the organisational order of the players in the public sector is inadequate. All these make the data management, the development of a data market and the elaboration of adequate regulations very difficult.

Hungary has a national Association for Geo-Information, HUNAGI (www.hunagi.hu), which is a non-profit, interdisciplinary umbrella association. It was established in order to

achieve competitiveness of the Hungarian players in the rapidly growing European GI content market. It was founded in 1994 and registered by the court in 1996. It has full member status in EUROGI and has been acknowledged as an Advisory Board member by the steering committee of GSDI. Its 110 (2005) member institutions are providers of data, value added products and services; data brokers; academic institutions; governmental agencies and users in many disciplines and application areas.

The development of the Hungarian SDI has been and still is clearly driven / accelerated by the EU accession process.

2 DETAILS OF THE HUNGARIAN NSDI

2.1 General Information

(www.hunagi.hu),

Official address:

Overall contact person:

Gábor Remetey-Fülöpp

Ministry of Agriculture and Rural Development

Department of Lands and Mapping

H-1860 Budapest Pf.1.

H-1055 Budapest Kossuth Lajos tér 11.

2.2 Component 1: Legal framework and funding

2.2.1 Legal framework and organisational issues

Act LVXXI of 1996 on Surveying and Mapping and the related Ministerial decrees provide the core of the legal background of GIS-related issues. All official surveying, mapping and related activities are governed by this Act. The basic aim of the Act is to ensure that base maps covering the total area of the country are available, as to enable land registration, development of geographic information systems, and a wide range of applications on various economic, scientific and social subjects. The Act makes it compulsory to use the governmental base map data to create GIS.

The Joint Decree No 21/1997 “On execution of some rules defined by the Law LXXVI of 1996 on Activities in Surveying and Mapping” regulates the co-operation between the ministers responsible for surveying and mapping activities and the rules and conditions for the operation of a Map Supply Coordination Committee.

The Resolution No. 13 from 1997 of the Governmental Commission on Informatics and Telecommunications provides further steps toward the set up of an NSDI.

Another important law is the **Act CXLI (1997) on Real Estate Registration**. According to this law, municipalities, courts, notaries and lawyers are allowed to link to the TAKARNET wide area transmission network, operated by the Land Offices. TAKARNET is the extranet of the land registry, which is now operational.

The National Board of Technical Development and the Prime Minister’s Office (PMO) used to play a significant coordinating role with respect to the NSDI and projects contributing to it. Today, besides the Ministry of Informatics and Communication, the dominant driving ministry is the Ministry of Agriculture and Rural Development, which is the main provider of GI in Hungary. The Ministry is responsible and co-ordinates the

integrated land registration and cadastral mapping, land use and large-scale topographic mapping. Its institutional network includes 136 District and County Land Offices and the Institute of Geodesy, Cartography and Remote Sensing (FÖMI), a leading R&D institute in GI.

2.2.2 Public-private partnerships (PPP's)

Private commercial firms are indirectly involved in helping to implement the NSDS as subcontractor e.g. in the implementation of the National Cadastral Program in a competitive environment. For the surveying and mapping, there is a partnership supported by the Chamber of Engineers, the Hungarian Society of Surveying, Mapping and Remote Sensing, the HUNGIS Foundation, etc.

There are particular efforts to strengthen PPP under the EU-ESA-initiative on GMES through collaboration between HUNAGI-FÖMI-HSO-EUSC.

2.2.3 Policy and legislation on access to *and reuse of public sector information (PSI)*

The Constitution of Hungary states that “in the Republic of Hungary everyone has the right to know and to disseminate data of public interest”. This fundamental right was elaborated in the Act on the Protection of Personal Data and Accessibility of Public Data, which requires all government agencies at national or local level to facilitate access to information in their possession, and to make accessible data concerning their activities, data types held by them, and acts concerning their operation.

The 1992 Act is overseen by the Parliamentary Commissioner for Data Protection (DP) and Freedom of Information (FOI). Besides acting as an ombudsman for both data protection and freedom of information, the Commissioner's tasks include maintaining the Data Protection Register and providing opinions on DP and FOI-related draft legislation as well as all categories of official secrets.

Directive 2003/4 on access to environmental information and directive 2003/98 on re-use of PSI have not been transposed into national law yet.

2.2.4 Legal protection of GI by intellectual property rights

The most important rule of the Hungarian copyright-related legislation is the **Law LXXVI of 1999** on Copyright, which was modified during the past decade several times. **It explicitly protects photographs and maps and cartographic works.** In 2000, the decision was taken by the Government in the Law Approximation Program to revise the copyright and related laws in order to ensure the harmonization with the copyright directives of the European Union, and to meet the requirement needed for the Hungarian adoption of the Copyright Agreement in the institutional framework of the WIPO. **The sui generis right was included in the Copyright Act in 2001. Directive 2001/29 on copyright in the information society was also transposed into Hungarian law.**

2.2.5 Restricted access to GI further to the legal protection of privacy

Article 59 of the Hungarian Constitution protects the individual's right to the "good standing of his reputation" as well as the inviolability of his or her home, private affairs and personal data.

Furthermore, the protection of personal data is assured by Act LXIII of 1992 on protection of personal data and the disclosure of data of public interest. The purpose of this Act is to guarantee the right of everyone to exercise control over his or her personal data and to have access to data of public interest, except as otherwise provided by law under this Act. The Parliamentary Commissioner for Data Protection and Freedom of Information plays the same role concerning the protection of personal data as he does for the access to public sector documents.

Directive 2002/58 on privacy and electronic communications **has been transposed into national law.**

2.2.6 Licensing framework

No information has been found nor provided.

2.2.7 Funding model for SDI and pricing policy

Funding

Resources for the implementation of the NSDS come from both government budgets and cost recovery. Funding by the European Commission (PHARE, Tempus) is not negligible.

In addition to government funding, the NSDI is also funded by user fees.

Pricing

According to the Joint Decree No. 63/1999 FVM-HM-PM on handling, servicing of state-basic data of surveying and mapping; and the service fees the prices of the data for different users are the same in general. The earlier referred ministerial decree (Joint Decree No. 21/1997) identifies the exceptional cases.

2.3 Component 2: Reference data and core thematic data

2.3.1 Scale and resolution: European, National, Regional, Local, Other

Maps and spatial data are produced for the following major scale and resolution levels

Scale	Resolution	Prime data provider	
1:500	10 cm	Private Sector	AM/FM applications
1:1.000 (old 1:1.440 also used)	20 cm	DLM MOARD	Cadastre, Urban Planning, Local Governments
1:2.000 (old 1:2880 also used)	40 cm	DLM MOARD	Cadastre
1:4.000	80 cm	DLM MOARD	Multipurpose cadastre
1:10.000	2 m	DLM MOARD	CAP, multipurpose
1:50.000 and smaller	10 m and less	Mapping Service, MoD	Multipurpose

2.3.2 Reference data and core thematic data by resolution or scale range

Administrative boundary data

The Institute of Geodesy, Cartography and Remote Sensing initiated the compilation of the Hungarian Administrative Boundary Database (MKH) in 1998 for two reasons. Firstly, to find another application and new market to a part of data collected and owned by the Land Offices of the country, and secondly, to facilitate the integration process to the European Union. Data collection for the database has been finished in 1999. The database is commercially available.

The source of the database is the national cadastre containing directly measured co-ordinates of those boundary points, which represent in the same time administrative boundaries. The output products are geodatasets of different resolution derived from the source by means of generalisation.

The standard products and their characteristics are shown in the following table:

Resolution	Approximate scale	Precision of co-ordinates
1 m	1 : 5 000	1 m

2 m	1 : 10 000	1 m
5 m	1 : 25 000	1 m
10 m	1 : 50 000	1 m
20 m	1 : 100 000	10 m
50 m	1 : 250 000	10 m
70 m	1 : 350 000	10 m
100 m	1 : 500 000	10 m
200 m	1 : 1 000 000	100 m
500 m	1 : 2 500 000	100 m

To satisfy users' requirements some attributes, like statistical codes, area of units, elements of hydrography etc. were attached.

Cadastral

The whole area of Hungary is covered by analogue cadastral basic maps in scale 1:1.000, 1:2.000, 1:4.000 depending on data density. Approximately 40% of the rural area cadastral maps are in digital form as a consequence of the compensation act 10 years ago. However their formats are not regular, not homogenous. Some 0,5 Mha of Hungary is covered by digital cadastral maps produced in the frame of so called National Cadastre Program and with data content and format defined by a new Hungarian digital map standard MSz 7772-1:1997 harmonised with CEN and ISO GI standards. It is estimated that this will be 2,6 Mha in 2005 and that 100% coverage will be reached in 2007. Recently, an IT development of the Hungarian land offices has been finished providing their computerisation (called TAKAROS system) and connecting them with a nationwide intranet (called TAKARNET).

Topography

As basic data, the digital topographic map at scales of **1:10.000**, 1:50.000 and 1:100.000 is serviceable, together with the related digital terrain models and various datasets, obtained from the traditional data acquisition methods. Recently a Hungarian Topographic Program has been proposed to carry out modernisation of digital topographic datasets.

A non-exhaustive list of core thematic geodatasets includes:

- TeIR, a Territorial Information System covering the whole of Hungary (owner: VÁTI, a settlement planning institution);
- Budapest Base Map in 1:25.000 scale (owner: Topolisz Ltd.);
- Population Census Data of Hungary (owner: KSH, Central Statistical Office);
- Digital geological maps (Zala County Complex Database, Minor Plain Database, Paks Atomic Energy Plant Geological Database, Geology of Budapest, Uniform Geological Digital Database, River Danube Geological Database), (owner: MÁFI, a Hungarian State Geological institute);
- Soil Scientific Database of Hungary (owner: TAKI, a Soil research institute);

- Settlement Addresses Database (owner: Geogroup Infograph Ltd.);
- OTAB as a 1:200.000 scale digital geographical map database (owner: Geometria Ltd.);
- Budapest-4.000 database (owner: Infograph Ltd.);
- Budapest CD Atlas (owner: Cartographia Ltd.);
- HALIS database of the Budapest water supply (owner: Budapest Water Works Company);
- Database of the Optical Backbone Network of Hungary (owner: MATÁV);
- KIR and KÖFIR electric supply database (owner: Budapest Electric Works Company);
- TIGÁZ database on gas supply;
- Voting District Database (owner: the Gallup Institute);
- Environmental Protection Sample District of the Lake Balaton and the Hortobágy;
- Local Government Managing and Geoinformation systems for the settlement Zugló, Szombathely, Debrecen, Hajdúszoboszló, Nyíregyháza, Pilis, Orosháza, Szeged, Pécs;
- Budapest Green Area Cadaster.

The next table gives overview on reference and core thematic data.

Geographical location	Type	Inspire priority	European	National	Regional	Local	VERY SMALL
Geodetic reference system	REF	H		Geodetic reference system (FÖMI)			
Geographical names	REF	H		HCSO			
Geographical grid	CT	H		Altimetry DEM grid			
Administrative units							
Official administrative units	REF	H	Hungarian Administrative Boundary Database (MKH) from FOMI	Hungarian Administrative Boundary Database (MKH) from FOMI	Hungarian Administrative Boundary Database (MKH) from FOMI	Hungarian Administrative Boundary Database (MKH) from FOMI	Hungarian Administrative Boundary Database (MKH) from FOMI
Blocks and census districts	REF	M		TAKAROS (Hungarian Land Administration)			X
Properties, buildings and addresses							
Properties	REF	L		TAKAROS (Hungarian Land Administration)			X
Buildings	REF	L		TAKAROS (Hungarian Land Administration)			X
Addresses	REF	H		HCSO			
Elevation							
Elevation	REF	H		FÖMI, DEM grid, DEM vector			
Bathymetry	REF	H					
Coastline	REF	H					
Hydrography							
Hydrography, river, lake....	REF	H		FÖMI, layer of the topographic map in vector and grid format			
Land surface							
Ortho-images	REF	H		FÖMI			
Unclassified satellite images	CT	M		FÖMI			
Natural resource							
Water catchments	CT	H					
Groundwater bodies	CT	H					
Soil	CT	H					
Bedrock geology	CT	L					
Climatic regions/data	CT	L					
Bio-ecological regions	CT	M		Acquis National Programme		X	
Vegetation	CT	L		Acquis National		X	

				Programme			
Land Cover	CT	H		corine100, corine50		X (Forest)	
Transport							
Transport networks	REF	H		Hungarian Road database (KOSUT100)		X	
Transport facilities	REF	L		Hungarian Road database (KOSUT100)			
Facilities							
Location of facilities	CT	M		FOMI, layer of the topographic map (also, electricity, pipelines)			
Location of utilities	CT	M		FOMI, layer of the topographic map (also, electricity, pipelines)			
Land use regulation							
Protected areas	CT	H				X	
Land regulation/Land use plans	CT	H				X	
Demography							
Demographic attribute data	CT	H		HCSO	X		
2.3.2.1 DTA50							

2.3.3 Geodetic reference systems and projections

A reference system called Hungarian Datum 1972 (HD-72) was introduced in 1972 based on independent adjustment of Hungary's astrogeodetic network. Its reference ellipsoid is the IUGG Geodetic Reference System 1967 (GRS67: $a = 6378160\text{m}$, $b = 6356774.516\text{m}$, $f=1/298.247167$). The HD-72 is located and oriented relatively at the terrestrial point Szőlőhegy.

Based on HD-72, Hungary established the:

- Uniform National Horizontal System (in Hungarian called: EOVA);
- Uniform National Height System (in Hungarian called: EOMA);
- Uniform National Mapping System (in Hungarian called: EOTR).

A projection system for civil use called EO (Uniform National Projection system) was introduced also in 1972. The reference ellipsoid of EO is the IUGG GRS67. The projection is of the oblique-axis reduced (secant) cylindrical type. The whole territory of the country is represented on one strip of cylindrical projection.

Projection systems of former times are still in use: three oblique-axis cylindrical projection systems: North, Median and South and a stereographic projection for cadastral maps at scale 1:2.880, 1:1.440 and 1:7.20.

To meet the requirements of the domestic and international professional communities, a Description Directory of Hungarian Reference and Projection Systems has been issued in 1995 by FÖMI. The Description gives an overview on the EO parameters, the HD-72 definition, the Hungarian vertical system and the relation of HD-72 to the WGS-72 and the EUREF-89 (WGS-84) systems. A revised version of the transformation parameters has been computed, harmonised in the frame of the EUREF Working Group of EuroGeographics and IAG, as well as disseminated for GI use in 2000. This version became part of the Hungarian GI standard.

The Uniform National Horizontal Network (EOVA)

The EOVA is based on the Hungarian Datum 1972, the network orientation is provided by 40 Laplace-points and the scale is maintained by 23 EDM lines.

Parameters connecting the Hungarian control network to the EUREF-89 and ED-87 systems have already been measured, computed and finalised.

For high order scaling, a 864-m long Standard Baseline at Gödöllő town (about 30 km from Budapest) has been measured with Väisälä interferometric method and Kern Mekometer in co-operation with Finnish Geodetic Institute in 1987 and re-measured in 1999. This very stable baseline with 5 pillars is accredited for EDM calibrations for national and international use.

The network consists of:

- 163 sites of 1st order (146 points within Hungary and 17 points in the neighboring countries),
- 1974 sites of 3rd order,
- 4307 sites of principal 4th order,
- 43780 sites of 4th order exist in EOVA,
- The 1st, 3rd and principal 4th order sites have 10306 orientation sites. 6080 orientation sites have co-ordinates.

An EOVA Database was created and is operated by the Institute of Geodesy, Cartography and Remote Sensing (FÖMI), containing the positional and descriptive data of horizontal control sites (1st, 3rd and 4th order) as well as their sketching.

The Uniform National Height System (EOMA)

The EOMA has normal heights with Baltic Sea level. The reference point is Nadap with height in the EOMA system $H=173,1638$ above Baltic Sea level; ($H= 173,8385$ above the Adriatic Sea level, in which the height system of Hungary was given earlier.)

EOMA consists of:

- 41 principal fundamental benchmarks (16 established on rock, others are well-based benchmarks situated in sedimentary area);
- 800 of 1st order special benchmarks based in 3-5.5 m deep;
- 5981 sites of 1st order;
- 5096 sites of 2nd order (ready at 75%);
- 13417 sites of 3rd order (ready at 80%) (GPS technique for the replacement of the classical 3rd order levelling is introduced in 2000);
- Hungary has a kinematic network containing about 1100 points along the 1st order levelling lines to study the recent crustal movements;
- 23 connecting levelling lines to the neighbouring countries.

Upon the 1994 call of IAG/EUREF subcommission, Hungary has prepared data expressed in geopotential index numbers for the purpose of connecting the Hungarian vertical network to the UELN frame. Hungary participated at the EUVN 97 campaign with successful GPS observations as well as levelling and gravity measurements of 4 special benchmarks.

An efficient technique has been elaborated at FÖMI for the replacement of the 3rd order levelling with GPS and geoid. This technique is successfully applied in practice for the completion of the EOMA 3rd order network in the TransDanubian region, and operating recently.

A Database of Vertical Network containing the data of height control sites (1st, 2nd and 3rd order) was created and is operated by FÖMI. Items in this database are number of the sites, vertical co-ordinates, location of the sites (county, settlement, sheet number), date

of determination, measurement and control of the sites, textual and scanned description of the surroundings.

The National GPS Network (OGPSH)

The Satellite Geodetic Observatory of FÖMI, Penc is the centre for the Hungarian GPS Network activities given below:

- 7 sites of Hungarian part determined in EUREF Network (1991 and 1997);
- 24 sites of the OGPSH (frame network) measured both in EOVA and ETRS-89 (1991);
- 1153 sites of the OGPSH measured all over the country.

The 3D spatial co-ordinates of the OGPSH sites are referred to the EUREF-89 reference frame, as well as determined in EOVA projection system for home mapping purposes. The superior accuracy of the OGPSH allows to analyse the traditional EOVA network as a whole.

An OGPSH database was created and is operated by FÖMI. The database contains the most important data of GPS control sites. These data are: number of the sites, the EUREF and the EOVA vertical and horizontal co-ordinates as well as the location of the sites (county, settlement, and sheet number), textual and scanned sketch approach

The Hungarian Active GPS Network

During last years both the hardware and software environment of the Hungarian permanent GPS network have considerably been developed. Besides the existing 3 EPN stations 6 new non-EPN stations were installed. The non-EPN stations are operated along the same standards as the EPN, but their data is available only on commercial basis. In 2005 additional 2-3 stations will be installed. The network development (geometry, services) is focusing on the full coverage of the country with real-time services. In the 1st phase, by 2006 the full coverage of Hungary with a sub-meter DGPS service based on 13 stations is planned. Then a networked-RTK service will be installed covering Budapest and its broader surrounding. If this pilot project proves to be successful a much denser network could be extended to the whole area of Hungary providing centimetre accurate positioning with a single user receiver.

The network and its services are called GPSNET.HU. A web server with the same name has been installed, which provides access to all related information and RINEX data. The DGPS and RTK corrections are being distributed via the Internet, based on the NTRIP technology. The development, maintenance and data analysis are done at the FÖMI Satellite Geodetic Observatory (SGO).

Hungary is also participating in the EUPOS initiative, which intends to establish a Europe-wide, multipurpose GNSS network mostly for real-time applications. The developments are in accordance with the EUPOS standards.

Implementation of the NTRIP technology

Within the framework of the EUREF-IP project, an Ntrip Broadcaster has been recently installed in Penc, Hungary. This first broadcaster in Central Europe is maintained by the Satellite Geodetic Observatory and it provides access to real-time correction data from a number of active GNSS reference stations in Hungary. The NtripCaster software, available from the BKG is an Internet server used for disseminating differential and RTK correction data in RTCM-SC104 format (or raw GNSS data in proprietary binary format) based on the HTTP protocol.

Active GNSS stations equipped with dual frequency receivers and telecommunication facilities (Intranet/Internet connection) generate and transmit code and carrier phase corrections to the Network Centre at the SGO. The broadcaster software collects the data streams and re-transmits them via the Internet to a large number of users simultaneously on the same TCP/IP port. The users equipped with a GNSS receiver and Internet connection (rovers are using wireless Internet connection, e.g. GPRS) can access the required data streams and improve their positioning accuracies. At the moment RTK corrections from 5 stations are available and further stations are being installed in 2005. The broadcaster also provides access to RTCM corrections (derived from RTCA) of 5 virtual EGNOS stations in Hungary.

Users in the test phase (by the end of 2005) may access the corrections free of charge.

2.3.4 Quality of the reference data & core thematic data

Data quality reporting by the major data producers includes positional accuracy, positional precision, logical consistency, completeness of objects, temporal characteristics.

Quality is documented through metadata provided on-line.

2.3.5 Interoperability

Major GIS-software encompass ESRI-products (ArcView (3.0, 3.2), Arcinfo (7.1, 8.0), MapObject 2.0, ArcView Internet Map Server), Erdas (Imagine, Essential, Professional, Ortobase 8.4), Bentley Microstation (J 7.0, - Geographics 7.0,- Descartes 7.0, - Descartes 4.0), Microstation SE 5.0, Bentley Geo-outlook, Mapinfo Prof. (6.5, 5.5), Bentley Model Server Discovery, Different Hungarian GIS softwares, Autodesk MapGuide 4, **Digiterra 3.0**.

Converters and interchange formats are available.

2.3.6 Language and culture

Metadata and accompanying documents are provided in Hungarian and mostly also in English (see reference list).

2.3.7 Data Content

No information has been found nor provided.

2.3.8 Geographical names

The gazetteer-database under responsibility of FÖMI contains 39 types of geographical names including the names of settlements, parts of settlement, landscapes, large units of the land, woods, nature conservation areas, relief and hydrography, names of remarkable points (ruin, look-out tower etc.) as well as the names of the most important objects of traffic. This is a Database of Geographical Names (FNT – Földrajzinév-tár).

The database has two versions. The first one (FNT1) corresponds in quantity of names approximately to a topographic map in scale 1:40.000. This database was produced by the use of 300 sources (maps, geographical literature, economical, statistical sources), and each municipality had the chance to complete, modify the database reflecting the local use of names. FNT1 covers the whole territory of Hungary, and is continuously updated.

The second version (FNT2) corresponds with respect to quantity and types of names roughly to the topographic map scale 1:10.000, with a readiness of 35%. It comprises the names of the database FNT1 with additions taken from large-scale topographic maps, cadastral maps, and other sources. The two parts of the database comprise 105.000 records.

2.3.9 Character sets

No information has been found nor provided.

2.4 Component 3: Metadata for reference data and core thematic data

2.4.1 Availability of metadata

Metadata are produced for a significant part of the spatial datasets.

2.4.2 Metadata catalogues availability + standard

A metadata catalogue is available at the Institute of Geodesy, Cartography and Remote Sensing since 1997. It is organized according to the DAT-standard (Digital Base Map), based on ISO TC211 and CEN TC 287.

Another catalogue has been set up at the Geological Institute of Hungary: METATER. It contains metadata of the framework basic data; the territorial information system data; and the geological thematic data. The owners of this metadataset are the Prime Minister's Office, the Institute of Geodesy, Cartography and Remote Sensing, the Hungarian State Geographical Institute and the Urban Development Institute.

At the Prime Minister's Office, the building up of the metadatabase called **KIKERES** (Search) for public administration is under way. It is going to take over the METATÉR and will include metadata of geodatasets belonging to governmental agencies, local governments and public administration.

2.4.3 Dublin core metadata standards for GI-discovery

The DUBLIN-core set of metadata was used for the development of the METATER.

2.4.4 Metadata implementation

No information has been found nor provided.

2.5 Component 4: Access and other services for reference data, core thematic data and their metadata

Such on-line access and other services are provided by The Institute of Geodesy, Cartography and Remote Sensing (FÖMI) via <http://www.fomi.hu> (English version at <http://fish.fomi.hu/angolfish/>). The aim of FÖMI's web site is to support a wide spectrum of customers with land related data and information services.

2.5.1 On-line access service for metadata of reference data & core thematic data

The Institute of Geodesy, Cartography and Remote Sensing (FÖMI) serves metadata of the data components of the NSDI to the Internet: geodetic control networks, cadastral maps, topographic maps, aerial photographs and satellite imagery, as well as data about the institutional network of the Lands and Mapping Agency of Hungary. Metadata and accompanying documents are available in Hungarian and mostly also in English.

2.5.2 On-line access service for reference data & core thematic data

Data which are available on-line include geodetic control points, central land-ownership data, analogue and digital maps, aerial photos and satellite images.

2.5.3 Inter-linkages of on-line access services for metadata and reference data resp. core thematic data

Access to geodatasets is organised through the metadata.

2.5.4 OpenSource software and access services

No information has been found nor provided.

2.5.5 Availability of web mapping service(s) and WebMap server interface

No information has been found nor provided.

2.5.6 Availability of catalogue services to regulate access

No information has been found nor provided.

2.5.7 Availability of catalogue services that perform payment operations

No information has been found nor provided.

2.5.8 Availability of catalogue services to extract and send data to a user application

No information has been found nor provided.

2.5.9 SDI user applications

www.fomi.hu is set up to provide to citizens and institutions services such as precise scanning and geocoding, data transformations, thematic mapping, professional plotting etc. Several applications exist in the fields of agriculture and land (Land Parcel Information System, vineyard register, land consolidation, crop monitoring, ...) and environment (disaster mitigation, agro-environment, ...). It is not clear however how these applications are delivered to the users and whether they are fully implemented according to INSPIRE principles.

One particular project is Nature-GIS in which the MoEWM together with other partners set-up a series of WMS and WFS using IONIC software for monitoring Ailanthus.

2.5.10 Availability of geo-processing services

No information has been found nor provided.

2.6 Component 5: Standards

Within the framework of the Hungarian Standardisation Board, a Technical Committee on GIS Standardisation started to work in 1994. As a result of this standardisation activity, the following documents were elaborated:

- General requirements on military digital topographic maps, 1996;
- Hungarian GIS data exchange standard, 1997;
- Conceptual model of the digital base map, 1997;
- Definition of digital topographic database, 2000.

The regulation system of digital base maps is built on the Digital Base Map Standard (DAT), 1997. The regulation system of digital topographic map is based on the Digital Topographic Database Standard.

The introduction of digital technology for the management of cadastral maps requires standards. Appropriate standards and instructions are created in Hungary for the definition of map content, their acceptance and quality control, and the digital exchange of this information, mostly harmonised with the respective CEN TC 287 and ISO TC 211 GIS standards. Issued standards and regulations are the following:

- National Standard MSZ 7772-1:1997 on Digital Base Map, Conceptual Model (often referred as DAT standard) has been prepared by FÖMI and issued by

the GIS Standardisation Committee (MB818) of the Hungarian Body of Standards and with support of MoARD/DLM. This standardises the digital cadastral maps.

- National standard MSZ 7771:1997 Hungarian Data Exchange Format for GIS has been issued by Hungarian Body of Standards based on the respective CEN TC 287 pre-standard.
- Derived from the MSZ 7772-1:1997 standard, a series of technical instructions (often referred as DAT instructions) has been issued by DLM/MOARD in 1997. They prescribe the certification and quality acceptance of cadastral maps, as well as the regulation for planning, creating and renewing maps, database content and structure, data exchange format, quality control and certifying of DAT (Digitális AlapTérkép - Digital Base Map).
- National Standard MSZ 7772-2:2002 on Definition of Digital Topographic Database, has been prepared by FÖMI and MS HDF, issued by the GIS Standardisation Committee (MB818) of the Hungarian Body of Standards.
- A modified version of the earlier regulation No. F2 on performing certain cadastral survey works using cadastral base maps and related public proceedings, as well as on the institutional background and data supply in public land administration has been issued by DLM/MOARD in 2002.

2.7 Component 6: Thematic environmental data

The Ministry of Environmental Protection and Water Management is an important producer of environmental GI. It is involved in the implementation of the NSDS and the elaboration of the NSDI.

Access to environmental data is organised through the website of the Ministry of Environment and Water. Thematic environmental data are available about: water quality – including a water quality warning system -, environmental risk, pollution accidents, etc. Functions include: searching of data, visualisation (including zooming), etc.

A general statement is that the legal framework and funding principles set out in section 2.2 are also applicable to thematic environmental data.

2.8 Use and efficiency of SDI

A NSDI exists in Hungary, although in its early stage of development. There is significant coordination between different spatial data providers and users. Some geodatasets can be downloaded from or ordered through the internet. Special services can be provided upon request. The development of the information society is one of the driving forces for the NSDI.

3 ANNEXES

3.1 Building blocks of the Hungarian SDI

Name of initiative	Purpose of initiative	Data type	Area coverage	Resolution	Status	Responsible organisation
National Cadastre Program	Producing cadastral maps in digital database form	reference	country	0,5-1 m	ongoing	MOARD
TAKARNET service	Authentic real estate e-commerce data service operating the computerised distributed databases of the Land Offices (TAKAROS) and the networking them together TAKARNET by FÖMI	reference and thematic	country	–	operational	MOARD
DTA50	Producing medium scale topographic maps in digital form (including the respective DEM, too)	reference	country	1:50 K	ready and operational	MOD
DTA50 restitution	Updating the DTA50 and its reconstruction to meet the GI standard	reference	country	1.50 K	started	MOD
DTA100	Producing small scale topographic maps in digital form (including the respective DEM, too)	reference	country	1:100 K	ready and operational	MOARD
DTA10	Producing large scale topographic map layers in digital raster form	reference	country	1:10 K	ready and operational	MOARD
DTA10 restitution	Updating the DTA10 and its producing in digital database form	reference	country	1:10 K	started	MOARD
DEM10	Producing of high resolution digital elevation model database	reference	country	1-2 m (5 m gtid)	ready and operational	MOARD
MADOP	Airborne Survey of Hungary and Producing of high resolution digital ortophoto	reference	country	1 m	ready and operational	MOARD
EGM/HU	Producing the Hungarian segment of the European Global Map	reference	country	1:1 M	ready	MOARD MOD
ERM/HU	Producing the Hungarian segment of the European Regional Map	reference	country	1:250 K	started	MOARD MOD
DTA200	Producing small scale topographic maps in digital form	reference	country	1:200 K	ready and operational	MOD

Name of initiative	Purpose of initiative	Data type	Area coverage	Resolution	Status	Responsible organisation
VAB & MAG database	Supplying geodetic reference network data, including 78 000 sites of the horizontal and vertical geodetic reference network as well as 1052 sites of the 3D National GPS Network	reference	country	1;10 mm 0,5m-0,5m	operational	MOARD
ABDS/SABE database	Producing and supplying the administrative boundary data for each level of NUTS. Also providing the Hungarian segment to the SABE	reference	country	from 1:2 K to 1:4 M	ready and operational	MOARD
National Metadata Service	The National Spatial Metadata Service and Clearing house involves metadata on reference data and core thematic data being supplied for GI users on internet, free of charge	reference	country	–	ready and operational	PMO MIT
FISH	Supplying web information on land, mapping and geodetic data, to be used in Hungary to build GIS: metadata on all existing digital and analog reference data as well as data supply of selected reference data	reference	country	–	ready and operational	MOARD
MATERIA	Supplying web information on selected statistical data mostly used for geoinformation (metadata and the data merely)	thematic	country	–	ready and operational	HSO
TEIR	Supplying digital data and information on and for rural and built-in area planning	thematic	country	1:10 K 1:1 M	ready and operational	MOARD
Road database	Supplying digital data and information on motor ways including the 3 rd order roads	thematic	country	1-5 m	operational	Hungarian Road Authority

Name of initiative	Purpose of initiative	Data type	Area coverage	Resolution	Status	Responsible organisation
Forest database	Producing, updating and supplying digital map data and information on forest matters	thematic	country	1:10 K	operational	MOARD
Soil database	Supplying digital map data and information on soil	thematic	country	1:10 K	operational	HAS and MOARD
CLC-100	Producing and supplying digital and analog data on land cover element database build in the frame of and as part of the European CORINE Land Cover program	thematic	country	1:100 K	ready and operational	EC MoEW M and MOARD
CLC-50	Producing and supplying digital and analog data on land cover element database build in the frame of and as part of the European CORINE Land Cover program	thematic	country	1:50 K	ongoing	EC MoEW M MOARD
CROPMON	Database and information collection on yearly monitoring of crops and yield prediction	thematic	country	–	operational	MOARD
FLOOD	Flood and waterlog real-time monitoring by digital method and remote sensing	thematic	country (by selection)	10 m – 1 km	operational	MOARD
Vineyard Assessment and Cadastre	Vineyard assessment and cadastre and database using remote sensing, cadastral and topographic data as well as the respective thematic information	thematic	vineyard areas	10 m	ongoing	MOARD and HSO
Streets/ Addresses	Digital database supplying data on street names and numbers of the settlements in Hungary	thematic and reference	country per settlements	house number	ongoing operational	GEOX

3.2 List of SDI addresses / contacts for Hungary

Table: SDI contact list			
	Web address	Organisational mailing address	Over-all contact person: tel./fax/e-mail
National			
Institute of Geodesy, Cartography and Remote Sensing	www.fomi.hu	szabo@fomigate.fomi.hu	Dr. Szabolcs MIHÁLY +36-1-222-5111 +36-1-222-5112 szabo@fomigate.fomi.hu
HUNAGI	www.hunagi.hu	hunagi@axelero.hu	Dr. Gábor Remetey-Fülöpp +36-1-301-4052 +36-1-301-4719 gabor.remetey@fvm.hu

3.3 List of references for Hungary

Table: list of references used to compile the Country Report	
Web sites:	
	http://www.fomi.hu (English)
	http://www.hunagi.hu (English)
	http://www.fvm.hu
	http://www.kvvm.hu

Publications :	
	Annual Report on the Lands and Mapping Activities prepared by FÖMI. Budapest, 2002
	Proceedings of the EC-GI/GIS Workshops (Budapest 1998, Stresa 2000, A Coruna 2003)
	Proceedings of the GSDI Conferences (Sydney 1998, Budapest 2002)
	Remetey-Fülöpp and Bozo Pal, 2004. Relevant issues about SDI and ongoing developments of SDI-like initiatives in Hungary. Presentation at the INSPIRE for enlargement countries workshop held at JRC, Ispra on 13-14 May 2004.
	Bozo Pal, 2004. Environmental Information System in Hungary. Presentation at the INSPIRE for enlargement countries workshop held at JRC, Ispra on 13-14 May 2004.