Republic of Moldova
Agency for Land Relation and Cadastre

PROJECT FOR CREATION OF DATABASE FOR BASE MAP FOR DEVELOPMENT OF NATIONAL SPATIAL DATA INFRASTRUCTURE IN THE REPUBLIC OF MOLDOVA

Final Report

December 2012

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

PASCO CORPORATION
KOKUSAI KOGYO CO., LTD.

EI
JR
12-231

Currency exchange rate

Currency unit: Moldovan Leu (MDL)

1 euro = 15.564 MDL (interbank exchange rate on 31 Oct 2012)

1 euro = 103.04 JPY (interbank exchange rate on November 2012)

Photos


Counterpart’s Building


Discussion with CP


Training in Japan



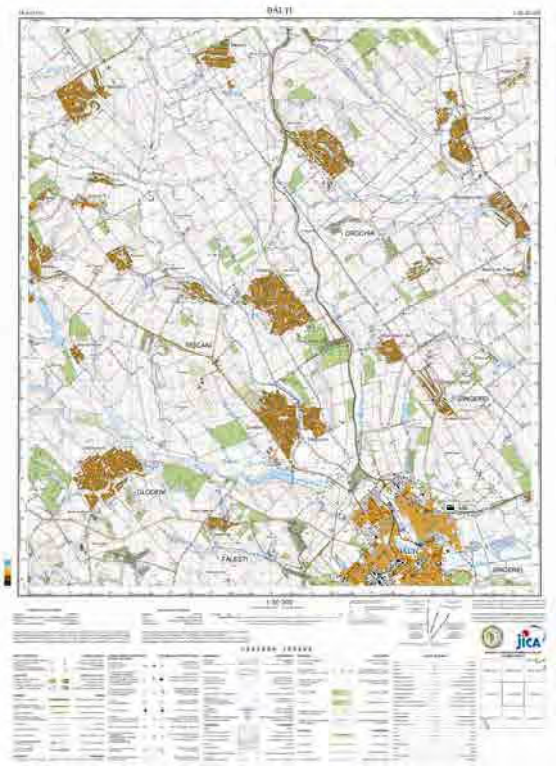

Scenes of Technology Tramsfer


Control point for triangulation survey which is registered as the world heritage

Scene of 1st seminar (February, 2011)

Scene of 2nd seminar (December, 2011)

Scene of final seminar (November, 2012)



A final topographic map

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Abbreviations

ALOS	Advanced Land Observing Satellite
ALRC	Agency for Land Relations and Cadastre
CP	Counterpart
CPU	Central Processing Unit
CTP	Computer to Plate
DEM	Digital Elevation Model
DMC	Digital Mapping Camera
GIS	Geographic Information System
GML	Geography Markup Language
GPS	Global Positioning System
ICT	Information and Communication Technology
INSPIRE	Infrastructure for Spatial Information in the European Community
ISO/TC211	ISO/TC 211 Geographic information/Geomatics
IT	Information Technology
JAXA	Japan Aerospace Exploration Agency
JICA	Japan International Cooperation Agency
KML	Keyhole Markup Language
NGIS	National GIS Committee
NSDI	National Spatial Data Infrastructure
OGC	Open Geospatial Consortium
OJT	On the Job Training
RPC	Rational Polynomial Coefficient
UCD	UltraCamD
UML	Unified Modeling Language
UPS	Uninterruptible Power Supply
WFS	Web Feature Service
WMC	Web Map Context
WMS	Web Map Service

1. Outline of the Study and its impact

1-1. Outline and objectives of the Study

Objectives

The aim of the Study was to prepare the latest geographic spatial data over the land by creating 1:50,000 topographic map data and GIS database that would facilitate a wide variety of its utilizations. The Study also aimed to develop the measures which encourage wide range of people to utilize those data in various scenes, and to implement technology transfer to the counterpart (ALRC) regarding the newest technologies about digital mapping and GIS database creation.

Benefits

Since spatial information is regarded as a key asset of infrastructure in Moldova, the Government of Moldova included the following actions to be implemented in the Action Plan during the period of 2009–2011 in order to create the National Spatial Data Infrastructure:

- Create and maintain National Geodetic Network;
- Develop Digital Base Map contributing to National GIS;
- Integrate with the International standard (ISO/TC211) of geographic information.

1-1-1. Study Area

The area to be targeted in the Study covers territory of the country except for the region that lays in eastern part of River Nistru (the Transnistria area) as shown in Figure 1. The total area accounts for 30,000km^2.

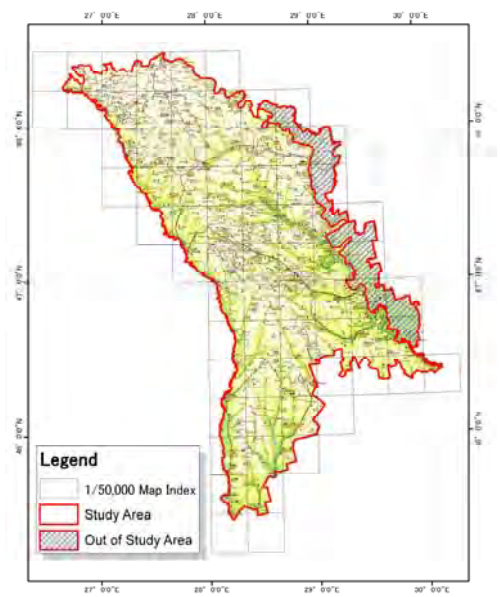


Figure 1 Study Area

1-1-2. Workflow

The workflow of the Study is shown in the following figure.

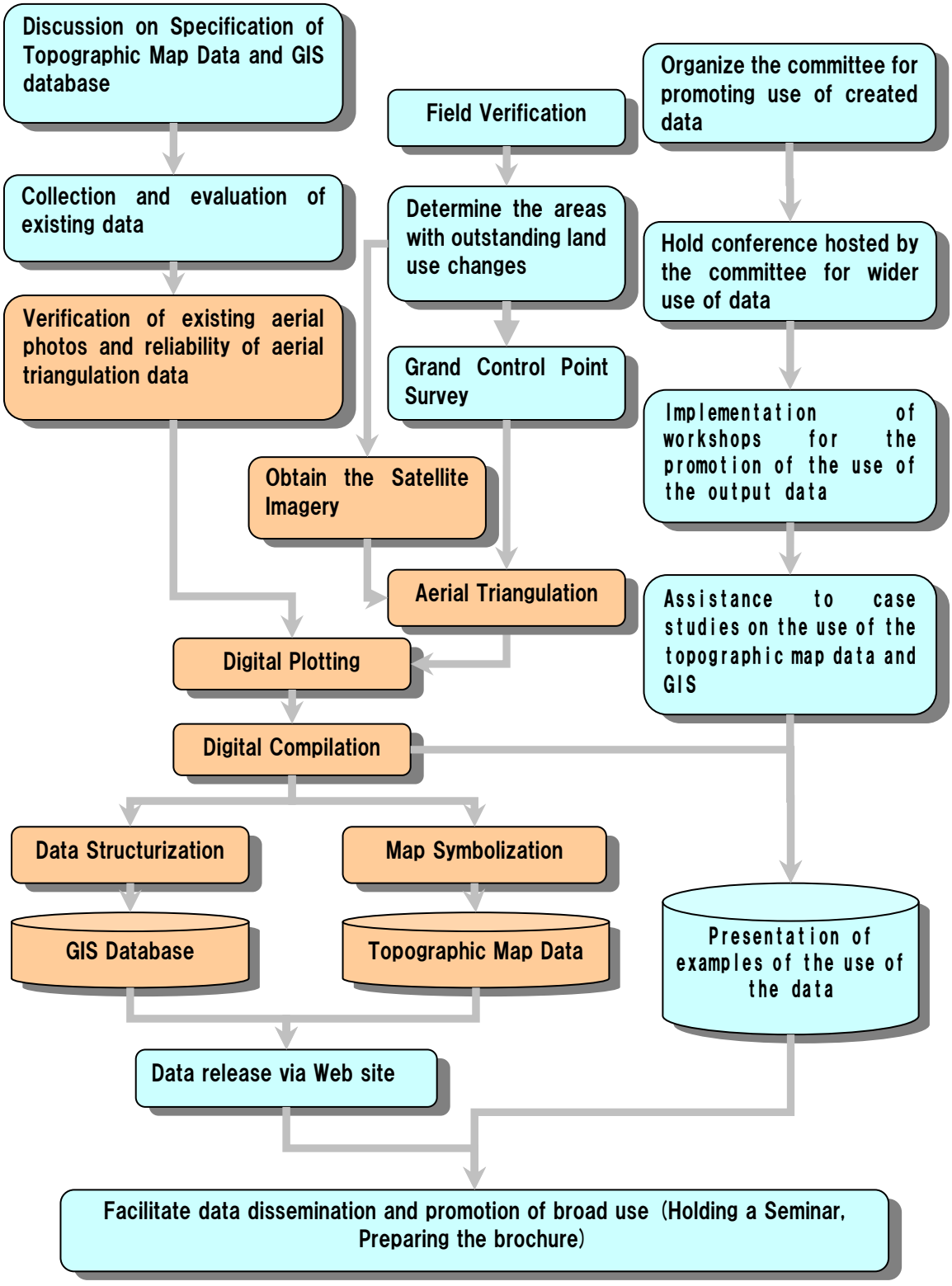


Figure 2 Workflow of the entire study

1-1-3. Implementation structure in the Study

Implementation structure between Moldovan side and Japanese side in the Study is shown below.

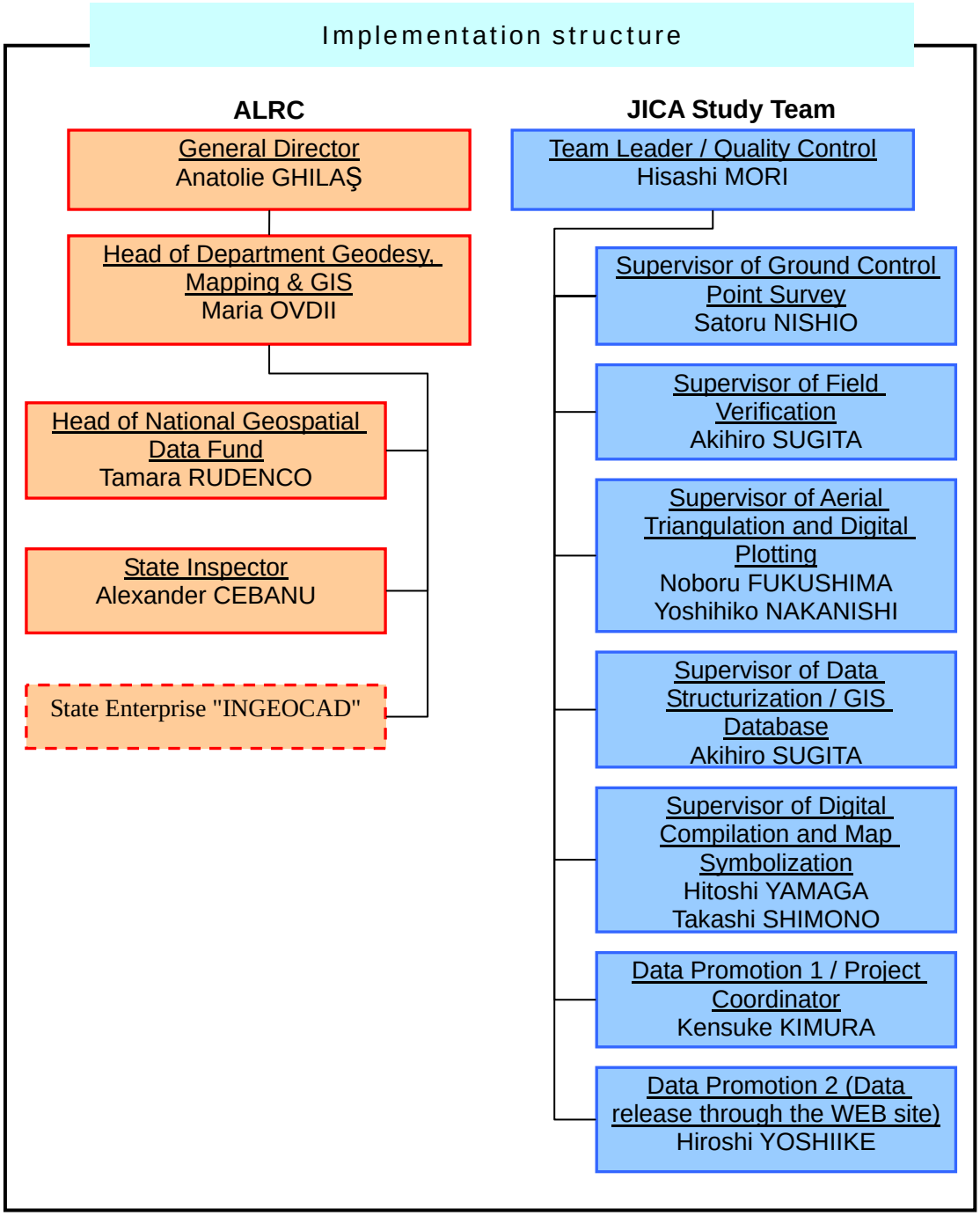


Figure 3 Implementation structure in the Study

1-2. Outcomes

The contents of the Study and its volume are as follows.

【1】 Creation of topographic map data in a scale of 1:50,000

Item	Quantity	Spec.	Remarks
Creation of topographic map data	Approx. 16,200km^2	1:50,000	By use of existing aerial photographs.
	Approx. 13,800km^2		By use of satellite imagery.
Field verification	30,000km^2		To be contracted out to local consultant.
Aerial Triangulation (aerial photograph)	30,000km^2		Need to verify the reliability of existing data.
Aerial Triangulation (satellite imagery)	48 scenes		Approx. 13,800km^2
Preparation of GIS database	30,000km^2	1:50,000	
Symbolization	30,000km^2	1:50,000	

【2】 Technology Transfer

Item	Description	Main aims
GCP survey, leveling and analysis	Field reconnaissance for selection of GCPs	・ Understand about GCP survey indispensable for creating topographic map data (with the use of satellite imagery, in particular). ・ How to use GPS equipment and conduct analysis with it. ・ How to prepare photo control point descriptions
	GCP survey	
	Leveling	
	GPS analysis	
Field verification	Preliminary photo interpretation	・ How to preliminary photo interpretation. ・ Method for field verification using orthophotos. ・ Method for field verification depending on map scale. ・ How to make use of a handy GPS receiver. ・ How to make use of a GPS-enabled digital camera. ・ How to organize the results.
	Field verification	
	Organization of field verification results	
Aerial triangulation	In case of satellite imagery In case of aerial photographs	・ How to operate a digital photogrammetric system and software. ・ How to import the result of GCP survey, aerial photographs and satellite imagery. ・ Difference between aerial photographs and satellite imagery. ・ How to evaluate aerial triangulation results.
Digital plotting	In case of satellite imagery In case of aerial photographs	・ How to operate a digital photogrammetric system and software. ・ Data acquisition depending on the data types. ・ Data acquisition depending on map scale (Particularly focusing on the knowledge and know-how in featuring objects for medium scale mapping). ・ Method of inspecting the data plotted.
Digital compilation	Optimization of plotted data	・ How to operate the software ・ Understanding of data cleaning ・ Understanding of methods to correct various types of errors

Item	Description	Main aims
	Creation of topology for GIS data	・ Understanding of the creation of topology of line, point and polygon data ・ Understanding of methods to correct various types of errors
Map symbolization	Allocation of symbols onto topographic map data.	・ How to operate the software ・ Understanding of map symbols ・ Priority order among the symbols (establishment of an order among layers) ・ Representation of symbols on maps at different map scales (creation, transfer and cartographic generalization of map symbols by data type) ・ Inspection methods ・ Understanding of spot colors and process colors ・ Difference between final prints and plotter printouts
Data Structurization / GIS database	Digital data structurization Database creation	・ Understand about GIS. ・ How to operate GIS software. ・ Method of extracting GIS database from compiled data. ・ Establishment of topology and error correction. ・ How to utilize GIS data.

【3】 Facilitation of data dissemination and its wider use

Measure	Target	Outline
Making a survey to various users	Relevant parties including private sector	・ Overview of current data utilization. ・ Analyze potentiality of data use.
Holding seminar	Relevant parties, data users in the field of GIS database and topographic map data, staff of overseas donor authorities and the press	・ Thoroughly inform the significance and operation method of digital base maps ,and report the outputs from the Study. ・ Introduce examples of application use for GIS analysis.
Holding workshop	Engineers concerned of the related parities	・ Discussion on methodology and sharing operational knowledge and technology transfer.
Distribution of data via Web	All citizens and foreign users	・ Disseminate the vector data resulting from the Study to the public in addition to orthophotos already distributed.

1-3. Impact of the Implementation of the Study (What the Implementation of the Study Brought to the Counterpart)

1-3-1. Successful Updating of Geospatial Information over the Entire Land

In Moldova, the 1:50,000 scale topographic maps created in the 1980's in the time of the former Soviet Union have been used as the national base maps which are the basis of national development. Therefore, updating of the geospatial data has been a priority issue of the country as land use patterns have changed with urban development and landforms have changed

with expansion of urban areas and division/merger of farmland after the introduction of a land ownership system in the major cities, including the capital, Chisinau, and their environs. The existing old topographic maps are maps printed on paper and the data on them is not digital data which can meet a variety of data needs including the use in GIS.

The implementation of this project led to establishment of a foundation for the national development in the form of the creation of the latest digital geospatial data of the entire territory of Moldova as GIS data.

1-3-2. Acquisition of Accurate Geospatial Data on the Land with Satellite Imagery

The JICA Study Team (hereinafter referred to as "the Team") purchased satellite imagery of an area (of *approx*. 13,800 km^2) where relatively remarkable change in land use patterns has taken place outside the inland agricultural area in order to include as much new geographic information as possible in the geospatial data to be created in the study and used the imagery in the creation of accurate geospatial data of the territory. The team purchased 159 scenes of the satellite imagery and used them successfully for the renewal of topographic map data, which could not have been done with the aerial photographs (taken in 2007) used for photogrammetry.

1-3-3. Firm Technology which enable updating of Geospatial Data by the Counterpart themselves

The counterpart personnel successfully learned the practical technologies required for the renewal of geospatial data in the OJT in the study in which they updated the topographic map data of a single map sheet area in a suburb of the capital, Chisinau, in which remarkable change in land use patterns was observed, using the above-mentioned satellite imagery. With this achievement, the counterpart personnel are now able to update geospatial data for changes in land use patterns which may occur in future.

1-3-4. Stimulating the Use of the Data in a Wide Area for National Land Development and Conservation

The GIS Data Sharing Council was established for the promotion of effective use of the output data while the Study was being implemented. ALRC serves as the secretariat of the council. The members of the council consist of staff members using geospatial data in their work in governmental institutions involved in national land conservation and development. The council is expected to stimulate sector-wide information exchange and promotion of the use of GIS data in a wide area through the sharing of the GIS data.

1-3-5. Upgrading of the Geospatial Data Dissemination System on the Web

A distribution service of orthophoto data and raster data of the existing topographic maps has been provided from the Geoportal of ALRC. The new geospatial data created in the Study is to be distributed from a new server installed in the e-Government Center located at a different place from ALRC. The new server is to have a larger disk capacity, a faster CPU and more memory than the existing one for the new geospatial data to be added to the geoportal. The upgrading of the data and the server is expected to realize improvement in accessibility to digital (vector) geographic information data and upgrading of the service contents and, thus, lead to an increase in the number and diversification of users.

1-3-6. Secure Movement to Establish a System to Utilize and Share Geospatial Data by Enacting Relevant Laws through the Learning from Japan

JICA Training Program was carried out in Japan over nearly 2 weeks for 5 trainees invited from the counterpart. They visited mapping agency of Japan, private companies related geo-spatial data development and non-profitable organization concerning geo-spatial data dissemination and research in order to learn the differences of technology and administration between Japan and the republic of Moldova.

As a fruit of the training, a strong will was expressed for establishing a system to utilize geospatial data and to enact relevant laws based on their achievement in the training once they were back in Moldova.

1-4. Preferable Step Advancing toward NSDI

1-4-1. Current Situation and Challenge

The National Development Strategy advocates the development of NSDI. The e-Government Center was established in 2010 under the e-Government Initiative. A major objective of the establishment of the Center is the development of e-Government by making full use of information and communication technology (ICT) to improve governance and services to the citizens. The government ministry and agency servers, which in the past were operated and maintained separately and independently, are now managed centrally at the e-Government Center. The Center has 20 staff members. None of them is knowledgeable about NSDI.

The use of IT and the creation of an environment for the use of IT are essential elements in the development of NSDI for data sharing. The Study has confirmed that the IT environment in Moldova is suited to such use of IT.

Meanwhile, the creation of basic topographic map data (at a scale of 1:50,000) in the Study, which marked a great step in the development of NSDI, has led to a rapid increase in the

motivation to develop NSDI on the part of the government organizations concerned. However, the problems and questions listed below will have to be resolved if NSDI is to be developed.

In relation to policy

- While the government recognizes the importance of NSDI, concrete measures concerning NSDI have not been put in place.
- Laws and regulations relating to NSDI have not been established.
- There is little cooperation in relation to NSDI between the organizations concerned.
- Although the government intends to follow the INSPIRE directive, it has not made a definitive decision on the technical specifications for geospatial data.
- Shortage of human resources (The development of human resources is essential for the development and management of NSDI.)
- Insufficient budget

In relation to the IT environment

- Whether the level of IT in Moldova is suited to the development and management of NSDI.
- Whether it will be possible to obtain hardware and software within or from outside the country when the need for such hardware/software may arise.

NGIS Committee and Current Situation Concerning Geospatial Data

The NGIS Committee was established in 2002 for the purpose of promoting the use of GIS in Moldova. The committee, consisting of 37 members from 22 organizations, has not taken any concrete action so far. One of the major reasons for this inactivity is that, since many of its members are senior officials of their respective organizations, it has not been possible to hold a committee meeting attended by all the members. However, in the committee meeting convened in response to the call for a meeting and the agenda raised in the final seminar of the Study, a clear consensus emerged regarding the need to establish a working group consisting of experts and policy makers in various areas and the need to prepare the specifications for geospatial data, and regarding the implementation of cooperation in the establishment of the working group. This development has raised expectations for more vigorous activities to promote the use of GIS.

Various organizations have created geospatial data independently in accordance with their own needs, and there is no consistency at all in the data created by the different organizations. Therefore, the cost of the creation of topographic map data has been expended more than once, and problems emerge when the attempt is made to combine the data created by different organizations.

In addition, detailed urban planning is expected to produce the need for large-scale (e.g. 1:5,000) topographic map data of urban areas.

The table below shows the organizations expected to take responsibility for the actual activities involved in the development of NSDI, and the tasks for which those organizations are expected to take responsibility after the completion of the Study.

Organization	Task(s)
ALRC	Leadership in the technical aspects of the development and management of NSDI, as the organization responsible for creation and maintenance of geospatial information; Creation of geospatial data for the development of the data infrastructure
NGIS	Preparation of technical specifications and establishment of standards and systems for the use of data for the development of NSDI; A study of the promotion of the use of geospatial information
e-Government Center	Centralized control of the servers of the ministries and agencies concerned; a clearing house for the geospatial data

The existing NGIS Committee shall establish a working group, and the members of the working group, together with experts including foreign advisors, shall have regular technical work meetings with a representative of ALRC acting as chairperson, this activity to be implemented immediately and leading to the development of NSDI.

”The NSDI Development Action Plan” should be formulated as an output of these work meetings within a year of the establishment of the working group. The action plan should include the following.

- Purpose(s) of the development of NSDI and guidelines for its use in practical work;
- Definition of stakeholders and their responsibilities;
- Description of work for which each stakeholder is responsible, and the policy for implementation of the work (by the stakeholders themselves, or outsourced to specialist consultants);
- Year of implementation and duration of each stage of development; and
- Budget plan.

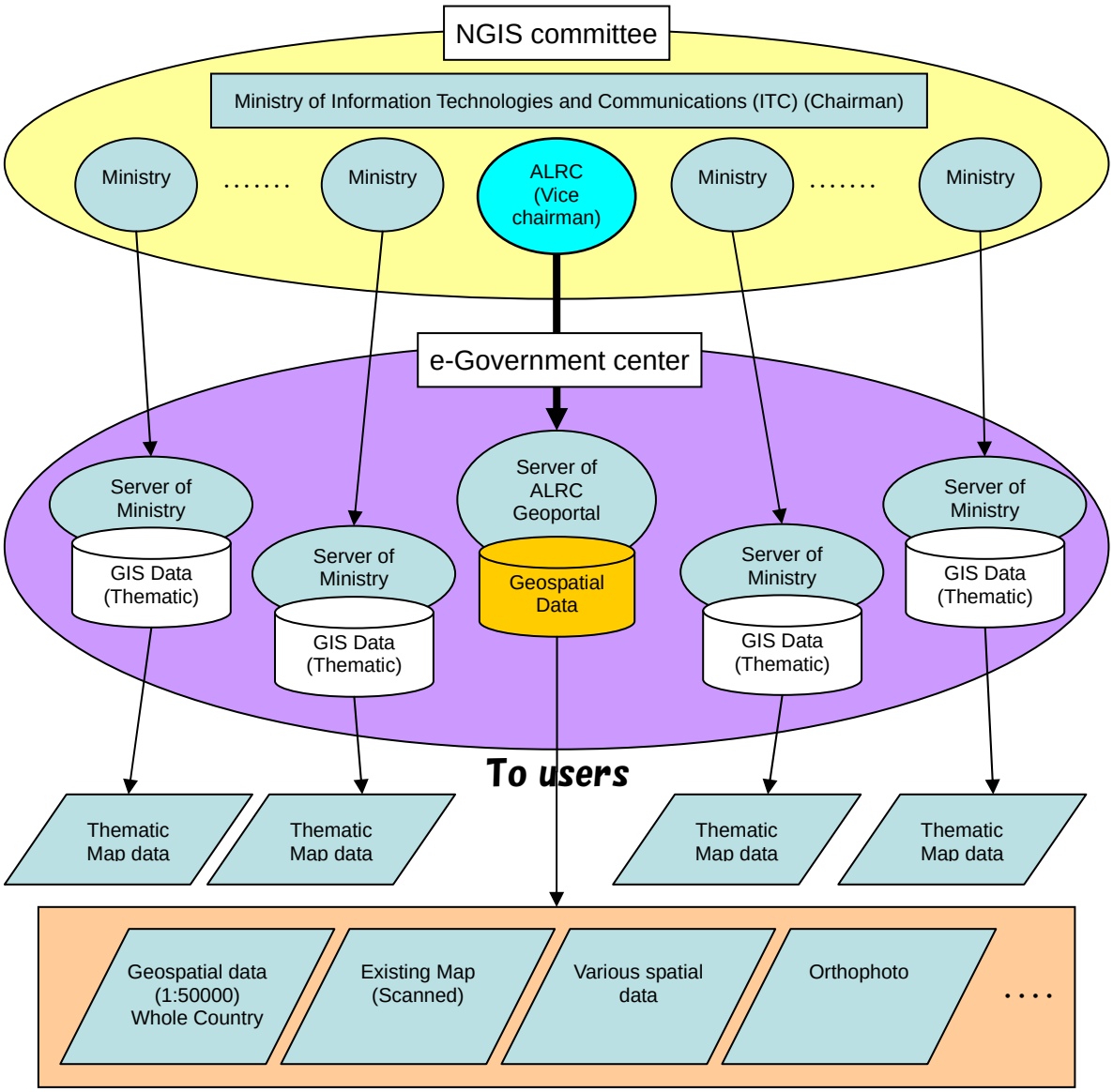


Figure 4 Current situation among ALRC, NGIS committee and e-Government center

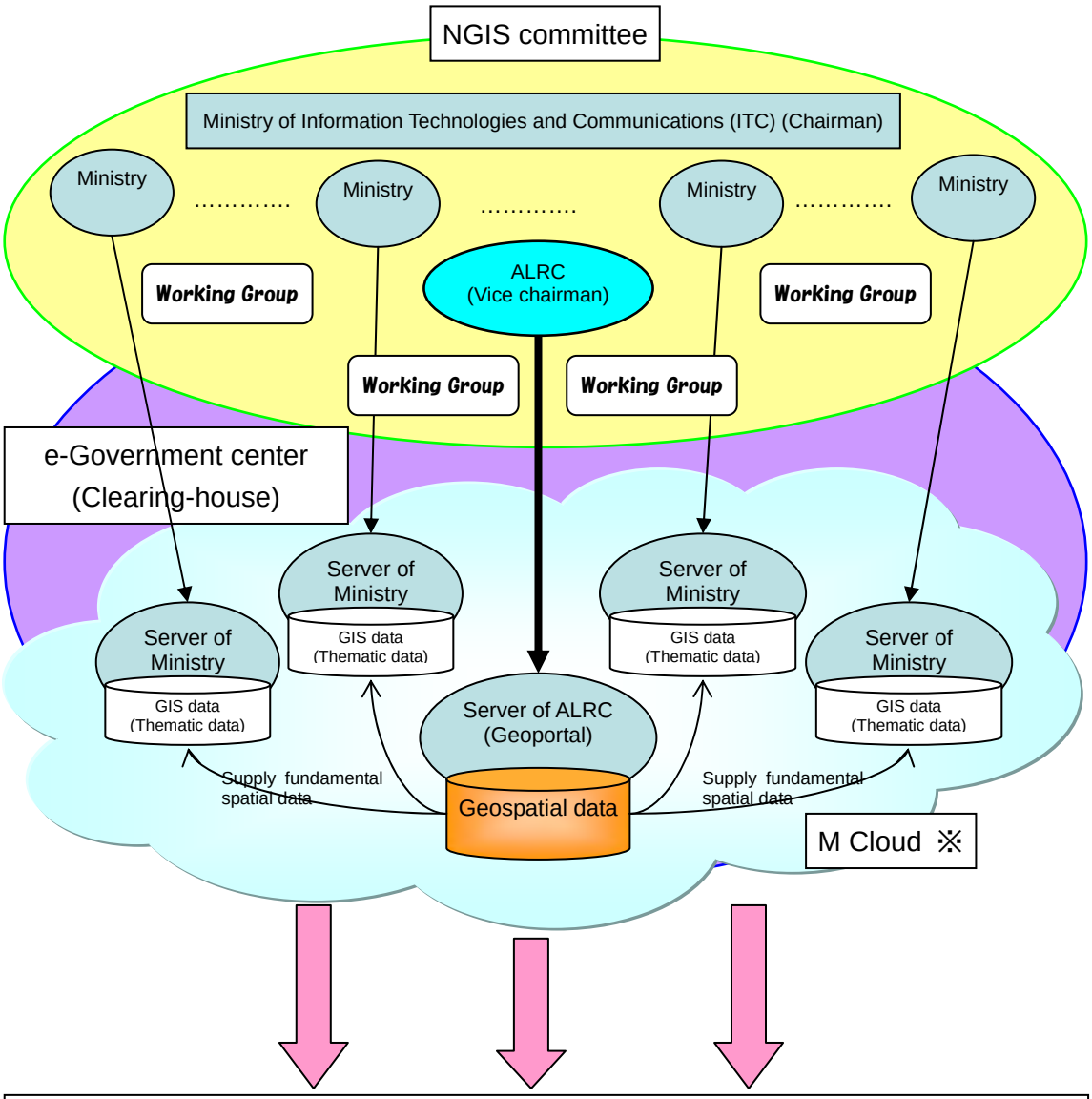


Figure 5 Future Ideal Situation among ALRC, NGIS committee and e-Government Center

※ The Government of the Republic of Moldova and the e-Government Center is developing and implementing "M-cloud" based on "Cloud Computing" technology from 2011.

1-4-2. Possibility of extensive uses for NSDI

The topographic map data in the 1:50,000 scale that was created in this Study is expected to be effectively used for formulating the master plans of national land and the guidelines for ecosystem-based natural environmental conservation. For the NSDI that can be built in the future, its application examples as expected are as follows:

(1) Master Plans of National Land

A. Master Plan of Urban Development

The 1:50,000 scale topographic maps are expected to be most suitable for formulation of master plans of regional-level development and improvement to draw up the basic plans for the appropriate locations, developable sites and development types of an urban area (including residential districts, commercial zones, industrial districts and public facilities) based on the future estimation of population, commercial sales and industrial production.

B. Master Plan of Agricultural Development

The land resource assessment at the national land level is mandatory for conservation and new development of agricultural lands. For this purpose, the 1:50,000 scale topographic map data is not only adequate to categorize the terrain, but also it allows the extraction and analysis of appropriate information (not too detailed and not too rough) from the viewpoint of river basin management. Therefore, it is possible to assess the potential productivity of agricultural lands based on this data and information.

C. Trunk Road Network Concept

In Moldova where the functional trunk roads are not fully developed at the national level, it is desired to formulate the Master Plan of distribution of trunk road networks in which the existing trunk roads and the sub-trunk road networks are categorized into levels to distribute the future road traffic in an appropriate manner to those. The 1:50,000 scale topographic map data contains the appropriate information on the present status of land use, conservation areas, and predicted traffic volumes, which are necessary for formulation of such a Master Plan.

(2) Formulation of Guidelines of Natural Environmental Conservation

In Moldova, the Master Plan of National Land Environmental Conservation has not been formulated based on the scientific knowledge from the viewpoints of disaster risk assessment and ecosystem conservation at the national land level. Therefore, the 1:50,000 scale topographic map data can be effectively used as an indispensable information source which is appropriate for formulating the following master plans:

A. Master Plan of Natural Disaster Prevention

In the agricultural country of Moldova, the 1:50,000 scale topographic maps can be used effectively to assess potential disasters and predict occurrences and expansion of landslides and soil erosion by overlapping the terrain undulations, land use status, vegetation cover information and river system data on the map data, thereby contributing to land conservation, and productivity maintenance and improvement. In drawing up the Master Plan of Flood Prevention in Areas, the basic plan of disaster prevention can be formulated by making use of simulation of disaster area scale and its expansion due to river floods based on accurate monitoring of land use in basins, inhabitable areas and public facilities.

B. Natural Environmental Conservation Plan

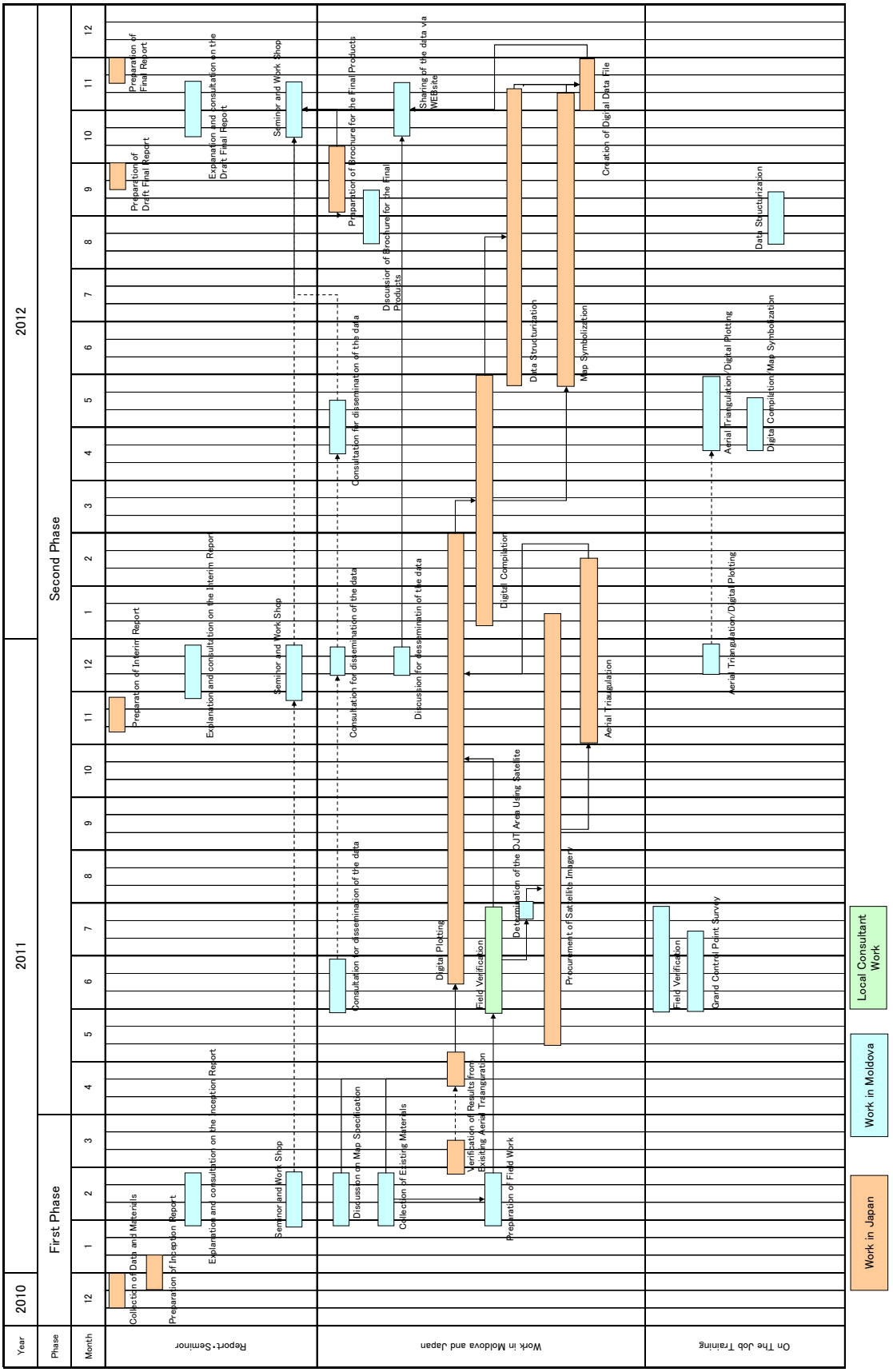
From the standpoint of ecosystem conservation, the 1:50,000 scale topographic map data contains effective information for drawing up the master plan of environmental conservation. Within this master plan the information on designation and review of the environmental conservation districts and assessment of hot spots at the national land level is incorporated from the viewpoints of forest conservation and revitalization plans, and biodiversity maintenance in Moldova's poor forest areas.

2. Contents of the work performed

2-1. Implementation Schedule and Assignment of Each Staff

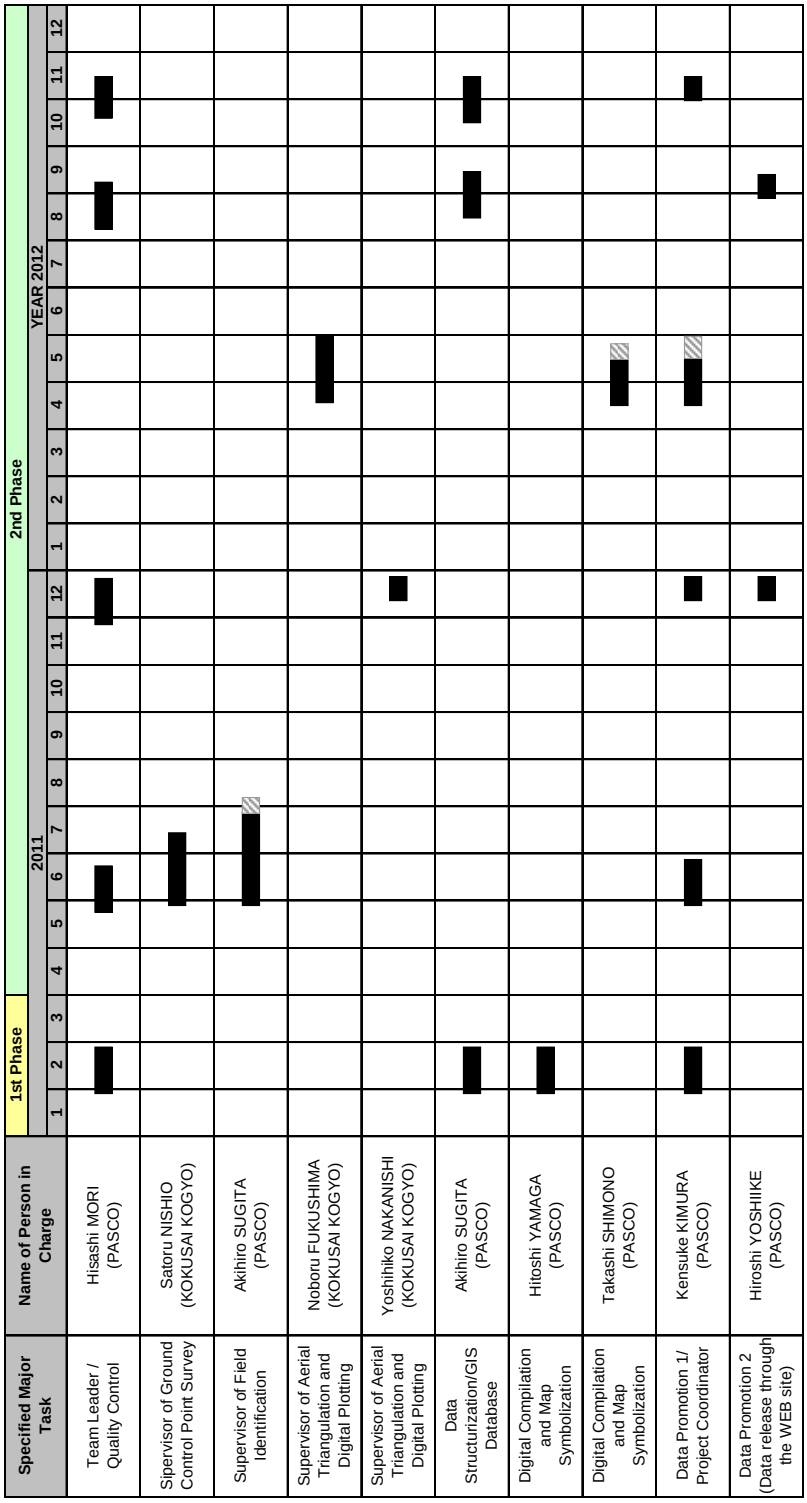
2-1-1. Implementation Schedule

The schedule and a flowchart of the Study are shown on the following page.


Year
2010
2011
2012
Phase
First Phase
Second Phase
Month
12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12
Report・Seminor
Work in Moldova and Japan
On The Job Training
Collection of Data and Materials
Preparation of Inception Report
Explanation and consultation on the Inception Report
Seminor and Work Shop
Preparation of Interim Report
Explanation and consultation on the Interim Report
Seminor and Work Shop
Preparation of Draft Final Report
Explanation and consultation on the Draft Final Report
Seminor and Work Shop
Preparation of Final Report
Discussion on Map Specification
Collection of Existing Materials
Verification of Results from Existing Aerial Triangulation
Preparation of Field Work
Consultation for dissemination of the data
Consultation for dissemination of the data
Consultation for dissemination of the data
Discussion for dissemination of the data
Digital Plotting
Field Verification
Determination of the OJT Area Using Satellite
Digital Compilation
Procurement of Satellite Imagery
Aerial Triangulation
Data Structurization
Map Symbolization
Preparation of Brochure for the Final Products
Discussion of Brochure for the Final Products
Sharing of the data via WEB site
Creation of Digital Data File
Field Verification
Grand Control Point Survey
Aerial Triangulation/Digital Plotting
Aerial Triangulation/Digital Plotting
Digital Compilation
Data Structurization
Map Symbolization
Local Consultant Work
Work in Moldova
Work in Japan

2-1-2. Assignment of Each Staff

The following table shows the assignment of each staff in terms of charge and period over the whole implementation.



2-2. First Phase

【1】 Preparation of Inception Report and meeting for its explanation

(1) Work in Japan

An Inception Report (in Japanese and in English) describing the implementation of the Study was formulated based on analyses and examinations of the Terms of Reference (TOR), the report of Preliminary Study for the scope of work (draft) and other collected materials. The report referred to following contents.

- Areas to be covered in the Study
- Workload and goal setting
- Overall policies
- Technical policies
- Policies on technology transfer
- Study contents of each year
- Implementation schedule of each year
- Items and quantities of final output
- Man- month table
- Miscellaneous

Meantime, map symbols were elaborated looking up 1) Specification for (proposed) symbols and output drawing on the Survey Operation Manual (for National Base Map) issued by JICA in December 2006 (hereinafter referred to “Survey Operation Manual”), 2) Specification for creation of map symbols issued by Geospatial Information Authority of Japan and the Standard for map symbols prepared former Soviet Union, which has been used in the mapping projects implemented by PASCO and KOKUSAI KOGYO.

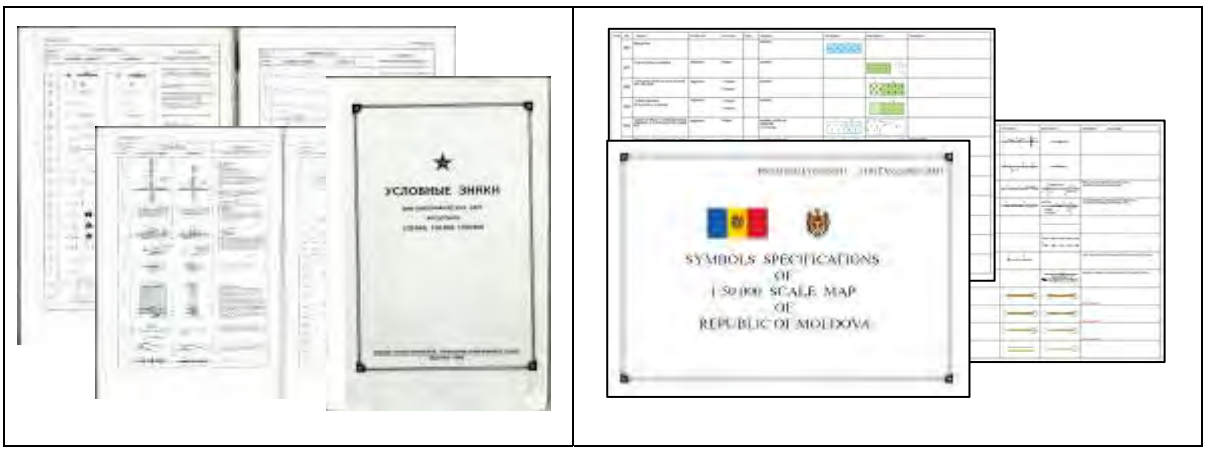


Figure 6 Booklet of Standard for map symbols used in former Soviet Union (Left), and a new specification of map symbols that is created by the Team

(2) Work in Moldova

The Team explained about the Inception Report to the counterpart and discussed the contents, implementation policies and other details of the Study with them. The discussions which had held between the two parties were pulled together into minutes of meeting (refer to Appendix-1) that was signed by both sides. The number of the staff attended to this meeting was 39 (35 from the counterpart and 4 from the Team).

Table 1 List of participants to the meeting for discussion

No.	Name	Section	Title
1	Iacovlev Andrei	ALRC	Deputy General Director ALRC
2	Ovdii Maria	ALRC	Department Geodesy, Mapping & GIS
3	Caba Maria	ALRC	Land and Real Estate Cadastre Direction
4	Cusnir Lucia	ALRC	Department Geodesy, Mapping & GIS
5	Danii Ivan	ALRC	Department Geodesy, Mapping & GIS
6	Decenco Iuliana	ALRC	Land and Real Estate Cadastre Direction
7	Feraru Maria	ALRC	Serviciul resurse umane
8	Gorincioi Sergiu	ALRC	Supplemental Analysis, Monitoring and Evaluation
9	Mihov Vladimir	ALRC	Department Geodesy, Mapping & GIS
10	Mocreac Octavian	ALRC	Land and Real Estate Cadastre Direction
11	Pascaru Leonid	ALRC	Land and Real Estate Cadastre Direction
12	Rudenco Tamara	ALRC	National Geospatial Data Fund
13	Turculet Mihail	ALRC	Land and Real Estate Cadastre Direction
14	Valentin Luchian	ALRC	Land Relation and Land Consolidation Direction
15	Mocanu Cornelia	ALRC	Land Relation and Land Consolidation Direction
16	Bolohan Ion	ALRC	State Inspectorate
17	Olaru Viorica	ALRC	State Inspectorate
18	Rascu Angela	ALRC	Economic and Financial Direction
19	Mindov Lilian	I.S. Cadastru	Engineer
20	Belcevicina Oxana	INGEOCAD	Engineer of department geoinformation system
21	Filenco Valeriu	INGEOCAD	Technical Director
22	Gurgurov Veaceslav	INGEOCAD	Engineer of department geoinformation system
23	Mutac Liubomira	INGEOCAD	Engineer of department geoinformation system
24	Nagorneac Constantin	INGEOCAD	Engineer of department geoinformation system
25	Nagorneac Serghei	INGEOCAD	Director
26	Paharicov Igor	INGEOCAD	Head of department geoinformation system
27	Zaharchina Svetlana	INGEOCAD	Head of department photogrammetry
28	Caminschi Alexandru	IS IPOT	Director
29	Radov Alexandru	IS IPOT	Head of IT department

No.	Name	Section	Title
30	Gutu Vladimir	MAIA	Ministry of Agriculture and Food Industry
31	Axenti Ion	Mass-media	
32	Munteanu Serghei	Ministerul Dezv. Reg.	Ministry of Regional Development and Constructions
33	Galupa Alexandru	Moldsilva ICAS	Head of Department geoinformation system
34	Sincariuc Pavel	MTIC	
35	Sarpac Grigore	Registru	Deputy Head of Department of the State Information Resources Center "REGISTRU"
36	Hisashi Mori	The Team	Team Leader / Quality Control
37	Akihiro Sugita	The Team	Data Structurization / GIS Database
38	Hitoshi Yamaga	The Team	Digital Compilation and Map Symbolization
39	Kensuke Kimura	The Team	Data Promotion1 / Project Coordinator

Figure 7 View of the meeting for explaining I/C Report (Above), Signing the M/M of the meeting (Below)

【2】 Gathering existing relevant data and Consultation

Collection and examinations were conducted for preparing necessary data to be needed in the Study. Data volume obtained through out gathering the data came up to the size as big as 4 TB, which includes existing aerial photographic data.

Table 2 List of data collected

Item		Contents	Remarks
Data of existing aerial photographs	Aerial photographic Image Data	Aerial photos which were taken in the Orthophoto program sponsored by Norway	8,780 scenes
	Calibration report on the aerial camera	Specification of the camera used in the Norwegian project	2 types of digital cameras * DMC manufactured by ZI Imaging Co. * UltraCamD manufactured by Vexel Co.
	Results of Aerial Triangulation	Data obtained from Norwegian Orthophoto project	Computation data from aerial triangulation targeting 30,000 km^2 (PATB model, SummitEvolution model, ZI model)
	Report on quality control	Information concerning the quality control performed in the Orthophoto project	Detail descriptions formulated by the operated company and the counterpart
	Orthphotographs	Imagery in digital format	5,466 scenes
	Data for DTM	Data created in the Orthophoto project	
	Descriptions of GCP	GCP details recorded in the Orthophoto project	Not yet confirmed if all of them are available
Others	Date for geodetic reference points	GCP details recorded in the Orthophoto project	Available to refer through the Web Site disclosed by the counterpart. (http://www.geoportal.md/) (Only in Russian)
	Existing topographic maps (1:50,000)	Scanned raster data	135 sheets
	Administrative boundary data		
	List of codes for objectives	Criteria for plotting in the 1/5000 line mapping program that counterpart is involved in.	

【3】 Discussions of Specifications

(1) Map symbols

Specifications for symbols and other representations, those for data and other details necessary for creating 1:50,000 topographic map were seriously discussed among counterpart personnel and the Team. Both side eventually reached consent for which the M/M was prepared for detailing agreed issues (refer to Appendix-2).

Table 3 List of counterpart staff attended in the meeting

Name	Section	Title
Ovdii Maria	ALRC	Head of Department Geodesy, Mapping & GIS
Rudenco Tamara	ALRC	National Geospatial Data Fund
Mihov Vladimir	ALRC	Department Geodesy, Mapping & GIS
Danii Ivan	ALRC	Department Geodesy, Mapping & GIS
Mocreac Octavian	ALRC	Land and Real Estate Cadastre Direction
Gorincioi Sergiu	ALRC	Supplemental Analysis, Monitoring and Evaluation
Pascaru Leonid	ALRC	Land and Real Estate Cadastre Direction
Cebanu Alexandr	ALRC	State Inspectorate
Eremia Ion	ALRC	Department Geodesy, Mapping & GIS
Paharicov Igor	INGEOCAD	Head of Department geo-information system
Nagorneac Constantin	INGEOCAD	Engineer of Department geo-information system
Hisashi Mori	The Team	Team leader / Quality Control
Hitoshi Yamaga	The Team	Digital compilation and Map symbolization
Akihiro Sugita	The Team	Data structurization and GIS database

Figure 8 Discussion on deciding applicable map symbols

(2) Quality control

The Team presented “the Survey Operation Manual of JICA (for National Base Map)”, (English Version) and the form of accuracy control sheet to be prepared at each stage of the work in accordance with the Specifications to the counterpart during the discussion on the quality management of the outputs of the Study. The two parties agreed in principle to implement accuracy control as provided in the Specifications in the Study.

【4】 Verification of the Existing Aerial Triangulation Outputs

Various data obtained from the counterpart reveals that aerial triangulation using existing aerial photographs was conducted by dividing the territory in 11 blocks as shown in Figure 10. Table 4 shows the numerical outputs of the aerial triangulation for each block obtained from the collected data.

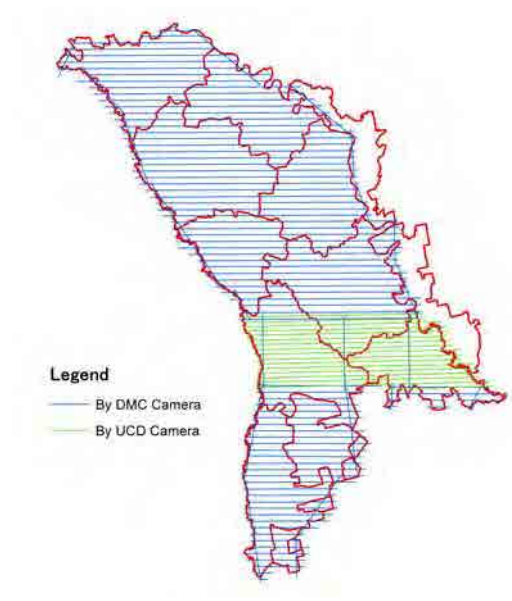


Figure 9 Index map for existing aerial photographs

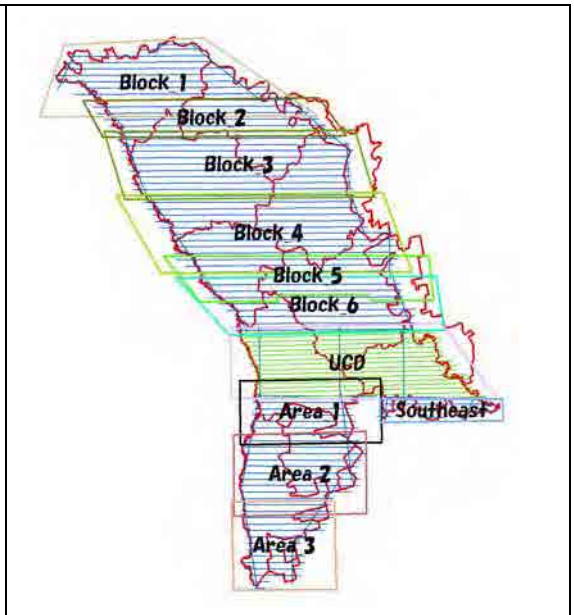


Figure 10 Blocks of existing aerial triangulation products

Table 4 Numerical values of the existing aerial triangulation products

Block no.	No. of photos	No. of filming courses	Residual error of control point（standard deviation） [m]		
			X	Y	Z
Block_1	1,258	17	0.096	0.116	0.175
Block_2	813	8	0.071	0.050	0.186
Block_3	1,513	14	0.073	0.086	0.186
Block_4	1,728	16	0.109	0.110	0.183
Block_5	943	10	0.118	0.096	0.131
Block_6	1,047	17	0.099	0.104	0.163

Block no.	No. of photos	No. of filming courses	Residual error of control point（standard deviation） [m]		
			X	Y	Z
UCD	1920	18	0.218	0.238	0.272
Area_1	666	11	0.211	0.148	0.354
Area_2	971	15	0.118	0.117	0.160
Area_3	665	18	0.083	0.097	0.167
Southeast	224	12	0.081	0.069	0.153

Table 5 Limitation Value in the Survey Operation Manual of JICA

Limitation value	Residual of Control Point	Residual of intersection of pass points and tie points	Tie point (between neighboring block)
Standard Deviation	within "Flight Height Above the Ground" * 0.02 %	within 0.015mm	-
Max	within "Flight Height Above the Ground" * 0.04 %	within 0.03mm	-
Discrepancy	-	-	within "Flight Height Above the Ground" * 0.09 %

The altitude adopted in taking the aerial photos is calculated as approximately 3,500 m, based on the specifications of the digital aerial camera and the ground resolution used in the shooting. Thus, the limit value of standard deviation is derived as 3,500 m x 0.02% = 0.7 m. The values shown in Table 4 seem to be within the allowable value.

Before conducting digital plotting based on the result of aerial triangulation, an examination was made to check if X parallax was not caused, because it should be eliminated for obtaining proper stereo models. As a result, no X parallaxes* were found by this examination.

*X parallax: An Error in stereo model constructed by a pair of photographs. In case this parallax is caused in the stereoscopic model, it is hardly conducted to operate proper plotting because of wrong stereoscopic vision.

【5】 Preparatory work necessary for the field verification task

The Team contacted with a local company for the field verification to be conducted in the second phase. The field verification was conducted not only in areas where significant secular change was expected to have occurred but in the entire study area because it was implemented in order not only to obtain reference information for the interpretation of planimetric features and vegetation in the digital plotting and compilation, but also to incorporate the latest information in the 1:50,000 scale topographic map data to be created. The Team and the counterpart studied the profiles and past achievement of the candidate local subcontractors, decided to qualify the four companies mentioned in the table below for the tender for the field

verification and prepared the selective tender of the four companies, in order to complete the tender process shortly after the commencement of the second phase.

Table 6 List of companies invited to the tender

Company Name	Address	Name of Director
"LENVETA" Ltd.	Botanica Veche Str, 6, ap.67; Chisinau, MD CF: 1002600012325; Tel: 232596 Mob: 069039649	Nicolae ŞVEŢ
"MERIDIAN DIGITAL" Ltd.	Miron Costin Str, 7, of. 304, Chisinau, MD Tel: 438322, 067170701	Dumitru CRETU
"BLOM" Ltd.	Valea Trandafirilor Str, 24A, Chisinau, MD Tel: (+ 373 22) 26 10 45 E-mail: office@blom.md	Vasile CHIRIAC
"TRIMETRICA" Ltd	Mesager Str, 11 floor. 3, Chişinău, CF: 1004601001823 Tel: (373 22) 837-231, (373 22) 837-227 Fax: (373 22) 837-227 E-mail: info@trimetrica.com	Eugeniu HRISTEV

【6】 Selection of map sheet for OJT

After series of discussions with the counter-part, map sheet to be chosen for conducting OJT was decided in consideration with following reasons.

- Easy access from Chisinau without overnight stays in conducting training.
- Variety of topographic types such as urban area, farmland and hilly terrain.
- Areas where satellite imagery are used.

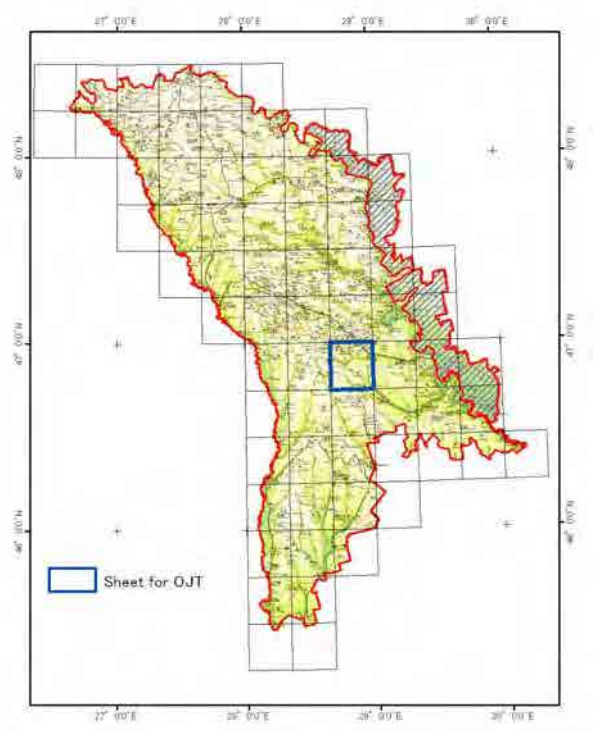


Figure 11 Map sheet chosen for conducting OJT

【7】 Holding Seminar and Workshop

With the aims of effective utilization of digital map data and outreach of the Study results, assuming that existing committee like NGIS or newly planned committee would be involved, 1st seminar was held with attendance of administrative bodies and the presses.

The counterpart invited relevant personnel of the government offices, research institutions and international organizations interested in the use of geospatial information to the seminar by sending them letters explaining the main purposes of the seminar. A total of 56 people from 17 government offices including the Cabinet Office, nine national organizations, 22 research institution/state enterprises and eight private institutions attended the seminar. In advance for opening of the seminar, the Team leader of the Team was interviewed by the staff of major press company concerning key contents of the study, resulting in the article on the newspaper that introduces objectives and key issues of the project. Moreover the leading TV in the republic Moldova broadcasted the seminar conference on air.

The Team gave detailed explanation of the contents and outputs of the Study to all the technical staff of the counterpart and some others in the meeting for the explanation and discussion on the Inception Report. As this meeting had achieved the aims of the first Workshop, the Team decided to consider this meeting as the first Workshop, with the consent of the counterpart. Meanwhile, the team asked the counterpart personnel to decide aims of the workshops of the following years and to select staff members whose participation in the work required for the implementation of those workshops is desired.

	
General view of the seminar venue -1	General view of the seminar venue -2

Team Leader, Mr. Mori, making presentation to introduce the Study component

Team leader interviewed by the press

Director, Mr. Gramma , interviewed as well

Figure 12 Seminar scenes

Issues which were raised from the floor are as follows;

Academy of Science of Moldova: Asking what if thematic data of Geology could be shown as well together with topographic data?

The Team: Answered that thematic map data like geology would not be created since the Study is aiming the creation of topographic database in this project. However, we are ready to assist you technically if you request the help in doing so.

Academy of Science of Moldova: Asking how big is the minimum size of plotting on the map?

The Team: Answered that accuracy of plotting is equivalent to the shape of building bigger than 25m x 25m in size on the ground.

【8】 Facilitation of data dissemination and promotion of effective utilization

(1) Making a survey targeting data users

The Team conducted a questionnaire survey of staff members affiliated with institutions involved in geographic information in order to study the methods of the distribution of the output data, practical measures to promote the data use and new areas for the data use. The Team gave the questionnaires directly to the participants at the seminars and asked the counterpart personnel to collect them. The following are the survey items in the questionnaire.

1. Objective of using topographic data and the way of utilization
2. Measure of data acquisition
3. Frequency of data use
4. Map scale of topographic data to be used
5. Publicity of Web distribution conducted by the ALRC
6. Circumstance to be equipped for friendly use of digital geographic data
7. About GIS
8. Current status of necessary equipment including GIS database
9. Suggestion or proposals to encouraging the use of topographic data including GIS database

(2) Encouragement to utilize geographic information data

The Team made visits to the following governmental institutions to encourage participation in working group that demonstrate practical use of topographic data and GIS base data created by the Study.

The institutions and the possibility of hopeful usage are as follows;

- Moldsilva

Moldosilva is principally engaged in management and conservation of national forests, and is currently tackling the forest preservation and reforestation over the country at the name of “Green Plan”. The agency has started to conduct establishment of Forest GIS in order to realize the plan. However, it is a big barrier to resolve the lack of staff who are well qualified in working on GIS practically.

All the agency has been practicing so far is just to overlay the forest boundaries on existing orthphoto data for locating the forest areas using MapInfo as a GIS software.

They are therefore very keen to be involved in some activity that the Team initiates to make collaboration in trying to use topographic data and GIS base data expected from the study.

- IPOT

The major role of IPOT is to prepare cadastral maps and to grasp the status of consolidations of farmlands after privatization of land property as well as the mission to evaluate productivity

of the land. As for the analytical work using digital data like GIS, they have no experience up to now. Therefore IPOT has a passion to make use of those digital data for a challenge of GIS utilization to their works. It is quite promising for IPOT to be involved in developing the practical use of topographic data created by us.

Figure 13 Visit to Moldsilva

Figure 14 Visit to IPOT

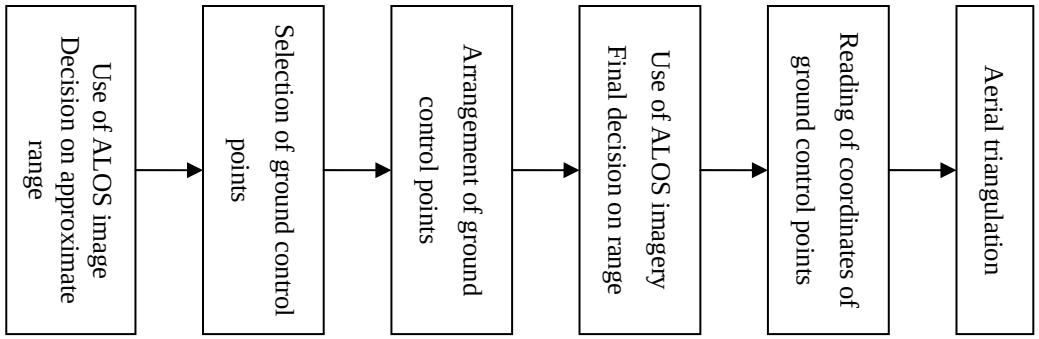
2-3. Second Phase

【1】 Ground Control Point survey

(1) Decision on the method

Although the final decision on the area of the use of satellite imagery was in fact made on the basis of the result of the subsequent field confirmation, control points were selected and sorted at this stage with the area originally planned with the entire work process taken into consideration. The satellite imagery was assumed to be ALOS (PRISM) and the number of scenes was assumed to be 65 (approx. 20,700km^2).

The local coordinate system used in the previous aerial triangulation was used in the aerial triangulation of the satellite imagery. Therefore, the coordinates of the selected control points in the local coordinate system were imported from the outputs of the aerial triangulation in the past and used in the subsequent aerial triangulation.



(2) Decision on the number of ground control points

The study of the verification data of the number of ground control points in ALOS/PRISM (ALOS/PRISM accuracy verification, 2nd year, Geographical Survey Institute 2006) and in-house verification results found that the use of RPC data without using any ground control point results in an extremely inferior level of accuracy but that the use of RPC data while using one or more ground control points ensures a satisfactory level of accuracy.

However, a decision was made to select ground control points with a total of 138 coordinates and elevations, two points per scene, based on the assumption that the selected ground control points may not be usable due to some circumstances.

Figure 15 Description of Ground Control Point （No.113 Chisinau）

(3) Selection of ground control points

During the selection, ground control points were pricked and distinct points on Google Earth, such as road crossings and rotary centers, were selected in consideration of the ALOS (PRISM) resolution of 2.5 meters. Since the approximate range of ALOS (PRISM) imagery to be used had been decided, the points were selected based on the assumption that they would be located in this area.

(4) Summary of ground control points

For the selected 138 ground control points, the approximate coordinates and images were summarized for the sake of subsequent tasks and listed in the ground control point detailed list.

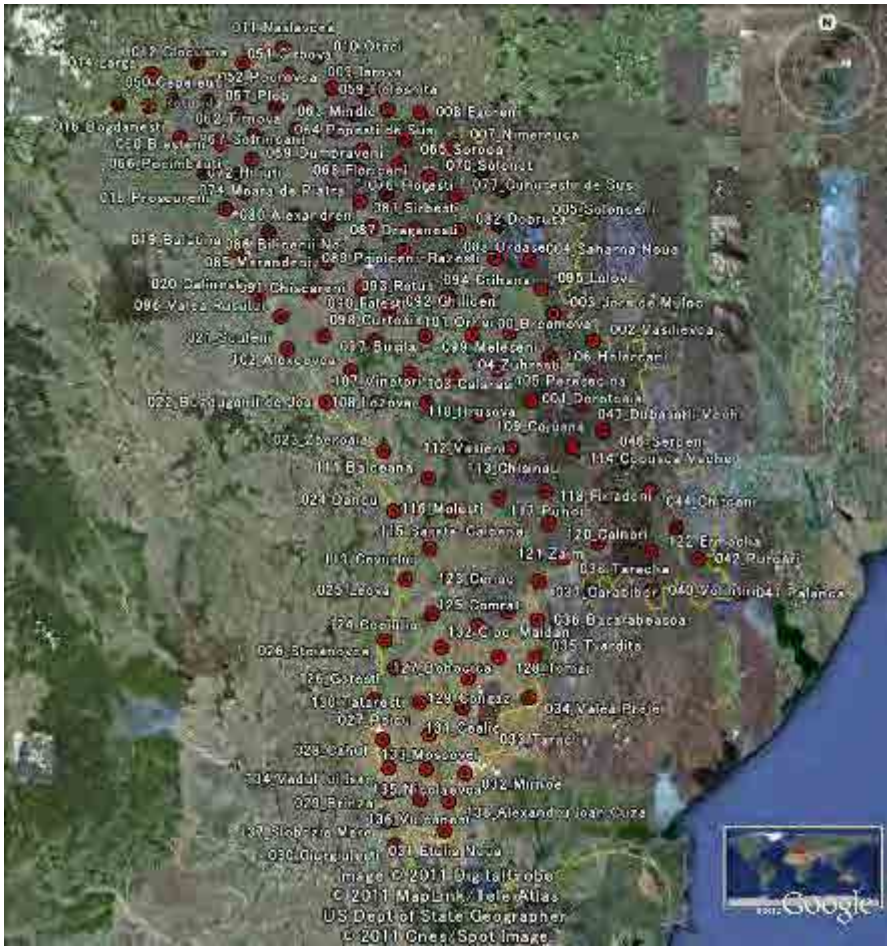


Figure 16 Allocation of ground control points

Although changes were made in the target range, the specifications of satellite images to be used and the number and allocation balance of ground control points were satisfactory. Therefore, a decision was made to use them in the subsequent tasks without change.

【2】 Field Verification

For the purpose of selection of a local subcontractor for outsourcing this task, tenders were invited from four candidates selected in Phase 1 (Table 6) and tendering was carried out at ALRC with the counterpart acting as a witness. As a result of overall evaluation, the successful tenderer was BLOM Ltd. with which a contract was concluded after technical negotiations, etc.

This field verification operation was carried out not only on the area where significant secular changes were expected, but on the entire Study area. The field verification is intended to be used not only as data for interpreting ground features, vegetation, etc. during digital plotting or digital compilation but also for facilitating up-to-date information on 1:50,000 topographic maps to be created.

Field verification was outsourced to a local subcontractor and was carried out in June and July 2011.

The details of the work are as described below:

(1) Preliminary photo interpretation

Photo interpretation was carried out, by overlaying existing 1:50,000 topographic maps on orthophotos output with geographical coordinate values allocated on them (at a scale of 1:10,000). The major objects to be interpreted included skeletal features such as roads, settlements, rivers and streams, waterways, railways, vegetation, and geographical names. Schools, churches, cemeteries and the like were also put down on the orthophotos, where possible.

(2) Field verification

The orthophotos on which the preliminary photo interpretation results were reflected, the existing topographic maps, handy GPS receivers, and other materials were brought to the field, where ground features, vegetation, and the like were identified in the field according to the classification criteria. Photo interpretation keys were created where needed.

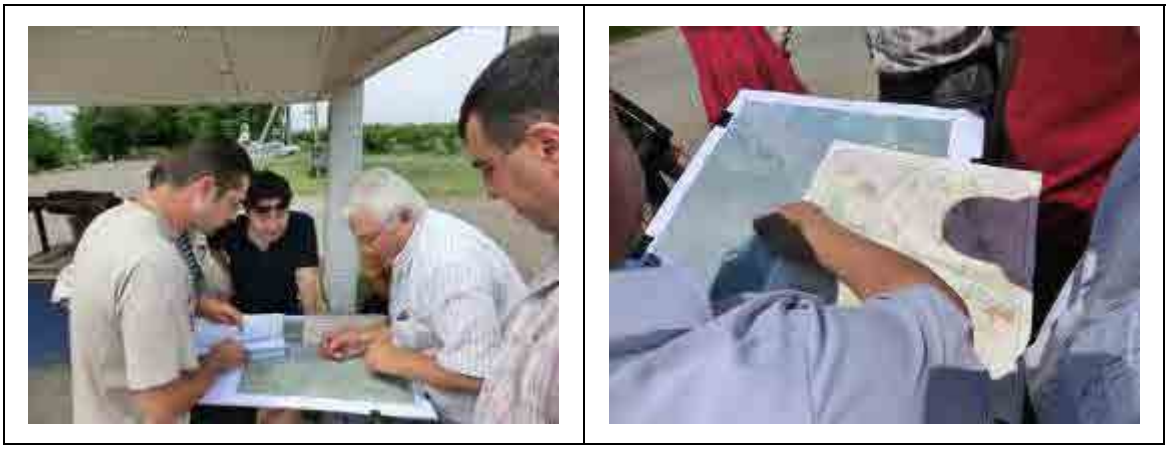


Figure 17 Scene of field verification by the local subcontractor

(3) Summary of field verification results

The maps on which ground features and objects had been marked in specified manner were checked for misclassification and omissions and corrected if needed.


Figure 18 Scene of summary process by the local subcontractor

At the same time as the field verification process, relevant organizations were requested through ALRC to supply data that cannot be verified easily in the field verification and other reference data. The following table lists the requested organizations and the description of data.

However, the Team could not obtain all the data described below the main reason being that the organization concerned did not have the data, among others.

Table 7 List of organizations requested to supply data

No.	Addressed to	Contents	Letter Number #
1.	Moldtelecom SA	ALRC requires the release of cell phone communication networks map, of the territory of Moldova	36/01-08/1116
2.	Moldcell Company	ALRC requires the release of mobile cellphone communication networks map of Moldova from communication network "Moldcell"	36/01-08/1117
3.	Union Fenosa SA	ALRC requires the release of voltage networks schemes of 110 kW and 35 kW.	36/01-08/1118
4.	RED SUD SA	ALRC requires the release of voltage network schemes of 110 kW and 35 kW.	36/01-08/1119
5.	RED NORD SA	ALRC requires the release of voltage network schemes of 110 kW and 35 kW.	36/01-08/1120
6.	Orange Moldova SA	ALRC requires the release of mobile cellphone communication networks map from the communication network Agency "Orange".	36/01-08/1121

7.	"Apele Moldovei" Agency (Moldova's Water Agency)	ALRC requires the release of terrestrial and underground water pipelines map for creating the topographic map.	36/01-08/1122
8.	Statistics Bureau	ALRC requires the release of Statistic Data of different regions population in Republic of Moldova	36/01-08/1123
9.	Moldova Gaz SA	ALRC requires the release of gas networks map from the Gas Agency.	36/01-08/1124
10.	Hydrometeorologic State Service	ALRC requires the release of hydrometeorologic stations positioning map of Moldova	36/01-08/1125
11.	Institute of Forest Researches and Arrangements	ALRC requires the release of information on newly planted forest since 1975 and the protected areas map	36/01-08/1126

【3】 Selection of the areas for plotting using satellite imagery

In Phase 1, the counterpart requested the Team regarding areas shown in Figure 19 because of the following reasons:

- Areas receiving damage from floods that occurred after the taking of existing aerial photographs (2007), i.e., in 2008 along the Dniester River and in 2010 close to the Romanian border
- Urban developments in the environs of the capital
- Lack of existing aerial photographs covering border

The Team had a discussion with the counterpart regarding the areas for plotting using satellite imagery in view of these reasons and the results obtained in Step [2]. Figure 20 shows the results of discussion.

The areas for plotting using satellite imagery were selected while referring to the "Specification of map symbols for 1:50,000 topographic map" issued by Geospatial Information Authority of Japan in 1989 and considering the criteria for acquiring major ground features to be plotted in 1:50,000 topographic maps and the satellite images to be used (resolution of 2.5 m). From technological viewpoints, attention was paid to the facts that (1) the minimum range that can be represented as a polygon is 150 cm x 150 cm (60 pixels x 60 pixels or 3 mm x 3 mm on the maps) and that (2) the minimum unit of points that can be read in photo interpretation is 7.5 m x 7.5 m (3 pixels x 3 pixels).

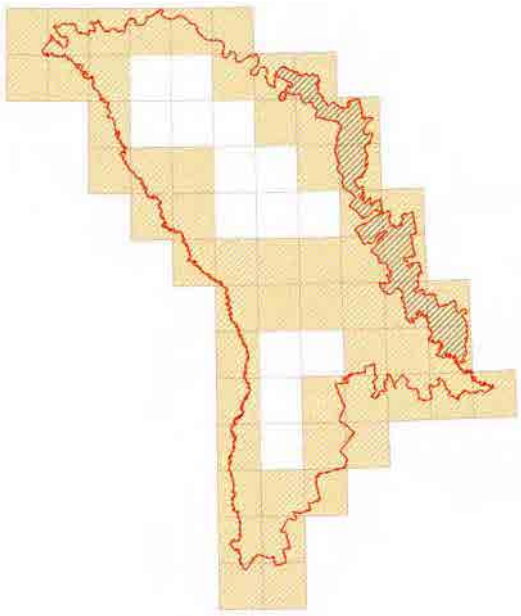


Figure 19 Areas initially assumed for plotting using satellite imagery

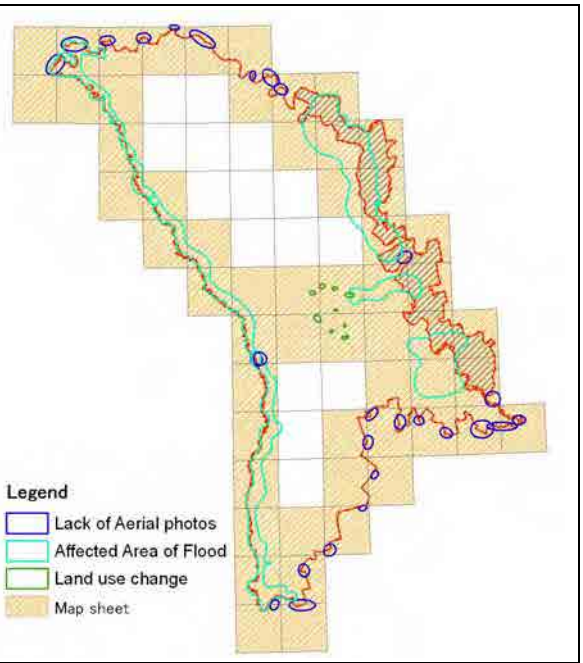


Figure 20 Areas determined for plotting using satellite imagery after discussion

【4】 Acquisition of satellite imagery

The Study assumed the use of ALOS (PRISM) satellite imagery. Therefore, the satellite images that cover the areas determined in Step [3] and the Transnistria area were examined for conformance to the following conditions: (1) Images taken of the area along the Prut in the western region in or after August 2010 (because a flood occurred in August 2010), (2) Images taken of the area along the Dniester (Nistru) in the eastern region in or after August 2008 (because a flood occurred in August 2008), (3) Images taken in or after August 2008 (because the existing aerial photographs were taken in May through November 2007), (4) Quality of satellite images (haze and cloud cover), and (5) lateral overlap and adjacent sidelap. As a result, only the ones shown in Figure 23 were found to meet the conditions (1) through (5) listed above.

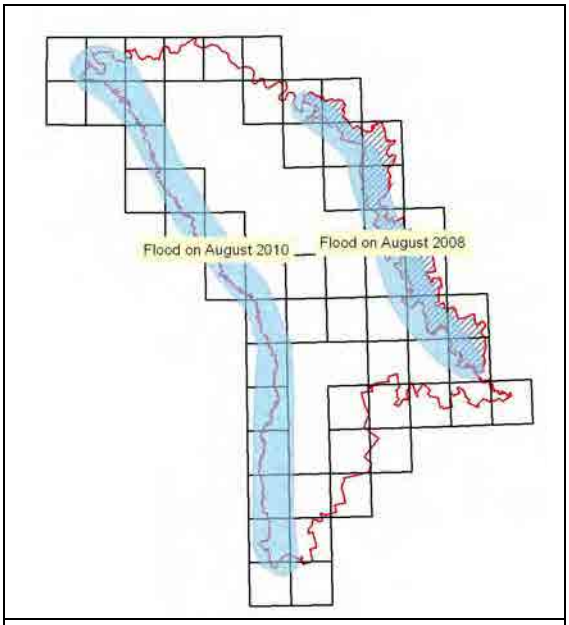


Figure 21 Flooded areas

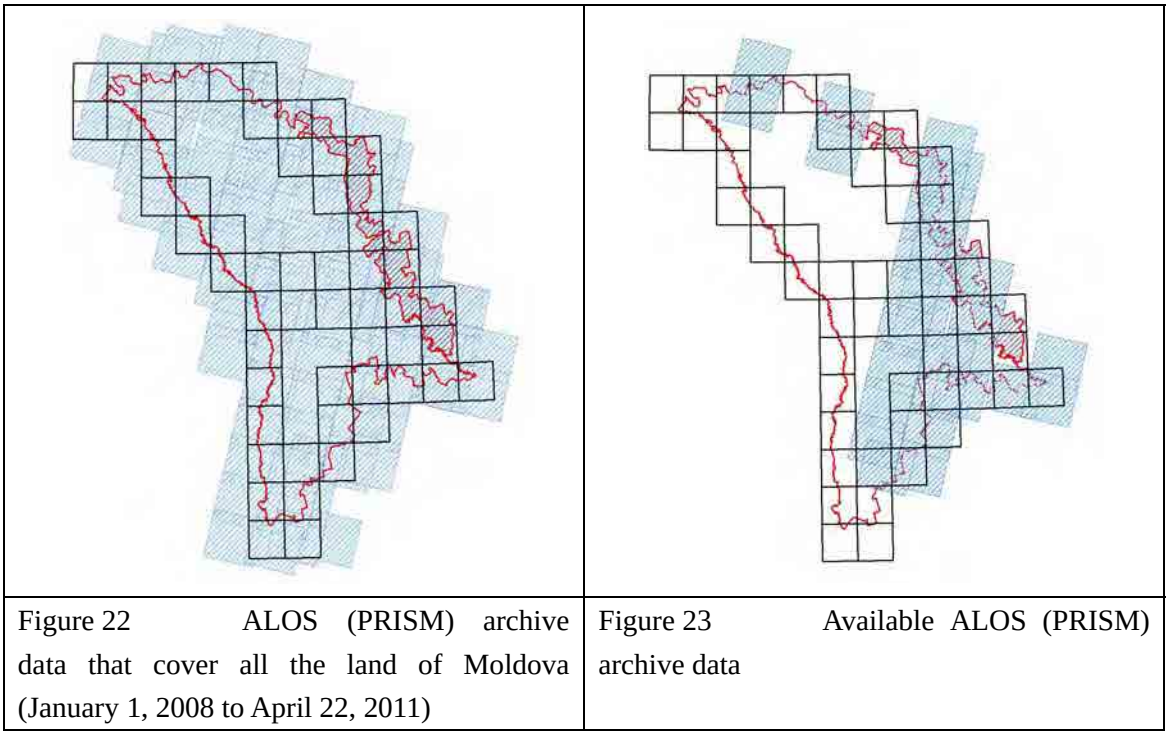


Figure 22 ALOS (PRISM) archive data that cover all the land of Moldova (January 1, 2008 to April 22, 2011)

Figure 23 Available ALOS (PRISM) archive data

The Team initially planned to procure ALOS (PRISM) data of newly captured images if appropriate ALOS (PRISM) archive data is not available. On April 22, 2011, however, the Japan Aerospace Exploration Agency (JAXA) announced that a power abnormality was discovered with ALOS and, on May 12 of the same year, it announced that the operation was terminated.

Therefore, the Team and the counterpart had a discussion on the satellite imagery required for the Study and considered the use of the imagery taken by satellites other than ALOS (PRISM) satellites which have a resolution equivalent to or better than ALOS (resolution of 2.5m or better). However, as the Team discovered later that it was difficult to obtain appropriate imagery taken by satellites other than ALOS, the Team and the counterpart had a new discussion on the satellite imagery and agreed on the

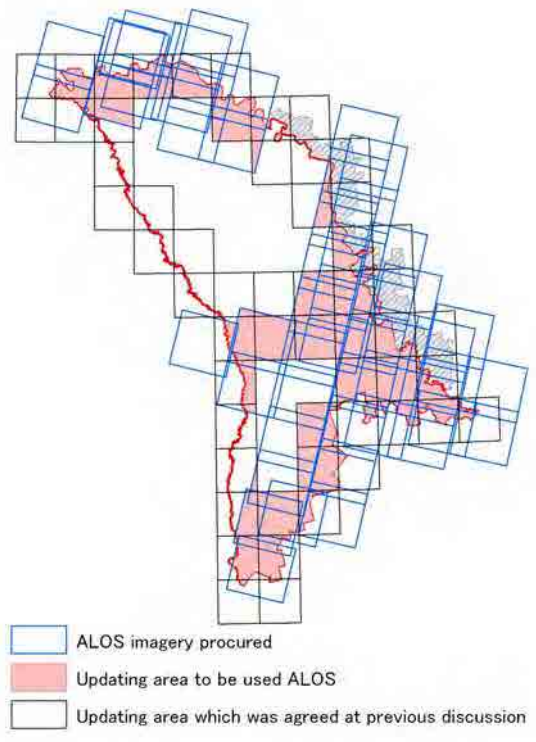


Figure 24 Areas for the procurement of satellite imagery and the areas for the use of satellite imagery for the creation of topographic map data provided in the final agreement

procurement of the satellite imagery of the areas shown in the Figure 24 and the areas in which the satellite imagery was to be used for the creation of digital topographic map data (a total area of 13,800 km^2).

The total number of the scenes of satellite imagery procured for the Study was 159. (As three different images from three different directions are taken for a single area in the ALOS satellite imagery, the total number of models was 53.)

The list of satellite imagery procured is shown in Appendix 11.

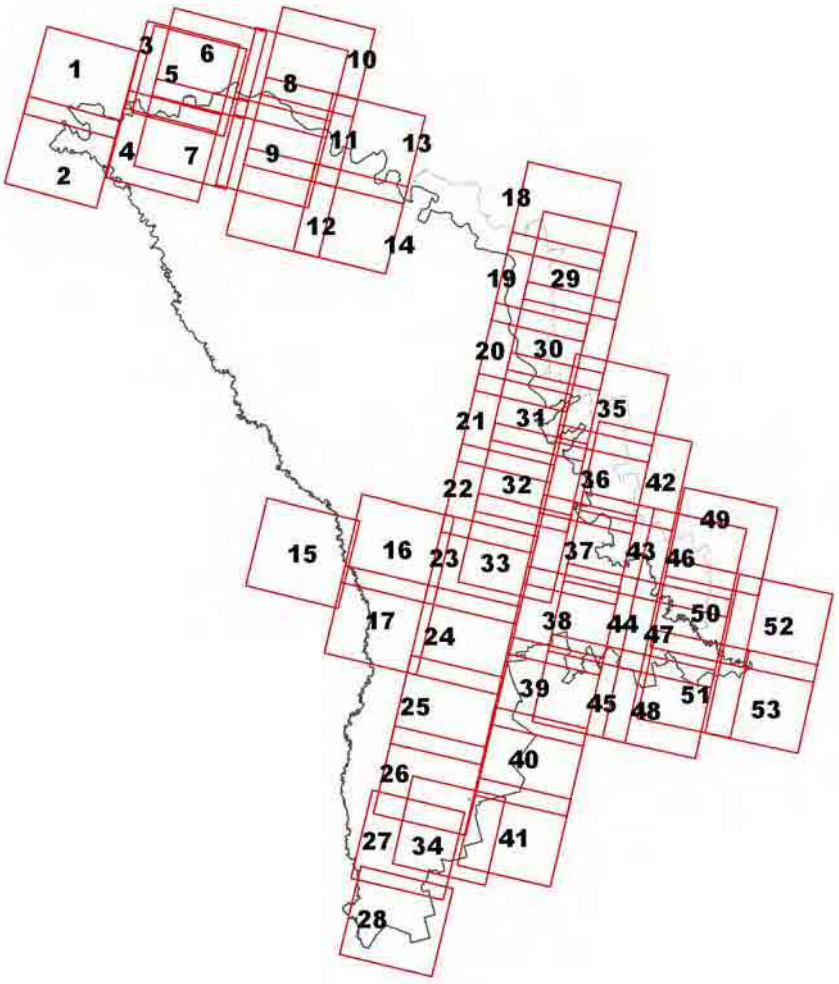


Figure 25 Satellite imagery procured

【5】 Aerial triangulation (Satellite images)

To build a stereo model required for the subsequent digital plotting process, the ground control points and tie points were observed and adjustment calculation using the Bundle method was performed, after importing the acquired satellite images and accompanying Rational Polynomial Coefficient (RPC) files into the digital photographic survey system.

When the ALOS (PRISM) satellite images are used, the following considerations are necessary: Since the PRISM sensor observes a single scene from three viewing directions (fore sight, nadir sight and back sight), all three images were used in the block adjustment.

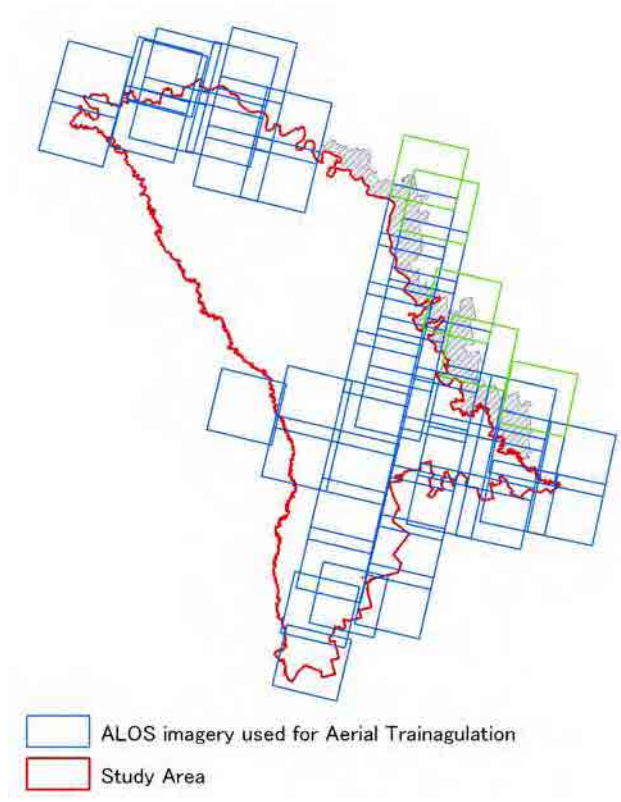


Figure 26 Scenes of the satellite imagery used in the aerial triangulation

As shown in Figure 26, not all the scenes of ALOS imagery procured in the Study are contiguous. Therefore, separate adjustment calculation was conducted for the 42-scene (14 models x 3 scenes) area in the north and the 102 scene (34 models x 3 line) area in the south. (The aerial triangulation of the areas marked with green boundary lines in Figure 26 (in Transnistria District) are out of the scope of the Study because the counterpart personnel are expected to do the aerial triangulation of these areas after the completion of the Study.)

Table 8 Result of the aerial triangulation (in the northern area)

Standards in the Survey Operation Manual of JICA (in the case of a scale of 1:50,000)			**Calculated value**
Geodetic control point residual	Horizontal position (standard deviation)	Less than 10.0m	0.621m
	Horizontal position (maximum)	Less than 20.0m	2.712m
	Elevation (standard deviation)	Less than 2.5m	0.448m
	Elevation (maximum)	Less than 5.0m	1.148m

Tie point mismatch	Standard deviation	Less than 1.0 pixel	0.17 pixels
	Maximum	Less than 2.0 pixels	1.33 pixels

Table 9 Result of the aerial triangulation (in the southern area)

Standards in the Survey Operation Manual of JICA (in the case of a scale of 1:50,000)			**Calculated value**
Geodetic control point residual	Horizontal position (standard deviation)	Less than 10.0m	0.690m
	Horizontal position (maximum)	Less than 20.0m	2.980m
	Elevation (standard deviation)	Less than 2.5m	0.361m
	Elevation (maximum)	Less than 5.0m	1.357m
Tie point mismatch	Standard deviation	Less than 1.0 pixel	0.19 pixels
	Maximum	Less than 2.0 pixels	1.64 pixels

The aerial triangulation was implemented without a problem for both areas because the values in Tables 8 and 9 are within the standard ranges.

【6】 Digital plotting

Digital plotting was implemented using the outputs of the aerial triangulation obtained in above-mentioned 2－2 [4] and 2－3 [5]. Digital plotting was performed based on the outcomes from aerial triangulation. In accordance with the agreements reached in the discussion on the specifications, the oriented stereo model was measured with a digital plotter in order to acquire the shape and position of ground features as graphic information and to obtain 1:50,000 topographic map data. Ground features were classified according to the topographic map data acquisition codes.

In the Study, satellite imagery and the existing aerial photographs were used for the creation of topographic map data of areas of *approx.* 13,800 km^2 and 16,200 km^2, respectively, in the total study area of *approx.* 30,000 km^2.

The table below shows the digital plotting systems used in this work.

	Software Name
Digital Photogrammetric System	Summit Evolution LPS
Data Plotting	AutoCAD Map MicroStation

【7】 Digital compilation

The digital compilation task included the integration of line data, data cleaning such as deletion of obsolete data, edge matching of adjacent maps on the vector data resulting from the digital plotting task, while compiling the data according to the field verification results.

The table below shows the software used in this work:

	Software Name
Digital Compilation	AutoCAD Map Bentley MAP

【8】 Data structurization / GIS database

The data for which the digital compilation is completed was structurized in GIS-applicable ways, according to the agreements reached in the discussion on the specifications. The format of the GIS database created by the structurization is the Geodatabase Format used in "ArcGIS," software of ESRI, procured in the Study for the technology transfer.

The Shape File Format is widely used as a format of GIS data and data in this format can be easily imported by other software. As the data in the Geodatabase Format used in the Study can be easily converted to that in the Shape File Format, data created in the Study can be distributed to users using software other than the one used in the Study without a problem. The Geodatabase Format has an advantage of supporting a function, topology management, which the Shape File Format does not support.

The data was structurized by map sheet. The figures below show the processes of data structurization by map sheet.

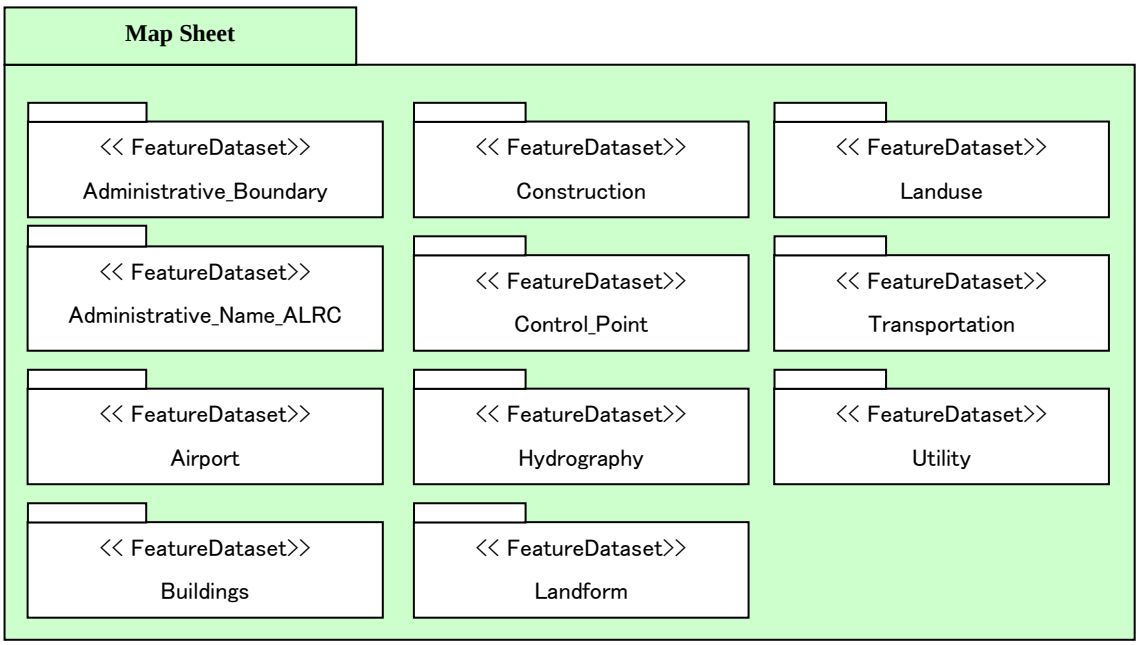


Figure 27 UML class diagram of GIS data

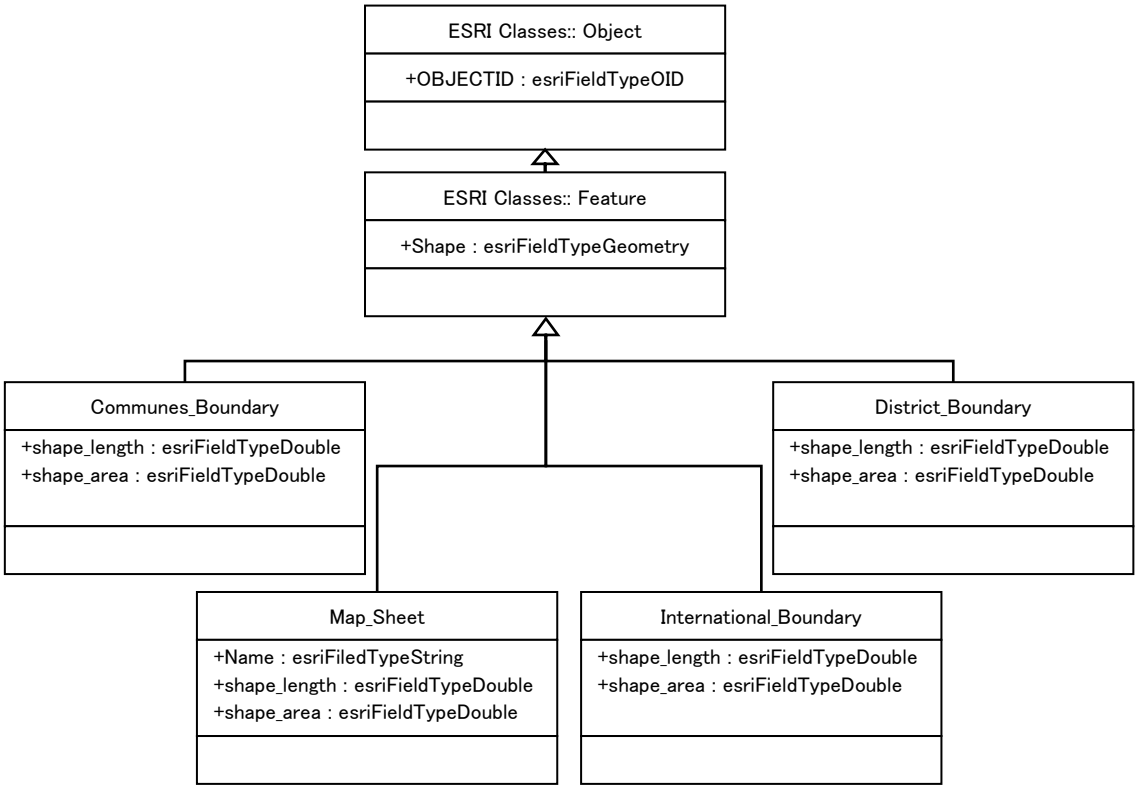


Figure 28 UML model of Administrative_Boundary package

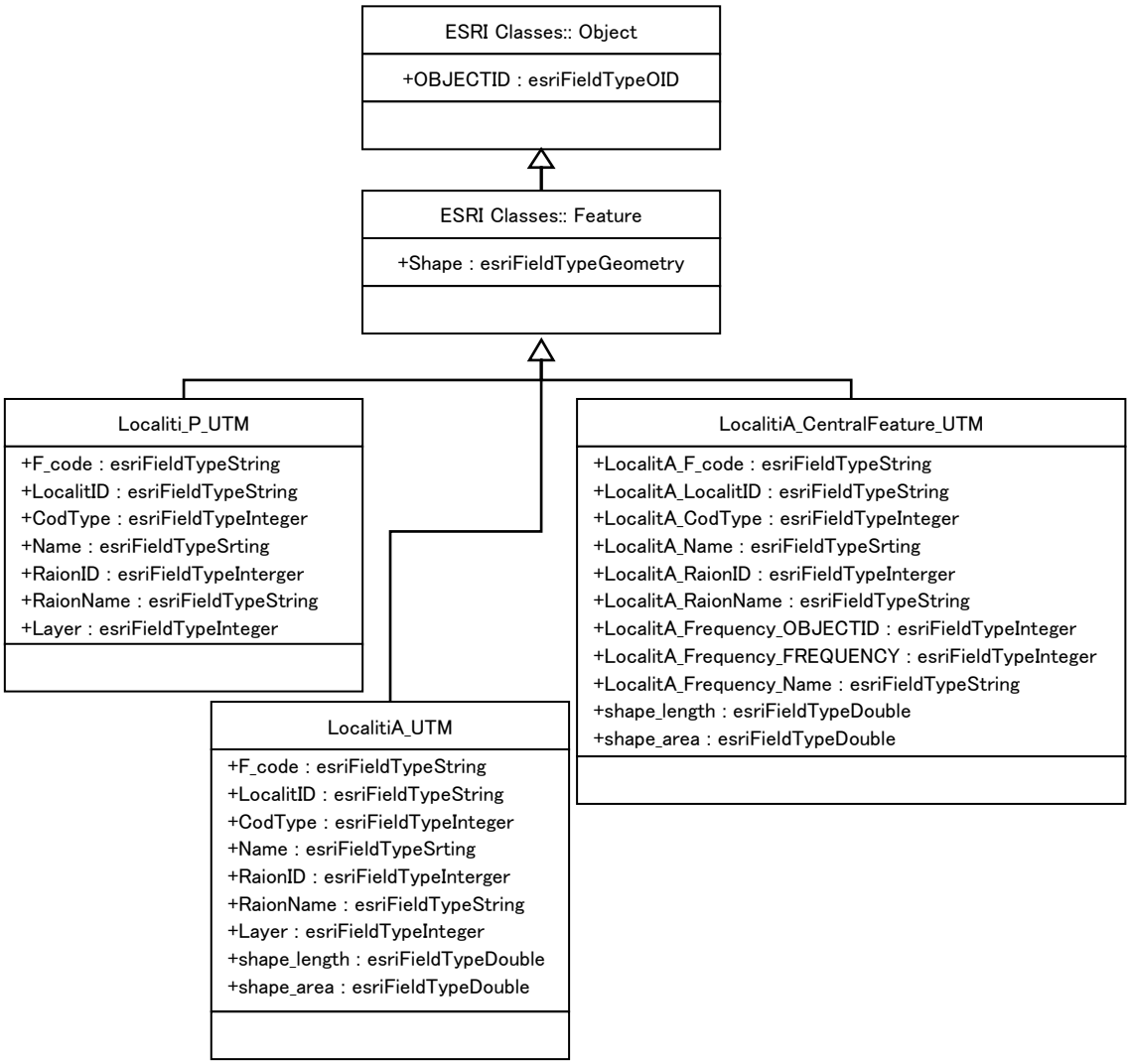


Figure 29 UML model of Administrative_Name_ALRC package

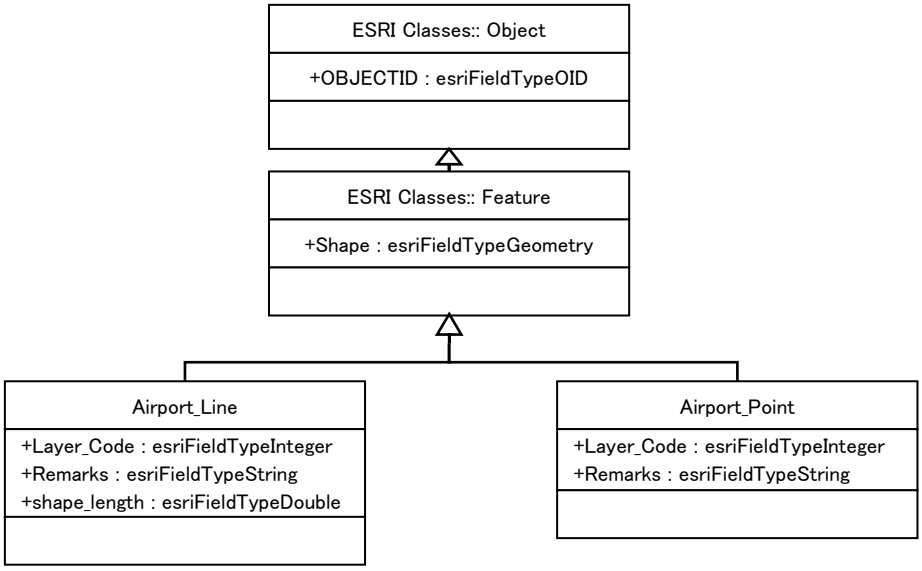


Figure 30 UML model of Airport package

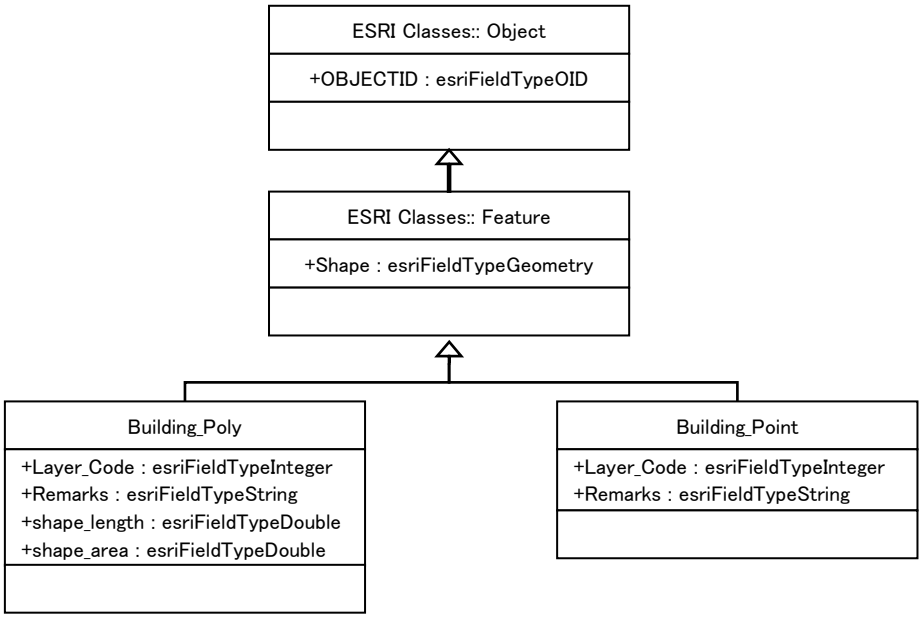


Figure 31 UML model of Buildings package

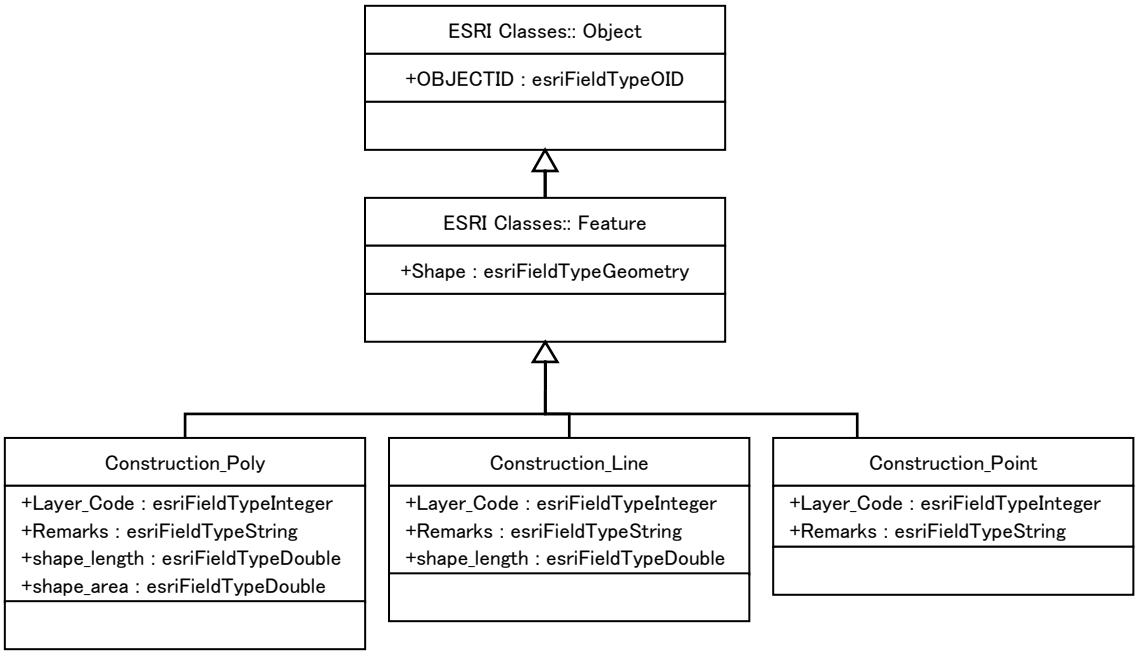


Figure 32 UML model of Construction package

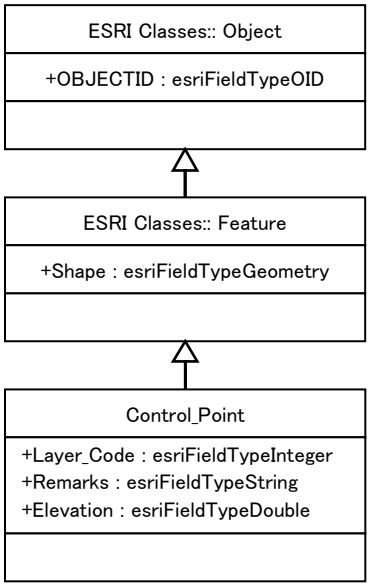


Figure 33 UML model of Control_Point package

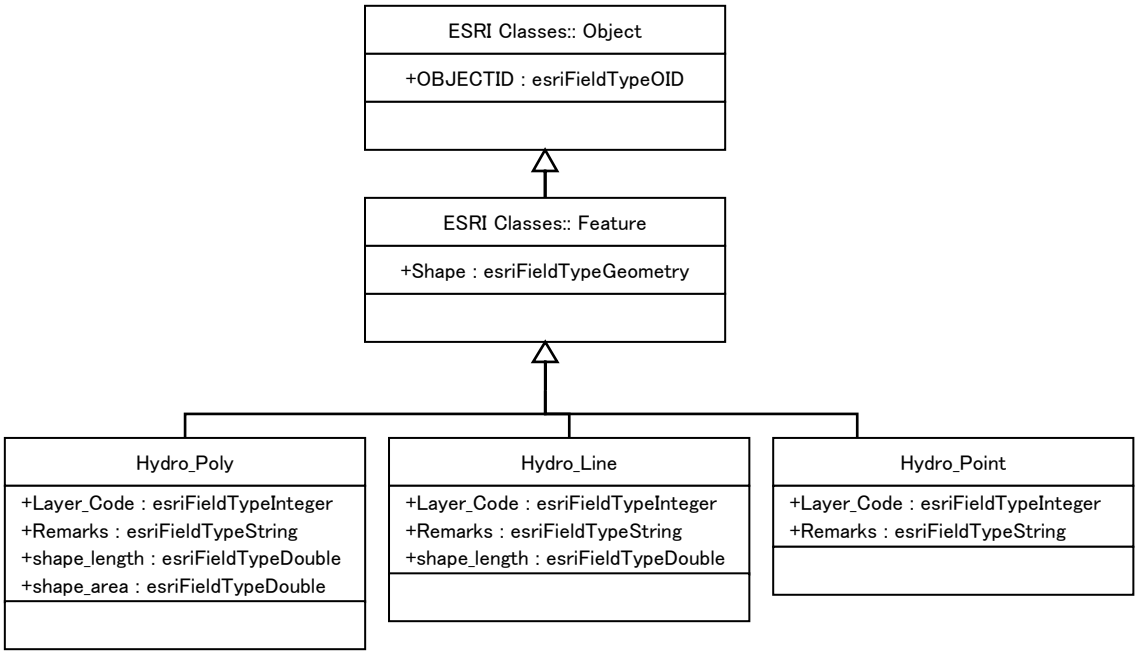


Figure 34 UML model of Hydrography package

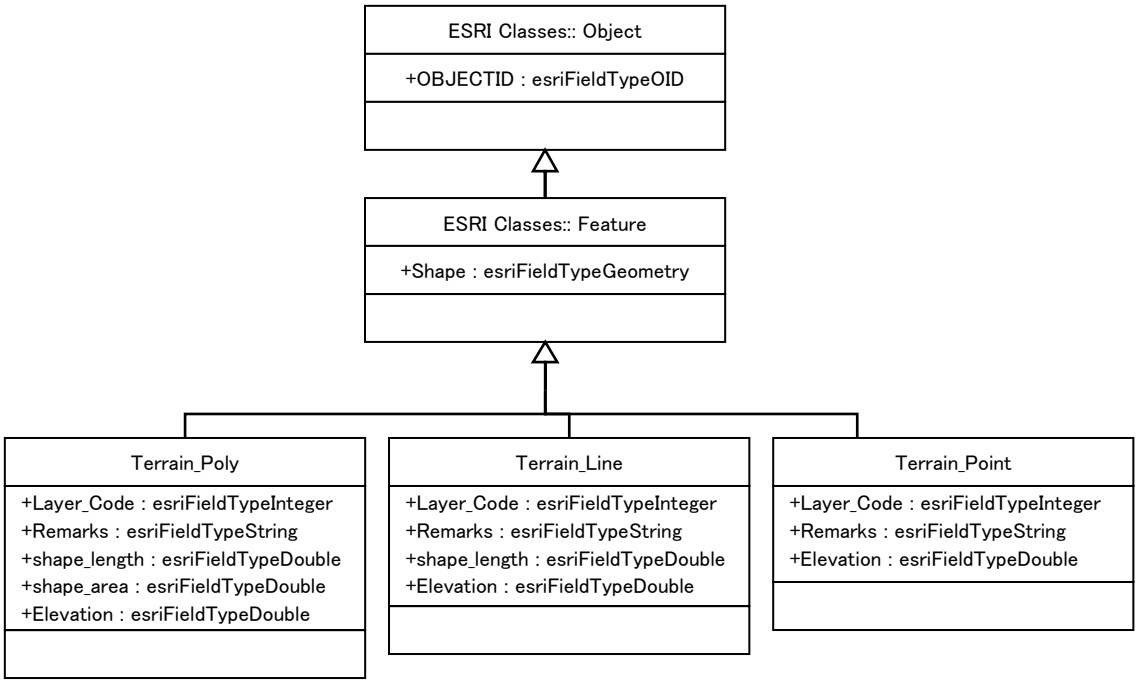


Figure 35 UML model of Landform package

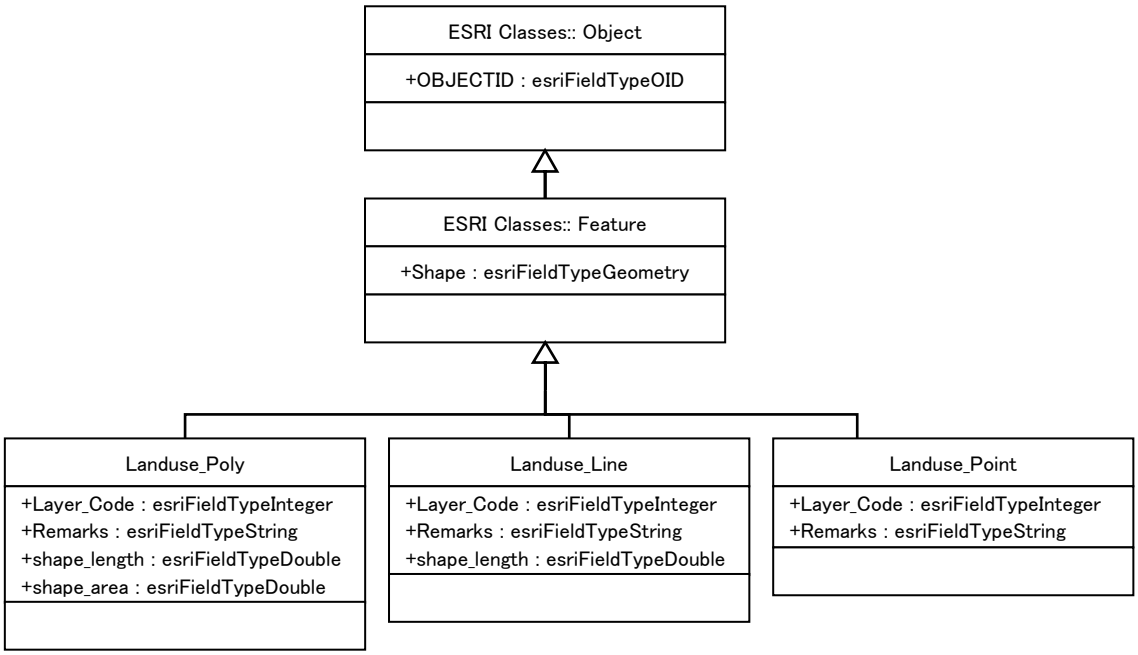


Figure 36 UML model of Landuse package

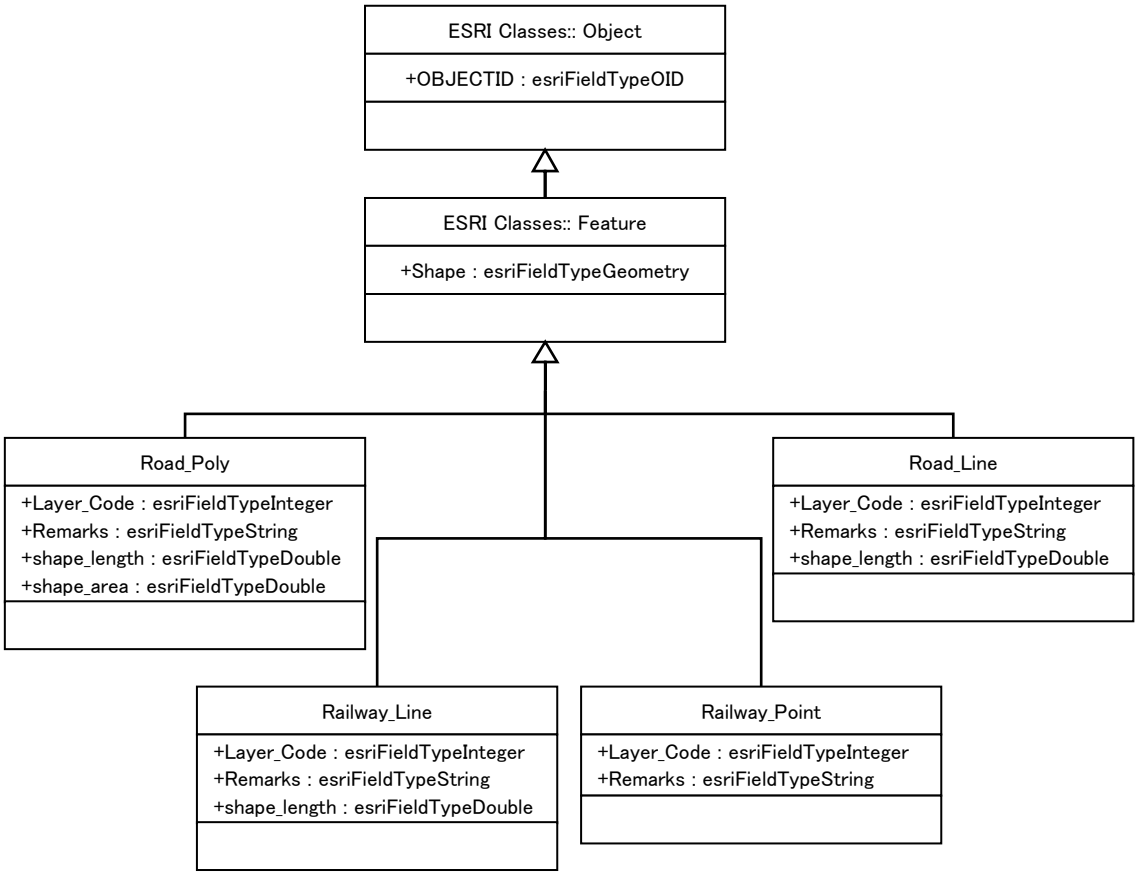


Figure 37 UML model of Transportation package

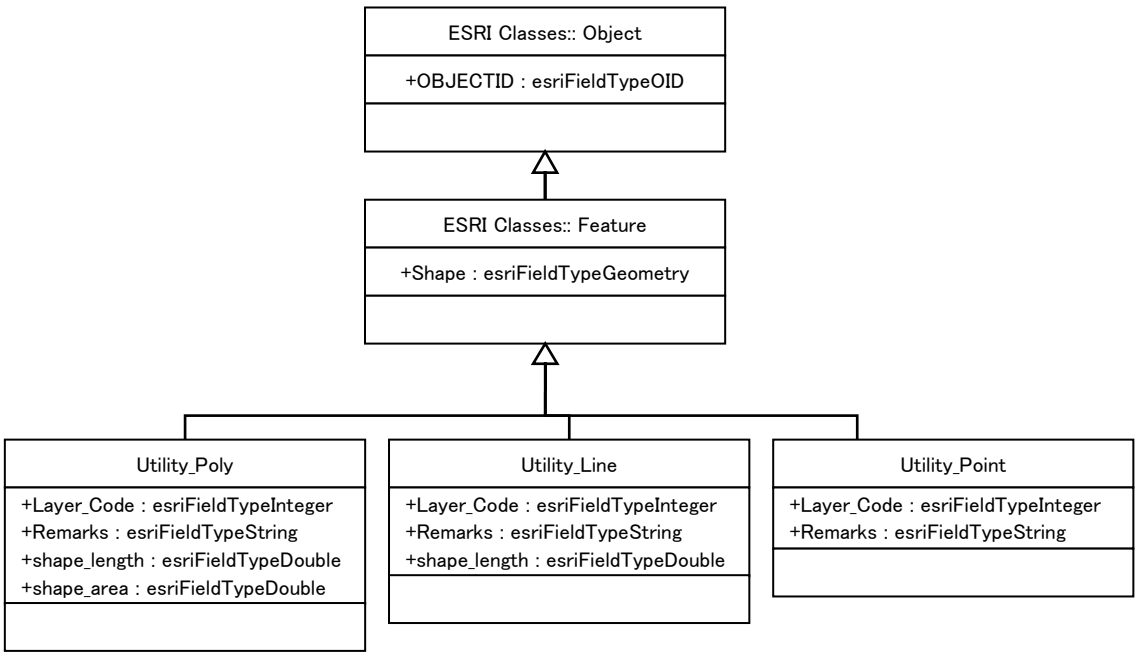


Figure 38 UML model of Utility package

【9】 Map symbolization

The Team created topographic map data from the digitally compiled data by applying the map symbols determined at the discussion on specifications to the digitally compiled data and by processing them in the map adjustment. The software used for map symbolization is Adobe Illustrator.

The figures below show an example of map symbolization.

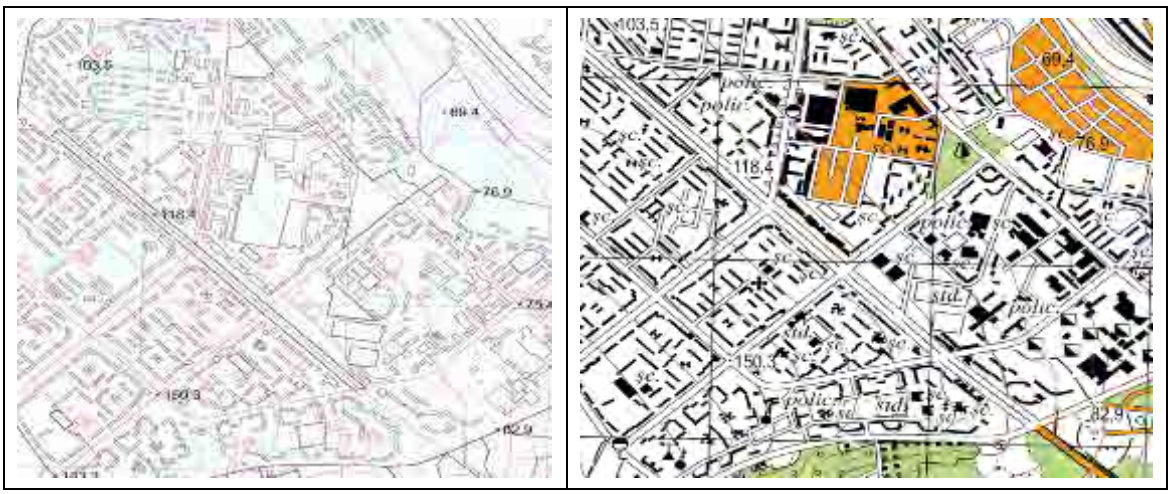


Figure 39 Maps before the symbolization (left) and after the symbolization (right)

As the currently available 1:50,000 scale topographic maps created at the time of the Soviet Union do not have a legend, a legend was created and attached to the topographic maps created in the Study. The figure below shows an example of the legend.

Figure 40 Legend attached to a topographic map created in the Study

【10】 Creation of brochures

As a tool of data use promotion, a brochure summarizing the contents and outputs from the Study has been prepared under agreement between the ALRC and the Team.

The brochure contains following topics.

- Mission of ALRC
- Historical review
- Aim of the Study and brief introduction of outputs
- Contribution to Moldova and ALRC
- Implication of active data utilization
- Implementation structure of the Study

【11】 Creation of digital data files

The topographic map data, GIS database and so on were saved and stored in removable storage media. As the total size of the data including the satellite imagery was approx. 100 GB, the data was saved on an external hard disk.

【12】 Holding Seminar

The seminars were held twice during the 2nd phase.

In the interim seminar, intermediate achievement was presented and participants were encouraged to utilize newest geospatial data to be prepared at a wide variety of scenes in each organization. A total of 73 people from 15 government offices including the Cabinet Office, 9 national organizations and 21 research institution/state enterprises attended in the seminar.

The Team elaborated on the successful progress of the works that were planned initially enhancing data dissemination expected after completion of the Study. The latter half, major

user from the governmental organizations put the agenda on data sharing of newly created dataset with ALRC and on cooperation for making the best use of the data to be created.

The main themes presented in their talk were as follows.

- The use of the data for forest management by Agency MOLDSILVA
- The use of the data for disaster prevention by Civil Protection and Emergency Situations Service
- The use of the data for land evaluation by Ministry of Agriculture and Food Industry.
- The use of the data for Monuments management and easy access by Agency for Inspection and Restoration of Monuments.

Finally they reached joint statement expressing below for the closer ties each other and deepening data sharing and utilization.

- Seminar participants admitted that digital topographic map will greatly contribute to the realization of the Governmental Activity Plan “European Integration: freedom, democracy welfare”, of the National Program for the e-Government and creation of National GIS.
- Knowledge and technology transfer is one of the crucial moments for the capacity building process in learning the new methodologies of digital mapping.
- Most of institutions have also raised the issue about building up their capabilities in terms of both human resources and advanced technology in relation to the digital data and GIS database so that they can extend for mutual collaboration in an interactive way in the near future.
- It is necessary to develop mutual cooperation in terms of the spatial data use through signing the inter-departmental collaboration agreements and representing mutual interests.

Figure 41 Interim seminar scenes

Table 10 List of participants in the Interim seminar

	Organization's name	No. of participants
1	State Chancellery	1
2	e-Government Center	1
3.	Academy of Sciences	1
4	Academy of Sciences, Institute of Geography	1
5	Technical University of Moldova	1
6	State Agricultural University of Moldova	1
7	Ministry of Foreign Affairs and European Integration	1
8	Ministry of Defense	1
9	Ministry of Agriculture and Food Industry	2
10	Ministry of Environment	2
11	Ministry of Culture	1
12	Ministry of Labor, Social Protection and Family	1
13	Ministry of Healthcare	1
14	Ministry of Information Technology and Communications	1
15	Ministry of Youth and Sports	1
16	Agriculture Interventions and Payments Agency	2
17	Agency for Geology and Mineral Resources	1
18	National Bureau of Statistics	1
19	Interethnic Relations Bureau	1
20	Border Service	2
21	Agency MOLDSILVA	1
22	Agency of Tourism	3
23	Agency for Inspection and Restoration of Monuments	1
24	State Ecologic Inspectorate	2
25	Civil Protection and Emergency Situations Service	2
26	State Hydrometeorological Service	1
27	Chisinau City Hall	2
28	S.E. MOLDATSA	3
29	S.C. "APA-CANAL CHISINAU"	3
30	Moldova's Waters Agency	3
31	S.E. URBANPROIECT	2
32	S.E. MOLDOVAGAZ	1
33	BLOM Moldova	1
34	Ministry of Environment	1
35	Agency for Land Relations and Cadaster	17
36	S.E. INGEOCAD	1

	Organization's name	No. of participants
37	S.E. CADASTRU	3
38	S.E. IPOT	2
39	JICA Study Team	5

The final seminar has been held to call for the positive use of created data by demonstrating the outputs published by ALRC. A final seminar was on 1st November, 2012 with approximately 130 participants from related ministries, agencies, organizations and academia..

Table 11 List of participants in the final seminar

	Organization's name	No. of participants
1.	State Chancellery of the Republic of Moldova	1
2.	Embassy of Japan in Kiev	3
3.	Ministry of Foreign Affairs and European Integration	1
4.	Ministry of Economy	2
5.	Academy of Sciences of Moldova	3
6.	Ministry of Agriculture and Food Industry	1
7.	Ministry of Internal Affairs / Civil Protection and Emergency Situations Service	1
8.	Ministry of Defense	1
9.	Ministry of Regional Development and Construction	1
10.	Ministry of Transport and Road Infrastructure	1
11.	Ministry of Environment	1
12.	Ministry of Information Technologies and Communications	3
13.	Agency "Moldsilva"	2
14.	Agency of Tourism	1
15.	Agency for Land Relations and Cadastre	18
16.	State Enterprise "INGEOCAD"	4
17.	State Enterprise IPOT	6
18.	State Enterprise "Cadastru"	2
19.	Technical University of Moldova	4
		8 (Students)
20.	State Agricultural University of Moldova	4
		17 (Students)
21.	Construction College Chisinau	1
22.	Union of Geodetic Surveyors of the Republic of Moldova	4
23.	Union of Geodetic Surveyors, Geologists and Cadastral Engineers of the Republic of Moldova	2

24.	Joint Stock Company , “APĂ-CANAL CHIŞINĂU”	2
25.	Land Direction and Land Relations, Municipality CHISINĂU	1
26.	Foreign Ownership Enterprise, “BLOM’’ S.R.L	4
27.	Mixed Enterprise “TRIMETRICA” S.R.L.	1
28.	S.E. “URBANPROIECT”	2
29.	“AFINĂ-VSh” S.R.L	2
30.	Mixed Enterprise “MERIDIAN DIGITAL” S.R.L.	2
31.	S.C.“GEOVANMAX” S.R.L.	1
32.	Agency for Geology and Mineral Resources	1
33.	Border Police	2
34.	National Bureau of Statistics	1
35.	“Geocontur” S.R.L	1
36.	“EugenUngureanu” S.R.L	1
37.	MoldaTSA	1
38.	S.J. C. Moldova Gaz	2
39.	CHISINAU GAZ	1
40.	POST OF MOLDOVA	1
41.	Ministry of Culture	1
42.	Agency for Inspection and Restoration of Monuments	1
43.	Analyst in business and use of data base - freelancer	1
44.	“Lenveta” S.R.L.	1
45.	JICA Study Team	5
46.	TV7 - television company	2
47.	Moldpres A.I.S. - news agency	2
48.	Euro TV	2

In the part early of seminar, overviews of the Study, technical aspects in the Study and future vision of ALRC were presented by the Team members and ALRC staff. In the second part, counterpart staff presented about technology and knowledge transferred through not only training in Moldova but also training in Japan, and the utilization of geospatial data were presented by promising users from relevant governmental organizations.

Those presenters are supposed to be involved to urge developing NSDI.

Figure 42 Final seminar scenes

【13】 Discussion of Draft Final Report

The Team explained about the Draft Final Report to the counterpart and discussed the contents, the result and other details of the Study.

Issues which were raised from the floor are as follows.

Question-1: When is the data creation completed and delivered exactly?
Answer-1 (the Team): We plan to finish the project and to deliver created topographic data by the end of this year.

Question-2: What do you mean by “quick launch of “New Geoportal”?
Answer-2 (the Team): We say “quick launch of “New Geoportal” meaning the upgrading of the existent Geoportal site by installing a new server with bigger memory and higher functional capacity. So, that you can upload the newly created data and could increase the number of application functions provided by Geoportal. In this way you can disseminate your data in more advanced way and for more users.

Question-3: What do you mean by “reform ALRC”?

Answer-3 (the Team): In this context, by “reform ALRC” we, first of all, mean the creation of a department or section within ALRC that will be responsible for collecting, uploading, maintenance, administration and dissemination of the data. Of course, in order to realize this task, you might need to increase the number of staff responsible for geospatial data administration. May be invite experts and young specialists in GIS domain. As well, you could consider approval of some new regulations related to standardization, like conformity with Inspire standards and regulations related to data distribution. May be come up with a payment system that will allow you to commercialize some products to a certain category of users, and using this fund you could administrate your newly created system (pay salary to new staff). Regarding this, it is also necessary to develop a policy or regulation in order to deal with partners (other ministries and institutions) in the domain of data sharing. Decide what kind of data can be easily accessed and downloaded from the site and what data need special permission to be used. In addition it is necessary to think of a way for data advertisement or promotion. So that more people could find out about existence of newly created data and could use it for a wider range of purposes.

Question-4: Could you give an example, in which country they managed to upgrade the concept of the portal for data distribution.
Answer-4 (the Team): One example could be our project in Madagascar. Where they managed to implement some of our recommendations and update and improve their GIS system.

Question-5: Who should be the staff of this new department, in your opinion? People from agency only? Or such institutions as INGEOCAD and others could be included?
Answer-5 (the Team): Actually these should be a team including staff from ALRC and relevant institutions.

3. Technology Transfer

3-1. Equipment installed for implementation of Technology Transfer

In advance for consulting equipment and materials required for Technology Transfer, an investigation was made focusing on the equipment and apparatus which the counterpart owned presently. Table 12 shown below is the result.

Table 12 List of current equipment in the counterpart

Item	Maker	Model	Number	Year purchased	Remarks
GPS	LEICA	GPS System 9500	6	1998	Not working
	LEICA	GPS System 500	8	2000	Not working -5
	LEICA	GPS System 1200	2	2006	Using in the field
	LEICA	Viva GS10	3	2010	Using in the field
Total Station	LEICA	TC 1100	8	1998	Using in the field
	LEICA	TCR 403	2	2000	Using in the field
	LEICA	TC 2003	1	1998	Using in metrology
Level	LEICA	NA 3003	2	1999	Not working - 1
Other	НППП "Геосистема"	Digital photogrammetric station “Delta”	10	2005	Using in production
	LEICA	Analytic photogrammetric station SD 3000	2	1998	Using in production
	LH SYSTEM	Digital photogrammetric station DPW 770	2	1999	Not working
	HP	Plotter Design 1055CM	1	1999	Using in production
	Epson	Plotter Stylus PRO 656000	1	2009	Using in production
	LH SYSTEM	Digital photogrammetric scanner DSW 300	1	1999	Not working

Further discussions were repeatedly made with the counterpart on the list of materials and equipment for technology transfer to be procures in the Study (Table 13) referring to the results clarified in Table 12.

In those discussions there were no objections to the idea based upon the list, and then both sides reached basically mutual consent in determination of proposed equipment. However, several requests and desires were raised for consideration. Those are;

- Brand of GPS would not necessarily be specified.
- It would be better to add handheld GPS’s that works for data correction in the

field.

- As for software for GIS, it is not necessary to purchase the newest version if the existing GIS software could be updated in functions.
- Possibility that we could minimize the budget by avoiding duplication in purchase of same equipment as existing one in ALRC.

The Team presented the following responses to the above-mentioned requests and suggestions. The counterparts were satisfied with the responses on the whole.

- It might be better if brand of proposed equipment can be same as existing one so that the training in OJT can done well due to familiar uses.
- It is uncertain whether the equipment and materials currently owned by the counterpart will be always available for the Study. (The use of the equipment and materials of the counterpart for the Study may obstruct ordinary work of the counterpart)
- It is also advisable to know current situation of dealers in practice of services in Moldova and neighbor countries.
- It looks updating of existing software owned by ALRC is difficult through the registration of end user.
- Technology Transfer should be implemented through the use of the latest functions that will be available from software of the newest version.
- Number of equipment in the Table 13 is minimum requirement for the smooth implementation of Technology Transfer.

Considering the above knowledge and suggestions, the Team came to judge that the listed equipment as originally planned on the list of materials and equipment for technology transfer (Table 13) after consultation with JICA.

Table 13 List of materials and equipment for technology transfer

Equipment	Q'ty	Place of procurement
GPS survey equipment	2	Procured in Japan
GPS analysis software	1	Procured in Japan
Note PC for GCP survey analysis	1	Procured in Japan
Handy GPS receiver (with rechargeable batteries)	4	Procured in Japan
Digital camera (with data storage media)	4	Procured in Japan
Basic software for Aerial Triangulation (AT), digitization and compilation	1	Procured in Japan
Software for AT, digitization and compilation (Stereo viewing)	1	Procured in Japan
Software for AT (Block adjustment)	1	Procured in Japan
Software for AT (DEM generation)	1	Procured in Japan
Basic software for digitization and compilation	1	Procured in Japan

Equipment	Q'ty	Place of procurement
Software for digitization and compilation (DEM editing)	1	Procured in Japan
Software for digitization and compilation (Data acquisition)	1	Procured in Japan
Software for digitization and compilation (Data editing)	1	Procured in Japan
GIS structurization software	1	Procured in Moldova
GIS utilization software (3D analysis)	1	Procured in Moldova
GIS utilization software (Spatial analysis)	1	Procured in Moldova
GIS utilization software (Network analysis)	1	Procured in Moldova
Map symbolization software	1	Procured in Japan
Image processing software	1	Procured in Japan
Workstation (for the digital plotter)	1	Procured in Japan
Personal computer	1	Procured in Japan
Printer (A3 size, with supplies)	1	Procured in Moldova
Stereoscopic display	1	Procured in Japan
Mouse for photogrammetry	1	Procured in Japan
HDD for the data server	1	Procured in Moldova
Compound machine（map scanner and printer for printed maps）with supplies (A0size)	1	Procured in Moldova
Uninterrupted power supply (UPS)	2	Procured in Moldova

The list of equipment installed finally is shown in Table 14.

Table 14 List of equipment installed

Equipment		Brand	Quantity
Photogrammetric Software	LPS Core	ERDAS	1
	LPS Stereo		1
	ORIMA/DP-TE/GPS		1
	LPS ATE		1
	LPS Pro600		1
	LPS TE		1
Photogrammetric Mouse	USB Topo Mouse		1
Plotting & Editing Software	Micro station	Bentley	1
Editing Soft ware	Bentley Map		1
Symbolization Soft ware	Illustrator CS5	Adobe	1
Image Processing Soft ware	Photoshop CS5		1
Stereo-Monitor	Planner SD2620W	Planar	1
Work Station	Precision T7500	Dell	2
	24inchi Wide TFT Color		2

Equipment		Brand	Quantity
	1.44MB Floppy Disc		1
	C-Type Plug Adapter	-	2
Documentation Soft Ware	Office 2010 Professional	Microsoft	2
GPS receiver	GS10 Professional receiver	Leica	1
	GVP647, Minipack for GNSS receiver		1
Software for GPS	LGO (Leica Geo Office ver8) Node locked license		1
	L1/L2 Adjustment Option		1
	RINEX Import Option		1
	Datum Map Option		1
	3D Network Adjustment Option		1
Personal Computer for GPS	Latitude E4310	Dell	1
GIS Software	Arc Info	ESRI	1
	3D Analyst		1
	Spatial Analyst		1
	Network Analyst		1
Handy GPS	GPSMAP 62s	Garmin	4
Digital camera with Memory Card	EX-H20G	Casio	4
Printer	Color Laser Jet CP5525dn	HP	1
Plotter	DESIGNJET T1200 HD MULTI-FUNCTION PRINT	HP	1
UPS	T1500 G3	HP	2

3-2. Ground Control Point Survey

The table below shows the contents of the technology transfer in ground control point survey. The technology transfer described below was implemented in accordance with this plan.

Item	Description	Main aims
GCP survey, leveling, and analysis	Field reconnaissance for selection of GCPs	・ Understanding about GCP survey indispensable for creating topographic map data (with the use of satellite imagery, in particular).
	GCP survey	
	Leveling	

Item	Description	Main aims
	Analysis	・ How to use GPS equipment and conduct analysis with it. ・ How to make pricking. ・ How to formulate a description of GCP.

(1) Preparation

a. Selection of participants in technology transfer

The Team explained the overview of technology transfer on ground control point survey to the counterpart and requested the ALRC to select participants in technology transfer. As a result, the following five specialists were selected.

	Participants	Affiliation
1	Mr. BOLOHAN Ion	ALRC
2	Mr. DANII Ivon	ALRC
3	Mr. MIHOV Vladimir	ALRC
4	Mr. EREMIA Ion	ALRC
5	Mr. NAGORNEAC Constantin	INGEOCAD

b. Questionnaire and hearing surveys

Questionnaire and hearing surveys were carried out with the five participants in technology transfer to ask them about their knowledge and experience in order to determine the content and level of technology transfer to ensure better understanding on the part of the participants.

The surveys revealed that the above five young specialists have technical knowledge on ground control point survey, but did not have experience in GPS observation or baseline analysis (refer to Appendix-9).

Figure 43 Hearing survey prior to Technology Transfer

Therefore, the following schedule was adopted, starting from the general explanation of basic ground control point survey and allowing the participants to have many opportunities for carrying out actual observation and calculation.

(2) Contents

The technology transfer was carried out from June 20 to July 6, 2011. The schedule and content of the technology transfer are as shown below:

- Day 1: Overview of ground control point survey and GPS observation
- Day 2: How to operate GPS devices and carry out observation
- Day 3: How to carry out GPS calculation (data download, baseline analysis, network adjustment computation, etc.), signalization for aerial photos and pricking, leveling, and compiling a description of GCP
- Days 4 - 8: Review by participants in technology transfer
- Day 9: Test observation by participants in technology transfer (1st day)
- Day 10: Test observation by participants in technology transfer (2nd day)
- Day 11: Test analysis and creation of a detailed list by participants in technology transfer

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Explanation of overview</td><td>Explanation of operation methods</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Explanation of observation methods</td><td>Test observation</td></tr>
</table>

Test observation

Indoor training

Figure 44 Technology transfer (Ground control point survey)

(3) Evaluation

The possible indexes and the initially assumed target values to be used to evaluate the achievement level of this technology transfer are as shown below.

Evaluation item	Index	Target level	Result
Participation in technology transfer	Number of days of participation	80% or higher	100% participation
Result of test observation and analysis	GPS observation field book and calculation book	Within accuracy of required quality	Achieved

All of the participants participated in the technology transfer throughout the period from the 1st to 11th days. They were very serious in their attitudes and had a high awareness toward the technology transfer.

The results of test observation and analysis from the 9th to 11th day were used as the final evaluation index of technology transfer on ground control point survey. The test observation results, i.e., the results of calculation and analysis conducted by the participants, were compared with the results of calculation conducted by the Team in advance and turned out to be exactly the same.

Therefore, it can be concluded that the technology transfer on ground control point survey has been achieved.

The Team revealed this evaluation result to all the technology transfer participants on the last day and advised them to deepen their knowledge on their own because the actual ground control point survey process would involve much more work load.

3-3. Field Verification

The table below shows the contents of the technology transfer in field verification. The technology transfer described below was implemented in accordance with this plan.

Item	Description	Main aims
Field verification	Preliminary photo interpretation	・ How to conduct preliminary photo interpretation ・ Method for field verification using orthophotos ・ Method for field verification depending on map scale ・ How to make use of a handy GPS receiver ・ How to make use of a GPS-enabled digital camera ・ How to organize the field verification result
	Field verification	
	Organization of field verification results	

(1) Preparation

a. Selection of participants in technology transfer

The Team explained the overview of technology transfer on field verification to the counterpart and requested the ALRC to select participants in technology transfer. As a result, the following five specialists were selected:

	Participants	Affiliation
1	Mr. BOLOHAN Ion	ALRC
2	Mr. DANII Ivon	ALRC
3	Mr. MIHOV Vladimir	ALRC
4	Mr. EREMIA Ion	ALRC
5	Mr. NAGORNEAC Constantin	INGEOCAD

b. Questionnaire and hearing surveys

In the same way as for ground control point survey described earlier, questionnaire and hearing surveys were carried out with the five participants in technology transfer to ask them about their knowledge and experience in order to determine the content and level of technology transfer to ensure better understanding on the part of the participants.

The surveys revealed that the engineers recognized the necessity of field verification and had a basic ability required to implement this task (the ability to identify their own position in a topographic map) but had little knowledge and experience in the method of actual operation. It

also turned out that there is no guideline for the items required to conduct this operation (refer to Appendix-9).

Therefore, the Team decided to create a guideline regarding field verification, explain the basic items in the operation method according to this guideline in advance, and explain the details while actually carrying out verification in the field.

(2) Contents

The technology transfer was carried out from July 7 to 20, 2011. The target area was the one covered by the OJT target maps shown in Figure 11. The schedule and content of the technology transfer are as shown below.

- Day 1: Overview of field verification and preliminary photo interpretation
- Day 2: Preliminary photo interpretation (For half of the day, the Team members in charge audited how the work had been done for the sake of evaluating technology transfer.)
- Days 3-7: Field verification (On the 7th day, the Team members in charge audited how the work had been done for the sake of evaluating technology transfer.)
- Days 8 and 9: Organization of field verification results (For half of the 9th day, the Team members in charge audited how the work had been done for the sake of evaluating technology transfer.)
- Day 10: Practice of making photo interpretation keys.

	
Explanation of overview	Tools used for preliminary photo interpretation
	
Preliminary photo interpretation	How route check is done before departure

	
Teaching by the Team member	Field verification by the counterpart engineer
	
Field verification by the counterpart engineers	Results of field verification

Figure 45 Technology transfer (Field verification)

(3) Evaluation

The following indexes and target values were established to be used to evaluate the technology transfer.

Evaluation method		Index	Target level	Result
Willingness to participate in technology transfer		Number of days of participation	80% or higher	100% participation
Actual operation	Preliminary photo interpretation	Understanding of preliminary photo interpretation operation	Field verification items to be checked are marked on orthophotos.	No problem
	Field verification	Accurate field verification of verification items	Using handy GPS receivers, verification results are recorded at accurate positions using specified symbols.	No problem
	Organization	Organization of verification results on new orthophotos	All the verified items are transcribed.	No problem

① Willingness to participate in technology transfer

All the participants were very serious in their attitudes and had a high awareness toward the technology transfer.

② Actual operation

The Team members observed the participants' work on the last day to explore the level of understanding of each item. The tasks carried out only by the counterpart engineers were observed to determine whether the above target values have been achieved.

The participants understood the verification items in terms of 1:50,000 topographic maps, the objective of the Study, and carried out the tasks in the field without any problems, such as a hearing survey on local residents and recording of target objects on orthophotos using handy GPS receivers.

The participants also organized the results of field verification, bearing in mind that they would be used in the subsequent process of plotting so that no problem was observed.

Therefore, it can be concluded that the technology transfer on field verification has been achieved.

The Team revealed this evaluation result to all the technology transfer participants on the last day and advised them that, when they carry out field verification on their own using what they learned in this technology transfer, they will need to examine the work plan and method according to the data specifications because then the data scale, etc. are expected to be different.

3-4. Aerial Triangulation

The table below shows the contents of the technology transfer in aerial triangulation. The technology transfer described below was implemented in accordance with the plan.

Item	Description	Main aims
Aerial triangulation	In the case where satellite imagery is used In the case where aerial photographs are used	・ How to operate the hardware and software ・ How to import satellite imagery/aerial photographs and the result of the GCP survey ・ Difference between satellite imagery and aerial photographs ・ How to evaluate a report on the result of aerial triangulation

(1) Schedule

The first half of the technology transfer on the basic issues was implemented in December 2012. The second half was implemented in April - May 2012.

(2) Preparation

a. Selection of the recipients of the technology transfer

The Team explained the outline of the contents of the technology transfer in aerial triangulation to the counterpart personnel and asked them to select the participants of the technology transfer. They selected the engineers listed in the tables below as the participants.

First half (December 2011)

	Participants	Affiliation
1	Ms. Rudenco Tamara	ALRC
2	Ms. Svetlana Zaharchina	INGEOCAD
3	Mr. Paharikov Igor	INGEOCAD
4	Ms. Scurtu Cristina	INGEOCAD

Second half (April–May 2012)

	Participants	Affiliation
1	Ms. Svetlana Zaharchina	INGEOCAD
2	Ms. Scurtu Cristina	INGEOCAD
3	Ms. Cusnir Lucia	ALRC
4	Mr. Sergiu Chirilor	Military Topography Centre, Ministry of Defense

b. Questionnaire and hearing survey

A questionnaire and hearing survey of the participants on their knowledge and experience in aerial triangulation was conducted before the implementation of the technology transfer. The aim of the survey was to decide the contents and technical level of the technology transfer which would realize the maximum benefit to the participants.

The survey revealed that some of the participants were engineers who had acquired rich knowledge and experience in practical work including aerial triangulation through their ordinary work, while others had some knowledge, but little experience in the practical work. The survey also revealed that all the participants had little experience in digital plotting for small-scale map creation and no experience in using satellite imagery.

Therefore, the Team decided to implement the technical transfer in accordance with the schedule mentioned below which began with a lesson on the basic operation of the software, in order to achieve the objective of familiarizing the participants with the basic operation of the software for aerial triangulation and the basic facts and processing of satellite imagery required particularly for the creation of small-scale maps.

(3) Contents

The dates for the first and second halves of the technology transfer were set between December 13 and 22, 2011 and between April 25 and May 23, 2012, respectively. The following describes the contents of technology transfer by day.

First half (December 2011)

- Day 1: Outline of aerial triangulation
- Day 2: Aerial triangulation with LPS (Setting of a stereo monitor and materials to be prepared)
- Day 3: Aerial triangulation with LPS (Selection of the projection system and import of orientation parameters and photographs)
- Day 4: Aerial triangulation with LPS (Observation of tie points and observation of control points)
- Day 5: Aerial triangulation with LPS (Adjustment calculation and verification with a plotter)
- Day 6: Aerial triangulation with LPS (Practice)
- Day 7: Overview of satellite imagery

Second half (April – May 2012)

- Day 1: Aerial Triangulation with ORIMA (Review of the operation of LPS and setting of LPS)
- Day 2: Aerial Triangulation with ORIMA (Adjustment calculation)
- Day 3: Aerial Triangulation with ORIMA (Accuracy control)
- Day 4: Orientation of satellite imagery with LPS
- Day 5: Aerial Triangulation with satellite imagery and ORIMA


Figure 46 Technology transfer (in aerial triangulation)

(4) Evaluation

All the participants were extremely serious during the technology transfer. They asked many questions and practiced the operation of the software actively and repeatedly. Such attitude was indicative of their keenness regarding the technology transfer. They showed particularly enthusiastic interest in the technologies using satellite imagery and took the lessons on them earnestly.

The participants had no problem in learning the operation of the hardware or software because they had basic knowledge of photogrammetry, despite the fact the hardware and software used in the technology transfer were different from ones which they used in their ordinary work.

In the lesson on import of satellite imagery/aerial photographs and the result of the GCP survey, the participants had some initial difficulty in interpreting satellite imagery. However, they mastered it shortly because satellite imagery was to be interpreted in the same way as aerial photographs.

The participants learned the difference between satellite imagery and aerial photographs through the general explanation on satellite imagery and the practice of software operation. The Team recommended accumulation of experience in practical work for them as a means to upgrade their understanding of the technologies.

The team recommended improvement in the accuracy of the aerial triangulation by “brushing up” the accuracy control currently used by them using an example of the accuracy control implemented in Japan as reference.

The format used in the technology transfer was demonstration of operation and explanation by the Japanese expert followed by the operation by the participants for each software application. The Team has confirmed through the observation of the activities of the participants that they have acquired an ability to identify where they made an operational error and correct the error by themselves using their basic knowledge and experience in using other software which they had had before the technology transfer.

The Team has concluded that the main aims of the technology transfer have been achieved on the basis of the above-mentioned observations.

3-5. Digital Plotting

The table below shows the contents of the technology transfer in digital plotting. The technology transfer described below was implemented in accordance with this plan.

Item	Description	Main aims
Digital plotting	In the case where satellite imagery is used In the case where aerial photographs are used	・ How to operate the hardware and software ・ How to acquire data by data type ・ How to acquire feature data at different map scales (difference in the specifications for data acquisition by difference in plotting scale and ground resolution) ・ How to inspect plotted data

(1) Schedule

The technology transfer in digital plotting was implemented from April 2012.

(2) Preparation

a. Selection of the participants of the technology transfer

The Team explained the outline of the contents of the technology transfer in digital plotting to the counterparts and asked them to select its participants. They selected the engineers listed in the table below as the participants.

	Participants	Affiliation
1	Ms. Svetlana Zaharchina	INGEOCAD
2	Ms. Scurtu Cristina	INGEOCAD
3	Ms. Cusnir Lucia	ALRC
4	Mr. Sergiu Chirilor	Military Topography Centre, Ministry of Defense

b. Questionnaire and hearing survey

A questionnaire and hearing survey of the participants on their knowledge and experience in digital plotting was conducted before the implementation of the technology transfer. The aim of the survey was to decide the contents and technical level of the technology transfer which

would realize the maximum benefit to the participants.

The survey revealed that some of the participants were engineers who had acquired rich knowledge and experience in digital plotting through their ordinary work, while others had some knowledge, but little experience in the practical work. Therefore, the Team decided to implement the technology transfer in accordance with the scheduled mentioned in the following section. The schedule began with a lesson on basic operation of the software, which all the participants had to master, and included plotting of data of Transnistria District requested by the counterparts in the final stage.

(3) Contents

The technology transfer was implemented from 25th April to 23rd May 2012. The following describes the contents of the technology transfer by day.

- Day 1: Digital plotting with PRO600 (Outline of digital plotting and basic operation of the hardware)
- Day 2: Digital plotting with PRO600 (Basic operation of the software and how to establish data acquisition codes, etc.)
- Day 3: Digital plotting with PRO600 (Basic operation of MicroStation, how to create map symbols, etc.)
- Days 4 – 8: Practical work using the materials provided by participants of the technology transfer - imagery of aerial photographs and results of aerial triangulation (Creation of DEM, creation of orthophotos, mosaicking method and color correction method)
- Days 9 and 10: On implementation of the digital plotting of the data of the OJT area, map symbols and their data acquisition criteria, a question-and-answer session, etc.

Figure 47 Technology transfer (in aerial triangulation and digital plotting)

(4) Evaluation

All the participants were extremely serious during the technical transfer and participated in its activities actively as the participants of the technical transfer in aerial triangulation had also done.

Although the digital plotter procured in the Study had a stereoscope of an unusual mechanism, the participants seemed to be able to operate it without difficulty. They had no serious problem in mastering the use of TopoMouse* either. The team advised them on the issues requiring attention on the parameter setting for the monitor, etc. for possible translocation of the plotter in future.

* A TopoMouse has 16 buttons on it so that its user can perform many types of tasks by manipulating them. A user can select 30 functions with combined use of the 16 buttons.

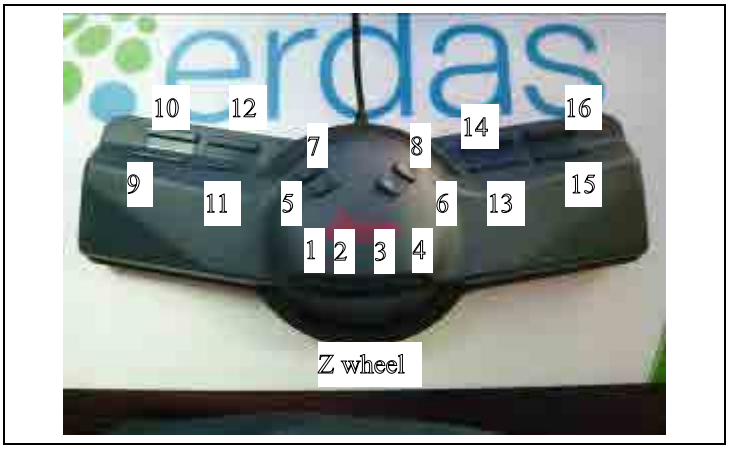


Figure 48 TopoMouse

The participants recognized the important points in the procedures to acquire data by data type and to acquire feature data for the creation of small-scale maps precisely and understood the procedures easily with their experience in the past. They also understood the contents of

the map specifications discussed and finalized in the Study perfectly. Therefore, the team expects that the counterparts will be able to apply the map specifications appropriately.

The team decided to have practice with the materials provided by the participants as requested by them in the second half of the technology transfer. As the team was convinced that the participants could carry out digital plotting independently by solving problems by themselves through trial and error after the completion of the technology transfer from the observation of their activities in the practice, the team has concluded that the main aims of the technology transfer in digital plotting have been achieved.

3-6. Digital Compilation

The table below shows the contents of the technology transfer in digital compilation. The technology transfer described below was implemented in accordance with this plan.

Item	Description	Main aims
Digital compilation	Optimization of plotted data	・How to operate the software ・Understanding of data cleaning ・Understanding of methods to correct various types of errors
	Creation of topology for GIS data	・Understanding of the creation of topology of line, point and polygon data ・Understanding of methods to correct various types of errors

(1) Preparation

a. Selection of the recipients of the technology transfer

The Team explained the outline of the contents of the technology transfer in digital compilation to the counterpart personnel and asked them to select the participants of the technology transfer. They selected the engineers listed in the tables below as the participants.

	Participants	Affiliation
1	Mr. Cebanu Alexandru	ALRC
2	Mr. Rudenco Tamara	ALRC
3	Mr. Nagornese Constantin	INGEOCAD
4	Mr. Paharicov Igor	INGEOCAD
5	Mr. Andrei Ceban	Military Topography Centre, Ministry of Defense

b. Questionnaire and hearing survey

A questionnaire survey of the participants on their experience and knowledge was conducted before implementing the technology transfer.

The survey revealed that they were engaged in digital compilation and creation of GIS data in their ordinary work and had experience and knowledge in data compilation for the creation of both large- and small-scale maps. However, since they did not have experience in using the latest software applications procured by the Team for the Study, “Bentley Microstation V8i” and “Bentley MAP V8i” (hereinafter “Microstation” and “MAP” respectively) in their ordinary work, they practiced basic operation of these applications and the operation of them for data cleaning and the creation of data topology.

* Microstation is a general-purpose CAD application. MAP is an application of an additional function specific for map data creation.

(2) Contents

The technology transfer was implemented from 24th April to 2nd May 2012. The data obtained in the OJT and manuals prepared beforehand, etc. were used as the materials.

- Day 1: Outline of the operation of Microstation (Basic operation)
- Day 2: Outline of data cleaning (Basic operation of MAP)
- Day 3: Practice of data cleaning (Cleaning of the plotted data in the OJT area with operation of Microstation and functions of MAP)
- Day 4: Outline of topology creation (Practice of the creation of topology of the plotted data in the OJT area and materials prepared by the Team with operation of Microstation and functions of MAP)
- Day 5: Practice of topology creation and conclusion (Practice of topology creation and accuracy control in the compilation)

Figure 49 Technology transfer (in digital compilation)

(3) Evaluation

The quality of the result of the practice on digital compilation produced by the participants themselves, an indicator of the level of their understanding of the transferred technologies, was good. Many of the questions that they asked during the technology transfer were related to their ordinary work. The Team expects further improvement of their technical capacity with their self-help effort from the above-mentioned observation.

Although the software used in the Study was different from that used in their ordinary work, they seemed to have rich experience in similar work. However, they did not seem to give particular consideration to detection and correction of errors using allowances or modification of data in accordance with map scales.

The Team reminded the participants that it was necessary to modify data by eye in accordance with judgment from the viewpoint of map production with a map scale taken into consideration in the compilation for the creation of medium- and small-scale maps, while it was not necessary for the creation of large-scale maps.

The team suggested the need to prepare a “work manual” and a “roadmap” for the training on the judgment from the viewpoint of map production, creation of compiled data from plotted data and updating and maintenance of the compiled data required for the creation of medium- and small-scale maps by counterparts themselves as their future task.

3-7. Map Symbolization

The table below shows the contents of the technology transfer in map symbolization. The technology transfer described below was implemented in accordance with this plan.

Item	Description	Main aims
Map symbolization	Allocation of symbols onto topographic map data.	・How to operate the software ・Understanding of map symbols ・Priority order among the symbols (establishment of an order among layers) ・Representation of symbols on maps of different map scales (creation, transfer and cartographic generalization of map symbols by data type) ・Inspection methods ・Understanding of spot colors and process colors ・Difference between final prints and plotter printouts

(1) Preparation

a. Selection of the recipients of the technology transfer

The Team explained the outline of the contents of the technology transfer in map symbolization to the counterpart personnel and asked them to select the participants of the technology transfer. They selected the engineers listed in the tables below as the participants.

	Participants	Affiliation
1	Mr. Cebanu Alexandru	ALRC
2	Ms. Rudenco Tamara	ALRC
3	Mr. Nagornese Constantin	INGEOCAD
4	Mr. Paharicov Igor	INGEOCAD
5	Mr. Andrei Ceban	Military Topography Centre, Ministry of Defense
6	Ms. Mutac Liubomira	INGEOCAD
7	Ms. Chiriac Ioana	INGEOCAD

b. Questionnaire and hearing survey

A questionnaire survey of the participants on their experience and knowledge was conducted before implementing the technology transfer.

The survey revealed that map symbolization is part of their ordinary work and they were engaged in the symbolization for the creation of medium- and small-scale maps and the creation of atlases for students, the Atlas of Moldova and various thematic maps. Therefore, they have knowledge and experience in map symbolization. However, the survey revealed that the method of map symbolization used by them was different from the one used in the Study

The team gave instruction on the symbolization to the participants using the data of part of the OJT area in the practice. As the team had been informed that they were using an older version of Adobe Illustrator in their ordinary work, the team gave them explanation on the basic function of the latest version of Adobe Illustrator (Adobe Illustrator CS5.1, hereinafter “Illustrator”) procured in the Study as a reminder on the assumption that they were familiar with the basic operation of Adobe Illustrator.

The team was informed that the counterpart outsourced the final printing of topographic maps and that the maps were printed with Computer to Plate (CTP) without creating positive plates.

Figure 50 Technology transfer (in map symbolization)

(2) Contents

The technology transfer was implemented from May 3 to 8, 2012. The OJT data and the manuals prepared beforehand were among the materials used in the technical transfer.

- Day 1: Preparation for the symbolization with Illustrator (Data import: on adjustment of the scale of CAD data, modification of the color system to be used and order of layers in accordance with the priority order among the symbols)
- Day 2: Practice of the symbolization with Illustrator (Line symbols: On creation of complicated line symbol patterns and difference in data processing for line symbol creations between the latest and older versions)
- Day 3: Practice of the symbolization with Illustrator (Point symbols: on the improvement in the efficiency of the work by registering point symbols, definition of the true position of a point symbol, etc.)
- Day 4: Practice of the symbolization with Illustrator (Polygon symbols/edge matching: on simple and complex polygons, difference in the results caused by the difference in polygon line attributes and how to handle the difference, method of edge matching on each map sheet, masking of the data in surrounding framework after edge matching, etc.)
- Day 5: Practice of the symbolization with Illustrator (Masking: on masking of overlapping symbols of same color code, transfer of a symbol in accordance with judgment from the viewpoint of map production, etc.)
- Day 6: Practice of the symbolization with Illustrator (Conclusion/questions and answers: on inspection using the reference systems used in the symbolization and the accuracy control sheet, process and spot colors, effects of overprinting and things to be remembered about overprinting, inspection of the printing condition with prints, etc.)

(3) Evaluation

The focus of this technology transfer was on the transfer of technologies on the operation required for the symbolization in the Study using the data obtained in the OJT and manuals prepared beforehand and creation of symbolized data, instead of the instruction on the basic operation of Illustrator, because the counterpart was familiar with the operation of the older version of Illustrator through the use of it in their ordinary work. The participants asked questions about operation and functions of the application in the symbolization and the Japanese expert answered those questions in the technology transfer.

The participants showed interest in the symbolization method used in the Study, because it was different from the one that they had been using. They were particularly interested in the inspection and essential parameters of data attributes, data attachment to the identical coordinates in the edge matching, definition of the true position of a symbol and creation of a line symbol with a complicated shape.

The Japanese expert taught the difference between printing maps with process colors and that with spot colors and the importance of the inspection of output before final printing to the participants using the printed outputs created by them. The knowledge on these matters is essential for the symbolization implemented in the Study and for printing the final products in future. Therefore, the team considers it meaningful that the counterparts have acquired detailed knowledge of these matters.

The Team gave advice to the participants on how to correct problems on the printed outputs using the outputs created by the counterpart personnel and how to express features on a map in a way that they wanted in the question-and-answer session. The team and the participants were able to share the information on the bugs in the latest version of Illustrator and the advantages of the old version. The Team requested them to improve their knowledge further by themselves.

The Team suggested the need to prepare a “work manual,” a “roadmap,” etc. for the work processes of creating symbolized data and printing data from compiled data at different map scales in order for them to be able to implement quality management of the map symbolization (inspection, correction, verification and maintenance of the data) for the creation of medium- and small-scale topographic maps.

3-8. Data Structurization / GIS Database

The table below shows the contents of the technology transfer in data structurization / GIS database. The technology transfer described below was implemented in accordance with the plan.

Item	Description	Main aims
Data structurization / GIS database	Structurization of digital data Creation of a database	・ Understanding of the concept of GIS ・ How to operate GIS software ・ How to create GIS data from compiled data ・ How to create topology and correct errors ・ How to use the GIS data

(1) Preparation

a. Selection of the participants of the technology transfer

The Team explained the outline of the contents of the technology transfer in structurization/GIS database to the counterpart and asked them to select its participants. They selected the five engineers listed in the table below as the participants.

	Participants	Affiliation
1	Ms. OVDII Maria	ALRC
2	Ms. RUDENCO Tamara	ALRC
3	Mr. DANII Ivan	ALRC
4	Mr. PAHARIKOV Igor	INGEOCAD
5	Mr. RORLOGA Iurii	Institute of Pedology, Agrochemistry and Soil Protection “Nicolae Dimo”

b. Questionnaire and hearing survey

The Team conducted a questionnaire and hearing survey of the five participants on their knowledge and experience before the technology transfer. The aim of the survey was to decide the contents and technical level of the technology transfer, which would realize the maximum benefit to the participants.

The survey revealed that most of the participants had experience in operating an older version of the GIS software procured in the Study, ArcGIS, and handling GIS data.

(2) Contents

The Team gave lectures on 1) the current state of geospatial information data in Japan (the state of the data being created in Japan, contents of the data, methods of data distribution, sales prices of the data, etc.), 2) presentation of the specifications used for the creation of geospatial data in Japan and manuals relevant to the creation and explanation of parts of the specifications and manuals and 3) GIS data, to the participants in the form of presentation with the findings of the questionnaire and hearing survey mentioned above taken into consideration.

The Team and the participants had a discussion on the file format of the GIS database to be

created in the Study and decided to use the Geodatabase Format of ESRI, which was used in ArcGIS.

The following describes the contents of technology transfer by day.

- Day 1: The current state of geospatial data in Japan
- Day 2: Methods of accuracy control used during the data creation in Japan
- Day 3: About GIS data
- Days 4 and 5: Discussion on the GIS database, an output of the Study
- Days 6 and 7: About Arc GIS

	
Scene of a lecture	Explanation of software use

Figure 51 Technology transfer (in data structurization/GIS database)

(3) Evaluation

The Team concluded that the participants had the basic knowledge of GIS data on the basis of the result of the questionnaire and hearing survey conducted before the technology transfer. Therefore, the team explained examples of quality management of geospatial information data in Japan to the counterparts in most parts of the technology transfer to urge them to discuss how they should use and extend the use of the methods for the quality management of the geospatial information data among them.

The counterpart already has the basic technologies required for creation and updating of geospatial information data. Therefore, the Team concludes that the counterpart will be able to implement the work practiced in the Study without problems. In fact, the counterpart has already created GIS data for 1:250,000 and 1:1,000,000 scale GIS maps (Euro Regional Maps, and Euro Global Maps, respectively). Therefore, what is important for them is to find effective ways to use the 1:50,000 scale topographic map database created in the Study which is considered useful in national land development planning.

4. Promotion and Extension of the Use of Geospatial Data

4-1. The Current State and Future Trends of the Use of Topographic Map Data

The Team examined the current state and future trends of the use of topographic map data of Moldova in order to extend the use of the output of the Study, geospatial data, and promote its application.

4-1-1. Current State of the Use of Map Data

(1) Users of Topographic Map Data and their Demands as revealed by a questionnaire survey

In the first seminar held in Phase 1, questionnaires were distributed to ask the participants about their usage of topographic data which were created by ALRC. The results were analyzed to grasp the tendency of map data utilization. (refer to Appendix-10)

Table 15 shows the numbers of the respondents and the organizations with which they were affiliated.

Table 15 Organizations whose staff members responded to the questionnaire

Classification	Name of organizations	No. of responses
Governmental organization	Ministry of Agriculture & Food Industry	1
	INCP “Urban Project”	1
	Security & Information Service	1
	Custom Service	2
	Civil Protection & Exceptional Situation	2
	Hydro meteorological Service	1
	IS “Mold ATSA”	1
	Geology & Mineral Resources Agency	1
	Center of Military Topography	1
	Office for National Statistics	1
	IS “Mold Silva”	1
	State Route Administration	1
	Border Service	1
Research and educational institution	Institute of Ecology & Geography	2
	UASM – State Agriculture University	1
	Technical University of Moldova	1

Private company	ISC BLOM SRL.	3
	Lenveta SRL.	1
	IM-Meridian Digital SRL.	1

- Demand for Geospatial Data and its Future

The respondents were mainly government organizations involved in policies relating to agricultural development, geological and resource surveying, meteorological observation, urban development, the natural environment, etc. It is supposed, therefore, that the principal users of 1:50,000 topographic maps are mainly this kind of ministry, agency or organization. Furthermore, these organizations are very familiar with GIS technology and many of them answered that they "want to use" or "feel the need to use" it in their daily operations. It can be easily estimated, therefore, that the demand for topographic map data, particularly digital data, will increase in the future, centering on these organizations.

From the questionnaire results, it is considered desirable to build a digital database of geographical information and distribute it over the Web in order to expand the demand for topographic map data. In this case, it is advised that ALRC should play a central role in distributing and updating this data, and that a system offering easy access and a method of providing low-cost, speedy services should be considered in terms of both the hardware and software components.

- For the Promotion of the Use of Geospatial Data

Looking at the methods by which the user organizations acquire and use topographic map data and the types of data they use, we see that the most frequently used is topographic map data mainly to a scale of 1:50,000 and 1:5,000, and the most frequent type of data acquisition is digital data. For other map scales, paper-based maps still seem to be being used. In order to dramatically expand use of the data, ALRC needs to inform general users of the versatility, ease of updating and ease of other handling of digital topographic map data, which can be compatible to any map scale.

Improvement in the quality of the Web distribution of topographic map data is important as an effective means to expand its use.

(2) Distribution of Geospatial Data through the Internet and its Current and Future Use

ALRC has constructed a Geoportal System (http://geoportal.md/) for users of topographic map data both inside and outside Moldova and distributed the data to users widely through the Internet in order to promote the use of geospatial data over a wide area. The access record to the Geoportal reveals that approx. 2,000 users visit every weekday to gather geographic

information (ortho data and topographic map data) through it at present (Google Analytics Survey 2012).

The survey result revealed that the total number of accesses to the Geoportal in the period of approx. one year (August 2011 – September 2012) was 471,859 and that approx. 80 % of the visitors were returning users. Users in Moldova accounted for approx. 94 % of the Geoportal users, while those in the three neighboring countries, Ukraine, Romania and Russia, accounted for 2.5 %. In addition, there were approx.1,000 accesses from European countries including Italy and Germany.

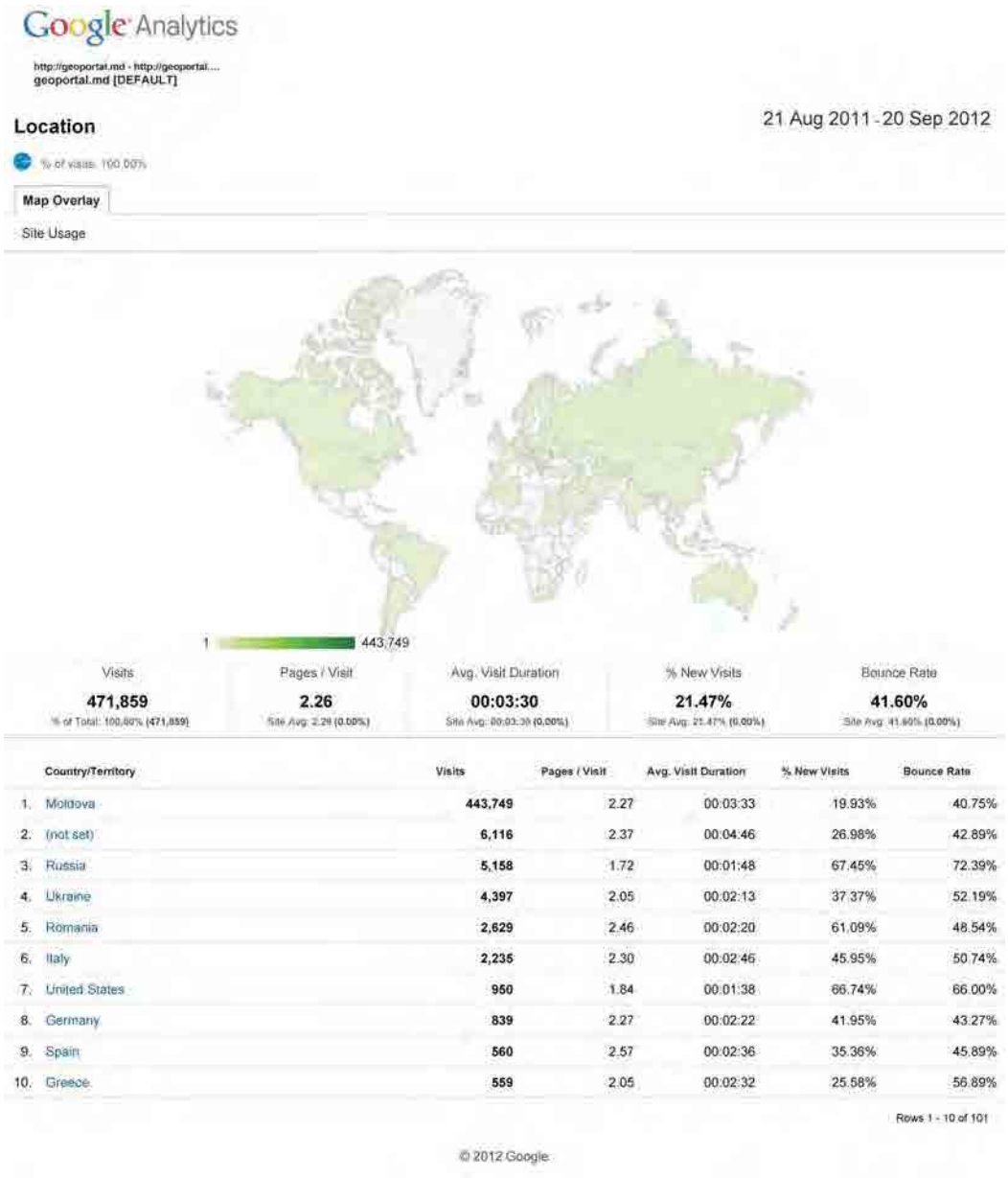


Figure 52 Fact statistic of Visitors to the Geoportal

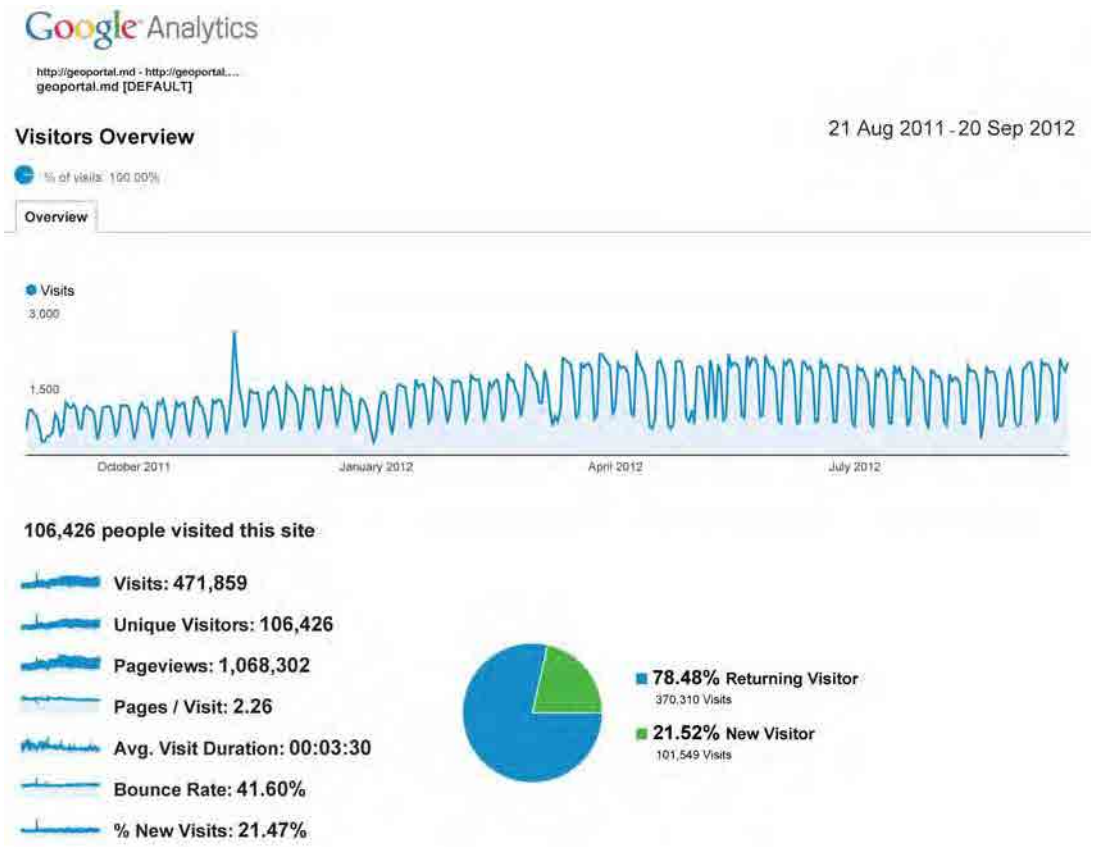


Figure 53 Overview of Visitors to the Geoportal

4-1-2. Distribution and Use of Geospatial Data at the Web Site

(1) Types of Distributed Data

ALRC is currently supplying data including orthophotos to ordinary users through Web distribution as a means to extend and promote the use of geospatial data in a wide area as mentioned above.

The following geospatial data is available from the Geoportal System:

- ✓ Orthophotos;
- ✓ Raster topographic maps (1:50,000) created from paper maps; and
- ✓ DTM created from orthophotos.

The outputs of this project, digital topographic maps (1:50,000), will also be made available from this Geoportal System.

This geospatial data will be stored and managed in the disk storage in the ALRC Office. Required data will be converted to the format of the database used by the Geoportal System and stored in the server of the system. The Geospatial System extracts geospatial data from this database and delivers it to a user (Figure 54).

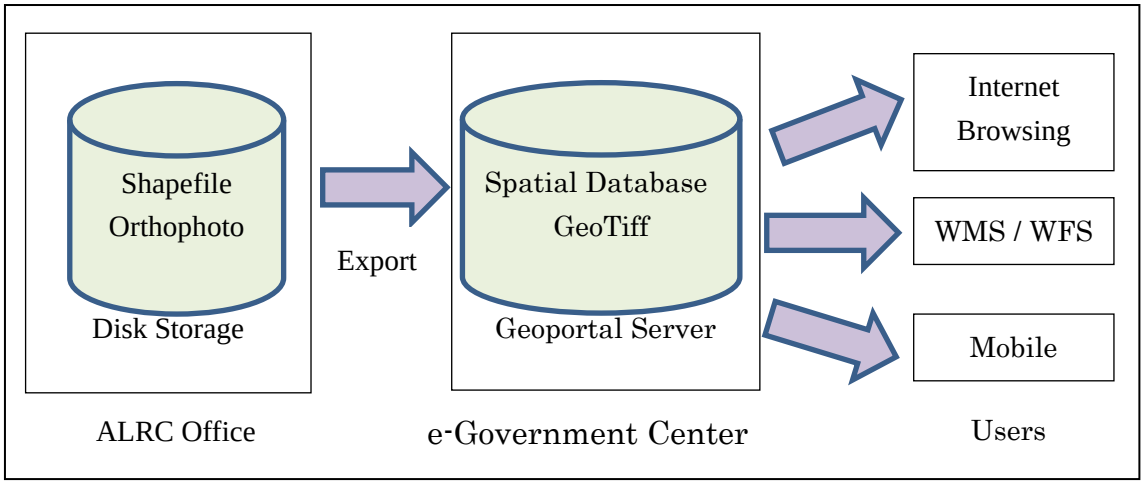


Figure 54 Flow of geospatial data

(2) Functions of the Geoportal System

The Geoportal System provides its users with features including browsing, sharing, editing and analysis of geospatial data. Its main functions include:

- ✓ user management;
- ✓ printing map images;
- ✓ distance and area measurement;
- ✓ editing layers;
- ✓ map data query (import/export);
- ✓ data publishing using WMS/WFS;
- ✓ routing; and
- ✓ mobile access from smartphones.

The Geoportal operated by ALRC provides these functions at present.

Figure 55 shows the Web page of “geoportal.md.” These functions are provided through the Geo-portal served by ALRC. Registered users can be benefit from those services upon clicking icons linked to favorite functions on the screen of the Geo-portal free of charge.

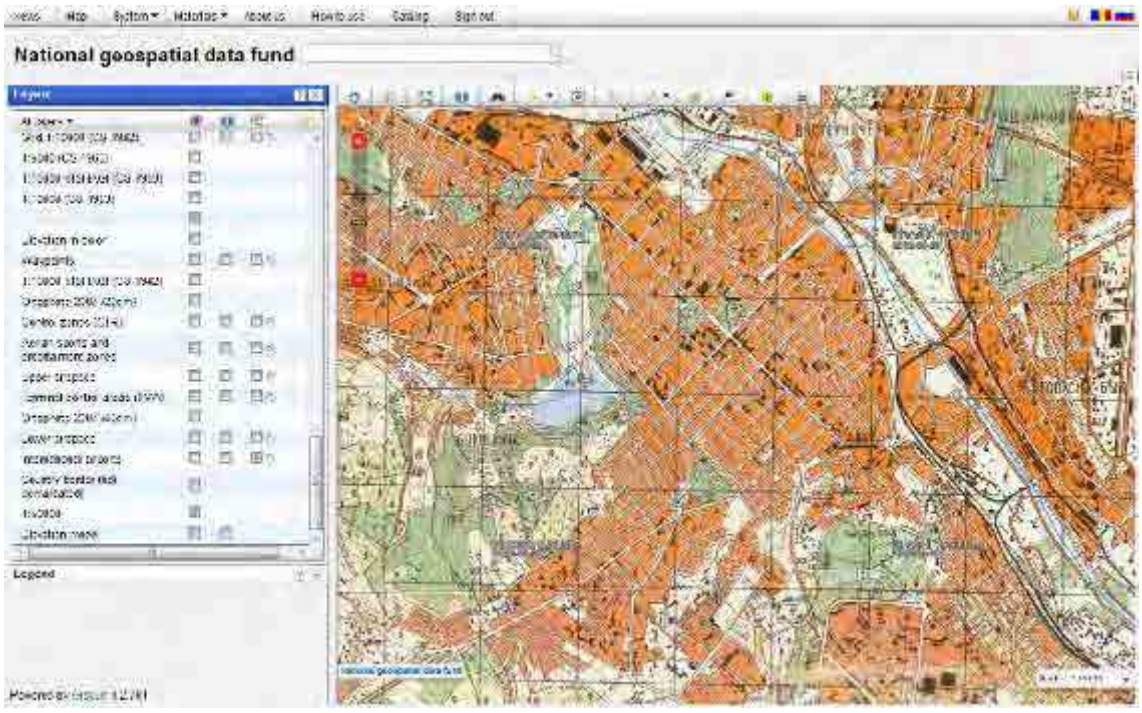


Figure 55 An example of icons with functions to use data services on the screen of the Geoportal

4-2. Problems in Supply of Data and Sound Data Distribution

4-2-1. Technical Problems in Distributing Large Amounts of Data

The Geoportal system in operation is a data distribution system on the Web developed for the distribution of orthophotos in the orthophoto project assisted by Norway. The functions in the system are still being expanded and new data for distribution is still being added to the system. The current state and components of the system are described in the following.

This geoportal system is constructed on the Linux operating system using open-source software.

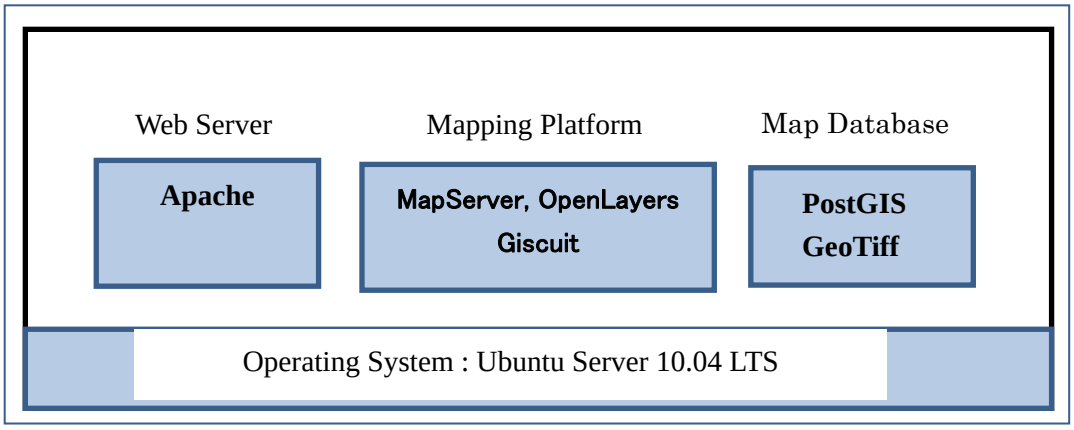


Figure 56 Components of the system

Table 16 Specifications of the Hardware of the Geoportal System

	Server in use	New server
Type	Lenovo ThinkCentre M58p	HP ProLiant DL180
CPU	Core2Quad 2.66GHz	Xeon E5620 (2.40GHz) x 2
Memory	6GB	8GB
HDD	1TB x 4 (RAID10)	2TB x 4 (RAID10)

The original plan was to use the server currently in use at the e-Government Center located at a different place from ALRC for the distribution of the output data of the Study, geospatial data (1:50,000 digital topographic data). However, it was revealed later that the capacity of the server installed in the center was too small to handle the new output, the GIS data. Therefore, it was decided that a new server was to be installed as part of this project.

This new server will be installed and operated in the e-Government Center as with the existing one. It shall have a larger capacity disk, faster CPU and more memory than the existing one in order to accommodate the new geospatial data to be added.

4-2-2. Prospects for the Dissemination and Promotion of the Use of Geospatial Data in Future

ALRC has decided to connect its geospatial data to INSPIRE (Infrastructure for Spatial Information in Europe) in accordance with a policy of the government and has been making preparation for the connection. INSPIRE is a mechanism aiming at integration and sharing of map and spatial information in the EU Area which is expected to be used in transborder disaster management and for solving transboundary environmental problems.

Creation of geospatial data and reconstruction of the Geoportal System will be required to make the system compatible with INSPIRE. The major requirements include the following:

A. Conformity to the Implementing Rules shall be required for the following:
   1. Metadata
   2. Data Specifications
   3. Network Services
   4. Data and Services Sharing
   5. Monitoring and Reporting

The Data Specifications are the provisions on geospatial data. They are classified into 34 themes in INSPIRE. As the Implementing Rules specify required items and specifications for each theme, geospatial data of Moldova will have to conform to the requirements.

B. Geospatial data shall be compatible with that of neighboring countries, as there is the need to match geospatial data of rivers, roads and railways crossing national boundaries at the boundaries to make geospatial data seamless in the EU Zone.

The developer of the Geoportal System in use has confirmed that the current system can be modified to be compatible with INSPIRE.

Meanwhile, ALRC wishes to replace the Geoportal System currently in use with a new geoportal system based on ArcGIS as a measure to make its system compliant with international standards such as ISO and INSPRIRE. Such replacement will require a study on the cost of introducing the new system and assistance to engineers.

References: Software composing the Geoportal system

The main open-source software packages used in the system are:

- ✓ Operating system : Ubuntu Server 10.04 LTS;
- ✓ Database : PostgreSQL + PostGIS;
- ✓ Web Server : Apache web server; and
- ✓ Mapping system: Giscuit, MapServer, OpenLayers.

Giscuit (http://giscuit.com/) is software which forms the foundation for open-source Web mapping. Giscuit is compliant with the standards of the Open Geospatial Consortium (OGC, http://www.opengeospatial.org/), an organization which standardizes technologies related to geographic information systems. Therefore, Giscuit supports the data interfaces of the OGC, including WMS, WFS, WMC, KML and GML.

4-2-3. Problems in the Management and Operation of the Geoportal System

ALRC is still trying to promote and extend use of geographic information to the public by improving the geoportal for the distribution of geospatial data consisting of ortho data and topographic map data on the Web. However, ALRC has no expert responsible for designing a data distribution system and technical maintenance of the system. The Geoportal system in operation is mostly managed and operated by two staff members. A full-time worker of ALRC is responsible for the management of the geospatial data and system administration, while an outsourced local consultant is taking charge of system development and maintenance. ALRC pays 4,000 euros a year to the consultant for his/her service as a necessary expense. ALRC always have trouble finding budget to pay the expense. ALRC depends on outsourcing for the establishment of a new geoportal with a new data distribution system. ALRC cannot be considered to have a financially and technically stable foundation for the reasons mentioned above.

Establishment of an independent system for the management and maintenance of the geospatial data system is urgently required in order for ALRC to respond to users with a wide variety of individual needs.

The distribution of topographic map data is being provided free of charge at present. However, if the costs of maintaining the system including the payment to the consultant mentioned above are taken into consideration, the operating costs of ALRC will increase. Such an increase will be a financial burden, which hinders establishment of sound operation of the organization and investment in new technologies. ALRC is considering charging fees for the provision of some types of data in future. Establishment of a sound financial foundation will be a significant future task for ALRC. A study on distribution of data with fees, which are decided on the basis of appropriate cost calculation, and introduction of independent accounting systems to some departments are among the measures to establish such foundation.

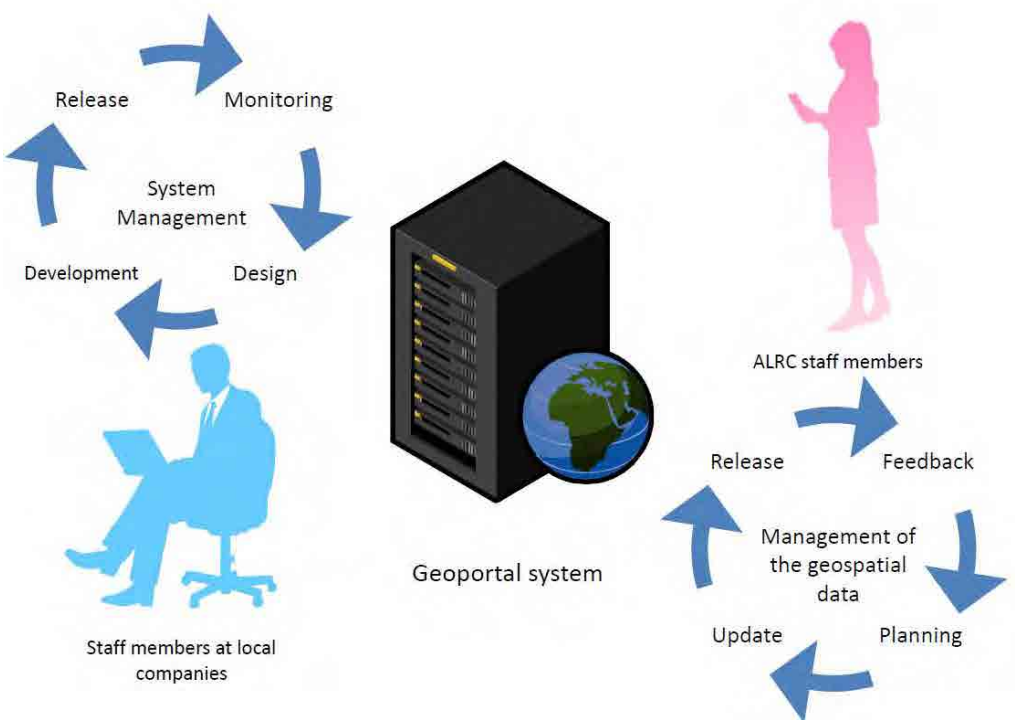


Figure 57 Conceptual diagram of the operation and management of the Geoportal for data distribution

5. Recommendation

5-1. The challenge to face

ALRC, the main counterpart, is composed of four departments including the Administrative Department. The main duty of these departments is technical supervision of geodetic surveys and map creation. The actual technical work is implemented by four state enterprises, including INGEOCAD which supervises the work. Personnel of ALRC are engaged in accuracy control, operational management and establishment of operating procedures. In this sense, they are considered to be performing the duty of management engineers who need to have highly-sophisticated knowledge and experience. At present, while ALRC has many staff members who are generally classified as administrative workers, it has very few middle-level engineers who are engaged in the actual work of surveys and map creation.

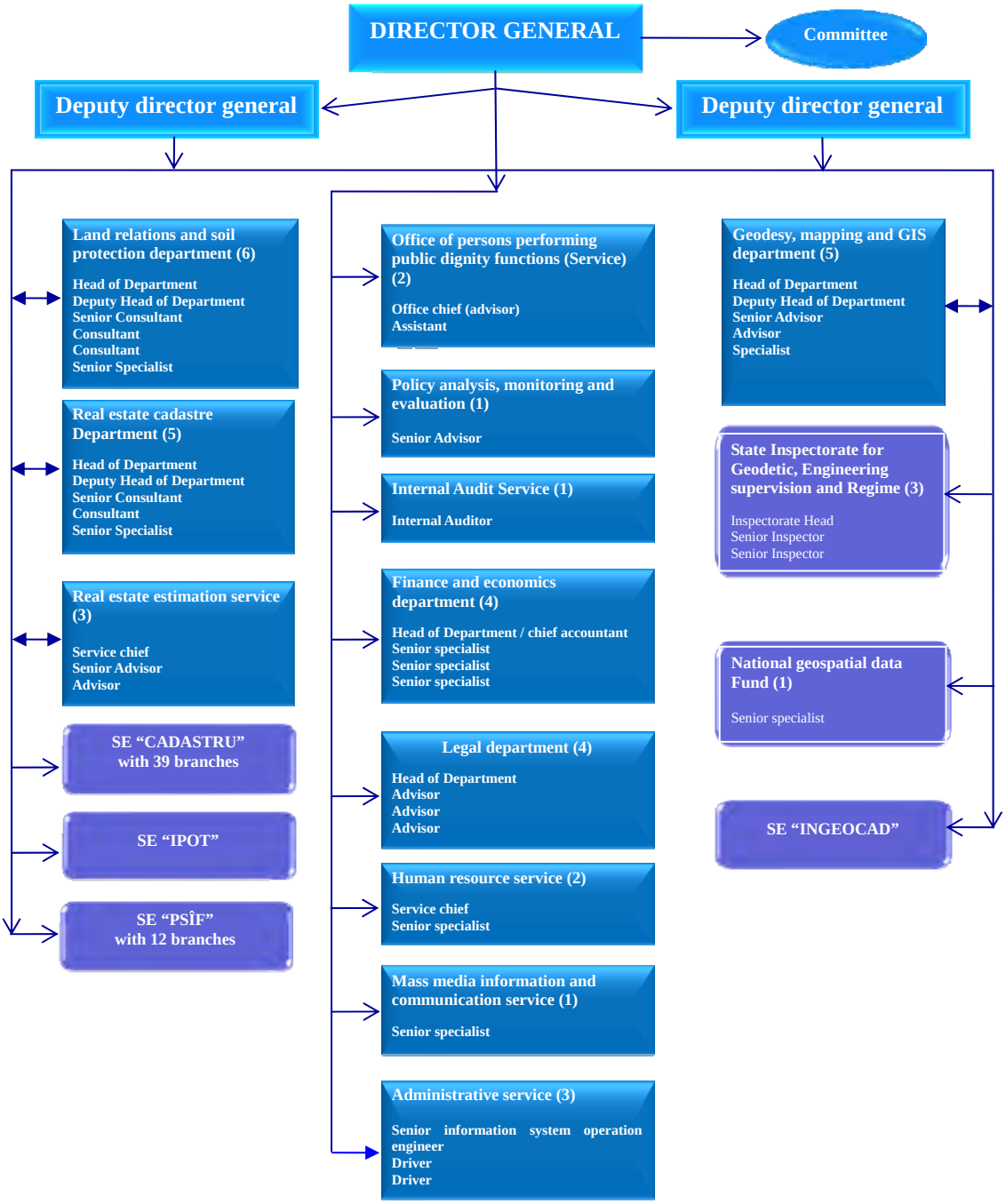


Figure 58 Organizational Structure of the ALRC (November, 2012)

Moldova has achieved great success in organizing land information, creation of cadastres for land property management and creation of orthophotos for national land protection and management with assistance from donors, such as the World Bank and Norway, since its independence from the former Soviet Union in 1991. However, it is behind the neighboring countries and countries in Europe in the areas of geographic information technology, mapping and photogrammetry.

The implementation of the Study has brought the latest technologies and equipment for map creation to Moldova. From now on, the Moldovan side will have to use such tangible and intangible assets to update geospatial data and to improve, expand and reform organizational structure including staff composition so that new maps can be created without external assistance.

The implementation of this project has also enabled the launch of the "New Geoportal," a data delivery system from the GIS database using the e-Government Center, for further reinforcement of efforts for the promotion and extension of the use of the data created in the Study.

5-2. Recommendation

Establishment of a System for the Use of Geographic Information as an Essential Tool for the Realization of National Strategies

The digitization of the geospatial data of the land of Moldova achieved in the Study will contribute significantly to accurate planning in a short time of the measures for the land conservation and national development, including urban planning, development of road and transport networks, measures against meteorological disasters, disaster prevention measures, cadastre management, agricultural measures, forest conservation and conservation of the natural environment. It will be essential to use the digitized GIS data as a tool to support decision-making on policies, in particular. It will be necessary to realize the following measures intended for promotion of use and application of the output data quickly.

1. Upgrading of the geoportal so that it ensures quick access to the GIS database
2. Conformation of the data created in the study to the European standards (INSPIRE) for technical integration of the data at the international level after the establishment of GIS and enactment and amendment of laws required for the conformation
3. Establishment of NSDI, one of the national development strategies of Moldova, in the near future

Partial Reorganization and Modernization of the Administration Concerning Surveys and Mapping in Moldova

The state enterprises and ALRC are independent organizations performing separate functions at present. However, their technical levels do not satisfy the international standards for map creation organizations. The state enterprises have capacity to use new technologies for digital mapping for large-scale topographic and cadastral maps because they have young and relatively competent mapping and survey engineers. The Team recommends that the Moldovan side

conducts a study on the standards for the new organizational design which can fully respond to technical requests for digital mapping from both inside and outside the country and administrative needs by incorporating the technical capacity mentioned above into the implementation system in the national administration on map creation and use, restructuring the existing organization of ALRC and developing a legal system. The team recommends that the Moldovan side make efforts to reform ALRC to an organization providing geospatial data services which deserves to be a member of the e-Government which is advocated by the Government of Moldova.

Establishment of a Sound Fiscal Base ALRC

The topographic map data are distributed from the Geoportal free of charge at present. However, the inclusion of the new geospatial data in the distribution service is expected to increase the operating costs of the service. Therefore, the Team recommends that ALRC introduces a fee-charging data distribution system applicable to certain types of data and services with the fees decided on the basis of appropriately calculated costs and an independent accounting system to the Service Department for the establishment of a sound fiscal base.

To Bear a Role of an Opinion Leader

At present, neither ALRC nor INGEOCAD can serve as an opinion leader in the NGIS Committee sufficiently, because neither has sufficient human resources or equipment in GIS technology. Therefore, the Team hopes for upgrading of the level of technical advice and other services provided by the council by establishing its secretariat in the new organization to be created and assigning experts to the secretariat to provide those services.

Table 17 List of NGIS members

Member	Affiliation
ŞCOLA Dona	vice-minister of Information Technologies and Communications, chairman of the Council
GHILAŞ Anatolie	director general of the Agency for Land Relations and Cadastre, vice –chairman of the Council
OVDII Maria	head of Geodesy, Cartography and GIS Department, Agency for Land Relations and Cadastre, secretary of the Council
GHERASIM Boris	vice- minister of transport and road infrastructure
SAINCIUC Sergiu	vice- minister of labor, social protection and family
POSTICĂ Gheorghe	vice- minister of culture
JURAVELI Andrei	director of the Agency for Geology and Mineral Resources,

Member	Affiliation
	Ministry of Environment
CRIGAN Ştefan	deputy general director of the Agency for Land Relations and Cadastre
PLEŞCA Elina	prime-vice-director of State Hydrometeorological Service, Ministry of Environment
VALCOV Vitalie	deputy general director of National Bureau of Statistics
VIERU Mihai	vice-chairman of the Academy of Sciences of Moldova
SÎRODOEV Ghenadie	chief of the laboratory of the Institute of Ecology and Geography, Academy of Sciences of Moldova
GOZUN Alexandru	director of General Division for Business Environment Development, Ministry of Economy
BÎNZARU Valerian	chief of Capital Investments and National Economy Financial Division, Ministry of Finance
ROTARU Oleg	director of the Department for Projects and Services Management, of the State Enterprise "CRIS "REGISTRU", Ministry of Information Technologies and Communications
GOLUŞ Iurie	director of the Department of Information Systems of the State Enterprise "CRIS "REGISTRU", Ministry of Information Technologies and Communications
ŞARPAC Grigorie	vice chief of the Department of Pre-project Research Systems of the State Enterprise "CRIS "REGISTRU", Ministry of Information Technologies and Communications
MUNTEANU Serghei	chief of Architecture and Urbanism Division, Ministry of Regional Development and Construction
GUŢU Vladimir	adviser of Land Resources and Land Improvement Division, Ministry of Agriculture and Food Industry
VOLOSATÎI Silvia	principal adviser in Department of Capital Investments and State Property Management, Ministry of Healthcare
LUPAN Alexandru	chief of Execution Control Department of General Division of Policy Analysis, Monitoring and Evaluation, Ministry of Internal Affairs
NIGAI Ghenadie	interim chief of Topogeodetic Service of National Army, Land Force Command, Ministry of Defense
STRATUŢA Radu	chief of Legal Department, Ministry of Youth and Sports
CEBANU Alexandru	chief of Sate Inspectorate for Geodetic, Technical and Regime Supervision, Agency for Land Relations and Cadastre

Member	Affiliation
NICOLAESCO Cristina	chief of Cadastre and Real estate Valuation Division, Agency for Land Relations and Cadastre
MOCANU Cornelia	adviser, Policy Analysis, Monitoring and Evaluation Service, Agency for Land Relations and Cadastre
NAGORNEAC Serghei	director of State Enterprise Institute of Geodesy, Technical Pamphlets and Cadastre "INGEOCAD", Agency for Land Relations and Cadastre
GÎNJU Valeriu	vice-director of State Enterprise "Cadastru", Agency for Land Relations and Cadastre
RADOV Alexandru	chief of Information Technologies Group of the State Enterprise "Institute for Projection for the Territorial Organization", Agency for Land Relations and Cadastre
GRAUR Alexandru	chief of Cadastral works and Geodesy Department of the State Enterprise "Soil Protection and Land Improvement", Agency for Land Relations and Cadastre
CHIRILOVICI Serghei	vice-director of the State Enterprise "ACVAPROIECT", Ministry of Environment
MAZURENCO Alexandr	vice chief of Regime Activities and Boundary Representative Department, Division of State Boundary Supervision, Border Service
ROTARU Petru	chief of the Forest Fund, Guard and Protection Division, Agency "MOLDSILVA"
CRĂCIUN Nicolae	vice-director, chief of Land Division, Architecture, Urbanism and Land Relations General Division, City Council Chisinau
DILAN Vitalie	chief of "Geographic Information Systems" Laboratory, State University from Tiraspol
CEPOI Eugeniu	university lecturer, Department of Geodesy, Cadastre and Geotechniques, Technical University of Moldova
HRISTEV Elena	CEO, State Enterprise "Trimetrica"

Appendix-1

Minutes of Meeting on the Inception Report

(February, 2011)

MINUTES OF MEETING
ON
THE INCEPTION REPORT OF THE POJECT
FOR
BASE MAP FOR DEVELOPMENT OF NATIONAL SPATIAL DATA INFRASTRUCTURE IN THE REPUBLIC OF MOLDOVA

AGREED UPON BETWEEN

AGENCY OF LAND RELATIONS AND CADASTER OF THE REPUBLIC OF MOLDOVA (ALRC)
AND
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

Chisinau

7th February, 2011

Dr. Vasile GRAMMA
General Director
Agency of Land Relations and Cadastre
The Republic of Moldova

Mr. Hisashi MORI
Leader of the Study Team
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

The JICA Study Team (hereinafter referred to as "the Team") headed by Mr. Hisashi MORI visited the republic of Moldova from 31 January, 2011 in order to carry out Project for Creation of Database for Base Map for Development of National Spatial Data Infrastructure in the Republic of Moldova (hereinafter referred to as" the Study"). The Team had an occasion for the meetings to explain the project details based on the Inception Report of the Study to the staff of ALRC. As a result of discussions held after the explanation, the Inception Report was accepted by ALRC. The points we discussed and agreed on are as follows;
The attendant list is attached in Appendix-1a,b.

1. Acceptance of the Inception Report

The Team explained the crucial issues shown hereunder that should be taken into account for successful implementation of the Study. ALRC understood the points that are stressed in the presentation of the Inception Report and agreed to the all.

1. Highlighting of overall objectives;
2. The importance of skills for creating a medium scale topographic map (1/50000);
3. Encouraging wide utilization by data dissemination;
4. The methodology used while project implementation
5. Importance of Technology Transfer;
6. The need of organization of a Steering Committee;
7. Involving local ministries, agencies, universities, institutes etc. in the seminar
8. Rigorous selection of the counterpart participants.

2. Undertaking matter

The Team confirmed the followings as undertaking matter of ALRC.

(1) To provide counterpart personnel from Headquarter of ALRC and subordinate bodies to be involved in the Technology Transfer in response to the request of the Team(refer to Annex-2).
(2) To provide necessary existing topographic maps, digital aerial photographic data, results of aerial triangulation and observation data of ground control points for the study area.
(3) To provide all necessary existing data for mapping such as boundary data and whatsoever to be needed after a series of discussion on map symbols.

3. Set up of the Steering Committee

Both sides agreed to launch a Steering Committee consisting of the members of the concerned ministries,

agency, university and related institutes for the purpose of facilitating data dissemination. ALRC promised to select appropriate personnel as the members from the above organizations.

4. Holding the seminar and workshop

The Team proposed the first seminar to be held on 18th February, 2011 in accordance with tentative program shown below. ALRC accepted this proposal and agreed to make an announcement to call for attendance from all part of Moldova.

1. Opening address
2. Greeting from Director of ALRC
3. Outline of the Study
4. Introduction of data expected in the Study
5. Launching Steering Committee
6. Closing remarks

5. Principle of contracting out

As for the contractor who is eligible to be invited to tender for the contract, the Team explained the basic policy and principle of tender invitation citing that only private sector has a right to become contractor.

ALRC admitted its rule for contracting the field surveys.

6. Area selection for mapping by Satellite Imagery

Both sides agreed to make an observation tour to verify the areas whether or not to be updated by the newest imagery. The Team requested ALRC to determine the areas to be chosen considering the result of the verification.

7. Procurement of Satellite Images

Concerning the timing of purchase of satellite images, ALRC strongly requested to amend the schedule of the procurement in the work flow at page 3-2 from July to between April and May, 2011 so that ALRC can make necessary preparations to work on preparatory works themselves over the Dniester region during the technical assistance from the Team is available. In addition, ALRC asked the Team to purchase the satellite images taken during March to April as well that is deemed to be the most optimum for photo-interpretation.

The Team promised to convey the above request and requirement to JICA headquarter so that those requests could be accepted.

8. Quality control

The Team was asked what if the quality control can be made by the Team or other executed organization. ALRC and the Team reached mutual consent that both sides will continuously discuss this matter to perform attaining required quality of the results. ALRC therefore agreed that both sides share any references to realize preferable quality control and will decide final specification for the execution until

beginning of the next term (around between May and June,2011).

9. Tender invitation

The Team explained that the tender invitation should be made to all eligible consultancies under the name of JICA Study Team by the time next session starting on May, 2011. ALRC understood that qualified company as a contractor would be chosen from among bidders to the tender taking their technical proposals into consideration.

Appendix 1-a

Attendant list

Moldavian side

Mr. Vasile Grama	General Director, ALRC
Mr. Andrei Iacovlev	Vice General Director, ALRC
Ms. Maria Ovdii	Head of Department Geodesy, Mapping &GIS, ALRC

Japanese side : JICA Study Team

Mr. Hisashi Mori	Team Leader
Mr. Kensuke Kimura	Study Coordinator
Mr. Akihiro Sugita	Supervisor of GIS and Mapping
Mr. Hitoshi Yamaga	Supervisor of Map Symbolization

Annex 1b

List of participants

Discussion on Inception report 3rd of February 2011

Name	Section	Title
Nagorneac Serghei	INGEOCAD	Director
Sarpac Grigore	Registru	Deputy Head of Department of the State Information Resources Center «REGISTRU»
Filenco Valeriu	INGEOCAD	Technical Director
Caminschi Alexandru	IS IPOT	Director
Radov Alexandru	IS IPOT	head of IT department
Valentin Luchian	**ALRC**	Land Relation and Land Consolidation Direction
Rudenco Tamara	**ALRC**	National Geospatial Data Fund
Decenco Iuliana	**ALRC**	Land and Real Estate Cadastre Direction
Caba Maria	**ALRC**	Land and Real Estate Cadastre Direction
Munteanu Serghei	Ministerul Dezv. Reg.	Ministry of Regional Development and Constructions
Mindov Lilian	I.S. Cadastru	Engineer
Galupa Alexandru	"Moldsilva" ICAS	head of department geoinformation system
Turculet Mihail	**ALRC**	Land and Real Estate Cadastre Direction
Feraru Maria	**ALRC**	Serviciul resurse umane
Mihov Vladimir	**ALRC**	Department Geodesy, Mapping & GIS
Danii Ivan	**ALRC**	Department Geodesy, Mapping & GIS
Mocanu Cornelia	**ALRC**	Land Relation and Land Consolidation Direction
Bolohan Ion	**ALRC**	State Inspectorate
Olaru Viorica	**ALRC**	State Inspectorate
Cusnir Lucia	**ALRC**	Department Geodesy, Mapping & GIS
Sincariuc Pavel	MTIC	
Rascu Angela	**ALRC**	Economic and Financial Direction
Iacovlev Andrei	**ALRC**	Deputy General Director ALRC
Axenti Ion	Mass-media	
Gutu Vladimir	MAIA	Ministry of Agriculture and Food Industry
Zaharchina Svetlana	INGEOCAD	head of department photogrammetry

Paharicov Igor	INGEOCAD	head of department geoinformation system
Mutac Liubomira	INGEOCAD	Engineer of department geoinformation system
Belcevicina Oxana	INGEOCAD	Engineer of department geoinformation system
Gurgurov Veaceslav	INGEOCAD	Engineer of department geoinformation system
Nagorneac Constantin	INGEOCAD	Engineer of department geoinformation system
Mocreac Octavian	**ALRC**	Land and Real Estate Cadastre Direction
Gorincioi Sergiu	**ALRC**	Supplemental Analysis, Monitoring and Evaluation
Pascaru Leonid	**ALRC**	Land and Real Estate Cadastre Direction
Hisashi Mori	JICA Study Team	
Kensuke Kimura	JICA Study Team	
Akihiro Sugita	JICA Study Team	
Hitoshi Yamaga	JICA Study Team	

Appendix-2

Minutes of Technical Meeting

(February, 2011)

MINUTES OF TECHNICAL MEETING
ON
PROJECT FOR
CREATION OF DATABASE FOR BASE MAP FOR DEVELOPMENT OF NATIONAL SPATIAL DATA INFRASTRACTURE
IN
THE REPUBLIC OF MOLDOVA

AGREED UPON BETWEEN
AGENCY OF LAND RELATIONS AND CADASTER OF THE REPUBLIC OF MOLDOVA (ALRC)
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

Chisinau, Moldova

February 25, 2011

Ms. Ovdii Maria
Head of Department Geodesy, Mapping &GIS, ALRC

Mr. Hisashi Mori
Team leader of the Study Team,
Japan International Cooperation Agency (JICA)

The JICA Study Team (hereinafter referred to as "the Team") headed by Mr. Hisashi MORI visited Republic of Moldova from 31 January, 2011 in order to carry out Project for Creation of Database for Base Map for Development of National Spatial Data Infrastructure in the Republic of Moldova (hereinafter referred to as "the Study"). Agency of Land Relations and Cadastre (hereinafter referred to as "ALRC") is a counterpart of the Team.
During the stay in this session, ALRC and the Team held technical meetings several times, and mutually agreed upon the specifications of the products and remaining issues mentioned below. The crucial issues discussed and decided are as follows:

1. About the symbolization for the 1:50,000-scale topographic maps

Contents of the discussion can be summarized as shown below.

1. Confirmation on the specification of the map symbols that was handed to the ALRC in advance.
2. Confirmation of the results examined by Study Team.
3. Annotation
4. Marginal Information and Legend

Each issue mentioned above was discussed and agreed in the following manners;

For 1 and 2:

Both, the ALRC and the Team, have confirmed that either we will adopt or not each symbol and whether or not integrations in case of similarity are necessarily. Definitions of map symbols were also confirmed to mutual understanding.

As of 17 February 2011 the article was revised as follows:

Symbols to be added

Name of Symbol	Number in the symbol specification
• Electrical national geodetic points.	1-1
• National geodetic points on mountains.	2
• Geodetic points on buildings	3
• Geodetic points on churches	4
• Survey network points on mountains	6
• Astronomical points	8

• Annotation of area for output of minerals by opencut operation (Quarries)	40
• Oil, gas and other wells with derricks and its annotation	44
• Annotation of Oil, gas and other wells without derricks	45
• Wind power station	48-1
• Annotation of television tower's height	53
• Simple tower (watch tower, etc)	58
• Bee gardens	63
• Enclosures for the cattle	64
• Woodman houses and its annotation	65
• Sinagogas	68-1
• Monuments, statues, common graves and separate graves	73
• Electric transmission lines of 14m and over in height on metal and iron concrete posts	79
• Electric transmission line closely running	80
• Annotation of gas pipelines (surface, underground, subwater) and its annotation	82
• Annotation of oil or gas pipelines closely running	83
• Annotation of oil and gas pipelines closely running	84
• Narrow-gauge lines and stations on them	93
• Stations and double tracks, platforms	97
• Loading/unloading platforms	98
• Annotation of height of trestle, embankment and cuttings	100
• Bed of dismantled railways	101
• Railways under construction	102
• Annotation of highways with more than 2 lanes per section, highways with more than 2 lanes with improved covering, motorways with covering and motorways without covering.	105,106,107,108
• Embankments, cuttings and slopes for roads	116
• Road number	120
• Annotation of height of steep and cliff, beach barriers and other ridges	133
• Annotation of waterfalls and rapids	137
• Beginning of regular navigation	138
• Specifications of rivers and canals	141

• Meadow grass	266
• Mound sands	283
• Sparse growth of trees with bushes and meadow grass	301
• Boundaries of regions	314

Symbols to be excluded

Name of Symbol	Number in the symbol specification
• Salt exploitation (Quarries)	42
• Peatary	43
• Mosques	69
• Cemetery of muslim	74(M)
• Subway station	103
• Aqueducts	172
• Sea ferries	190
• Beacons	203
• Passes, their spot height and duration	219
• Rock-remains	220
• Dike and range of narrow rocky steeps	227
• Rock-out crops	228
• Surface with mounds	277

Symbols to be revised

Name of Symbol	Number in the symbol specification
• Factories, plants and mills without pipes	37
• Radio station and television cnters	52
• Airport	55
• Railways	90
• Railway stations	96
• Isolated stones and stone accumulations	221
• Landslips	235
• Vine yards, fruit and citrus orchards with vine yards	262
• Impassible and almost impassible swamps and their vegetation	271
• Cane with separate bush s and groups of bushes on swamp	289
• Separate bushes and groups of bushes on swamp	291
• Dense brushwoods of bushes on swamp	292

For 3: Annotation

Since annotations on the map shall be expressed in Romanian and English, ALRC is responsible for conducting creation and checking of the annotations.

During the period of field verifications, investigations shall be made to collect necessary information for putting the annotation. And some necessary data shall be provided by organs concerned through ALRC.

For 4: Marginal Information and Legend

As existing map has no legend the Team confirmed whether or not that information is necessary. The Team will design legends originally so that ALRC might be able to evaluate them when a sample map with the legends is given to ALRC.

According to our agreement it is possible to make an amendment of the symbols while fulfilling the field verification and digitizing the map data even though we have decided to adopt or reject the symbols. We, therefore, agreed that the final symbols will be decided upon completion of all the works.

A final specification of symbols for the 1:50,000-scale topographic maps shall be prepared in English by the Team.

Others:

Concerning the code number of each symbol, the Team will prepare its list (draft) in Japan referring to the line map feature table for 1/5,000 which is to be provided by ALRC. It shall be sent by e-mail to ALRC and its contents shall be confirmed by ALRC.

ALRC agreed to verify the contents upon receipt of the draft that shall be furnished by the Team thru e-mail.

As for the specification for digital topographic data acquisition, the Team will prepare it in Japan referring to the symbol specification by USSR and to documents concerned as well. It shall be sent via e-mail to ALRC so that ALRC will be able to confirm its contents.

Notes

The above specifications shall be improved under an agreement between ALRC and the Team, if some difficulties or incoherence on the product processing confront in the middle of processing.

2. Quality control

The Study Team handed out the " Survey Operational Manual of JICA – for National Base Map – " authorized by JICA" of which norm will give the ground to go through the quality control of the data. ALRC confirmed the contents with sample formats to fill in and agreed to its appliance to the quality control unless it will cause inconvenience in the work.

3 . Determination of the areas to be revised by Satellite Imagery

ALRC proposed the area for revising information based on satellite imagery delimiting its map sheets shown in Appendix-2. In response to the request, the Team admitted to use satellite images for this purpose with a use of ALOS in principle.

Meantime apart from the revision of information, ALRC showed a desire to have full coverage of satellite imagery over the whole country, because consolidation of agricultural land tends to spread to all over the rural areas more prominently. . The Study Team committed to consult this matter with JICA headquarters after getting back to Japan. .

4 . Optimum equipment to be used in the Study

In response to a submission of equipment list that was required from ALRC side, ALRC elaborated on their models, types and functions and consequently asked the possibility of alternating some of proposed equipment like digital photogrammetric system and /or GIS software with other equipment which ALRC realistically need in their work.

ALRC explained faithfully the reason for their proposal that is due to economize the expense and install more crucial equipment which meets the Agency's missions.

The Team replied to the request by committing to transfer their request to JICA headquarters to reconsider.

Appendix 1-a

Attendant list

a. Moldavian side

Mr. Vasile Grama	General Director, ALRC
Mr. Andrei Iacovlev	Vice General Director, ALRC
Ms. Maria Ovdii	Head of Department Geodesy, Mapping &GIS,
Ms. Tamara Rudenco	Specialist of National Geospatial Data Fund

b. Japanese side : JICA Study Team

Mr. Hisashi Mori	Team Leader
Mr. Kensuke Kimura	Study Coordinator
Mr. Akihiro Sugita	Supervisor of GIS and Mapping
Mr. Hitoshi Yamaga	Supervisor of Map Symbolization

Appendix 1- b

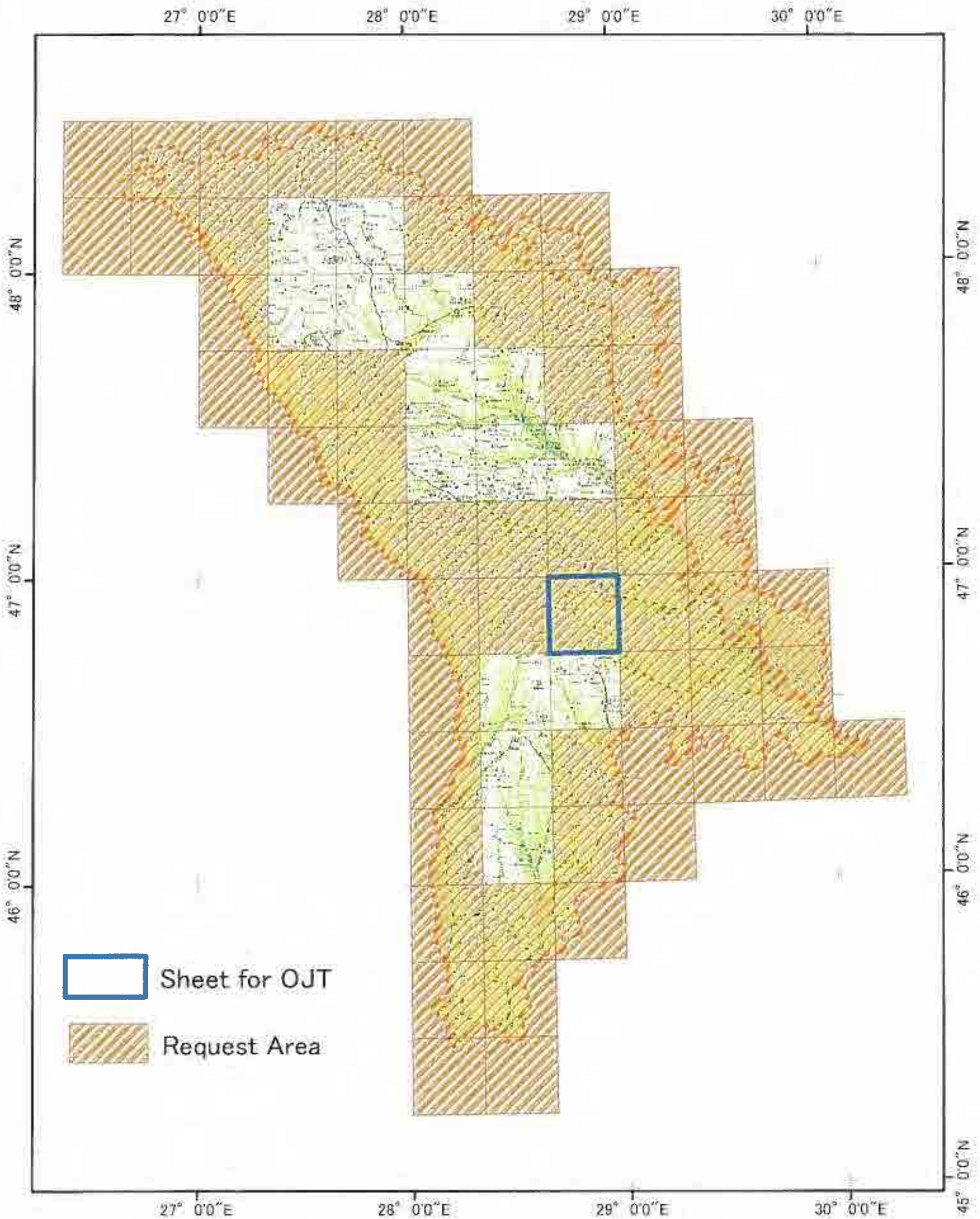
List of participants

Discussion on map symbolization

Name	Section	Title
Ovdii Maria	ALRC	Head of Department Geodesy, Mapping & GIS
Rudenco Tamara	ALRC	National Geospatial Data Fund
Mihov Vladimir	ALRC	Department Geodesy, Mapping & GIS
Danii Ivan	ALRC	Department Geodesy, Mapping & GIS
Mocreac Octavian	ALRC	Land and Real Estate Cadastre Direction
Gorincioi Sergiu	ALRC	Supplemental Analysis, Monitoring and Evaluation
Pascaru Leonid	ALRC	Land and Real Estate Cadastre Direction
Cebanu Alexandr	ALRC	State Inspectorate
Eremia Ion	ALRC	Department Geodesy, Mapping & GIS
Paharicov Igor	INGEOCAD	Head of Department geo-information system
Nagorneac Constantin	INGEOCAD	Engineer of Department geo-information system
Hisashi Mori	JICA Study Team	Team leader / Quality Control
Hitoshi Yamaga	JICA Study Team	Digital compilation and Map symbolization
Akihiro Sugita	JICA Study Team	Data structurization and GIS database

Appendix 2

ALRC requests for satellite imagery



Appendix 3

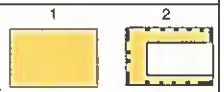
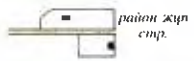
Specifications of symbolization

for the 1:50,000-scale topographic maps

Provisional version II 21th December 2011

SYMBOLS SPECIFICATIONS
OF
1:50 000 SCALE MAP
OF
REPUBLIC OF MOLDOVA

ITEM	No.	Name	Thematic layer	Feature type	Code	Remarks	Old Symbol	New Symbol	Description
Control Points	1	National Geodetic points	Control Point	Point		accepted		91.6	It is necessary to offer this data from ALRC
	1-1	Electrical National Geodetic points	Control Point	Point		accepted		93,8	It is necessary to offer this data from ALRC
	2	National Geodetic points on mountains	Control Point	Point		accepted		99,7	It is necessary to offer this data from ALRC
	3	Geodetic points on buildings	Control Point	Point		accepted			It is necessary to offer this data from ALRC
	4	Geodetic points on churches	Control Point	Point		accepted		a b	It is necessary to offer this data from ALRC
	5	Survey network points	Control Point	Point		accepted		51,1	It is necessary to offer this data from ALRC
	6	Survey network points on mountains	Control Point	Point		accepted		125,5	It is necessary to offer this data from ALRC
	7	National bench marks	Control Point	Point		accepted	71,9 / 71,5	71,9	It is necessary to offer this data from ALRC
	8	Astronomical points	Control Point	Point		accepted		астр.	It is necessary to offer this data from ALRC
Buildings and Other Structures	9	Houses, buildings	Buildings and Residential Districts	a Point b Polygon		Three kind minimum size buildings are unified or changed actual size.	a 6	a b Minimum Size Actual Size	Dwelling houses and not inhabited houses in estates, settlements with unsystematic buildings, and separately located buildings as well.
	10	Remarkable fire-proof buildings	Buildings and Residential Districts	a Point b Polygon		accepted		a b Minimum Size Actual Size	When a building scale which short side of length is longer than 1mm, it is drawn to actual size (scale size)
	10-1	Schools	Buildings and Residential Districts	a Point b Polygon				a b • шк. шк. • больн. больн. Minimum Size Actual Size	
	10-2	Hospitals							
	11	Separately located yards	Buildings and Residential Districts	Point		No11 is unified with No.9 of a.			
	12	Ruined and half-ruined buildings	Buildings and Residential Districts	a Point b Polygon		accepted		a b 1.6 Minimum Size Actual Size	

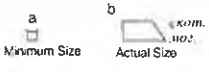
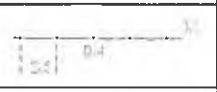
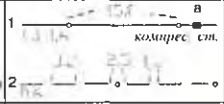
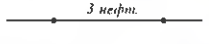
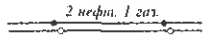
ITEM	No.	Name	Thematic layer	Feature type	Code	Remarks	Old Symbol	New Symbol	Description
Buildings and Other Structures	13	Permanent stayings of yurtas, tents etc.				excluded			
	14	Closely Built-on Estates with Predominance of Fire-Proof Buildings	Buildings and Residential Districts	1 Polygon 2 Polygon		accepted			1) in large cities: 2) in other settlements; In case of large cities, it is drawn by symbol "1". Inside are shown only important buildings.
	15	Closely Built-on Estates with Predominance of Non-Fire-Proof buildings	Buildings and Residential Districts	1 Polygon 2 Polygon		accepted			
	16	Closely Built-on Parts of Estates, Streets	Roads	1 Polygon 2 Line 3 Line		accepted			1) actual width of streets; 2) main and head streets; 3) other streets and passages;
	17	Scattered buildings or rarely built up estates in cities and other settlements	Buildings and Residential Districts	Polygon		accepted			
	18	Districts of new housing construction	Buildings and Residential Districts	Polygon		No.18 symbols(except road) are unified with No.17			
	19	Districts of new industrial construction	Buildings and Residential Districts	Polygon		No.19 symbols (except railway) are unified with No.17.			
	20	Wrecked and half-wrecked estates	Buildings and Residential Districts	Polygon		accepted			
	21	Overbridges for traffic on streets				excluded	not applicable at 1:50 000		
	22	Underground passages				excluded			
	23	Not traffic passable parts of streets				excluded	not applicable at 1:50 000		
	24	Suburban settlement estates with lots of trees	Buildings and Residential Districts	Polygon		accepted			

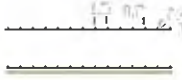
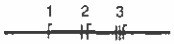
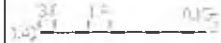
ITEM	No.	Name	Thematic layer / Feature type	Code	Remarks	Old Symbol	New Symbol	Description
Buildings and Other Structures	25	Example for map expression						
	26	Example for map expression						
	27	Example for map expression						
	28	Example for map expression						
	29	Example for map expression						
	30	Example for map expression						
	31	Example for map expression						
	32	Example for map expression						
	33	Example for map expression						
	34	Example for map expression						
	35	Example for map expression						
	36	Plant, factory chimneys and other pipes			accepted			with height value

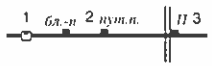
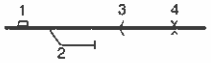
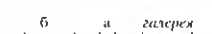
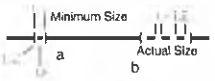
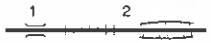
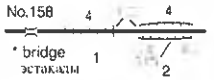
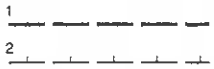
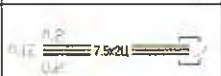
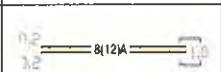
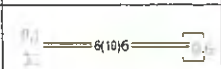
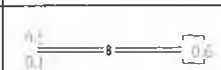
ITEM	No.	Name	Thematic layer	Feature type	Code	Remarks	Old Symbol	New Symbol	Description
Buildings and Other Structures	37	Plants, factories, mills with chimneys and other pipes	Buildings and Residential Districts	a Point b Polygon		accepted		a 50 Minimum Size; b Actual Size	
	38	Factories, plants and mills without pipes	Buildings and Residential Districts	a Point b Polygon		accepted		a Minimum Size; b Actual Size	
	39	Entrance to mines and adits 1) operating; 2) inoperating	Open Areas	1 Point 2 Point		accepted		1; 2	
	40	Areas for out put of minerals by opencut operation (Quarries)	Open Areas	a Line b Line		accepted	a Minimum Size; b Actual Size	a Minimum Size; b Actual Size 0.1	
	41	Waste heaps, rock dumps				excluded	a 15 Minimum Size; b 25 Actual Size		
	42	Salt exploitation (Quarries)	Open Areas	a Point b Polygon		excluded	a Minimum Size; b Actual Size		
	43	Peatary	Open Areas	a Point b Polygon		excluded	a Minimum Size; b Actual Size		
	44	Oil, gas and other wells with derricks	Other Constructions	Point		accepted			
	45	Oil,gas and other wells without derricks	Other Constructions	Point		accepted			
	46	Fuel stores and gas holders	Other Constructions	Point		accepted			
	47	Petrol pumps and filling stations	Buildings and Residential Districts	Point		accepted		0.4	
	48	Electric power stations	Buildings and Residential Districts	a Point b Polygon		accepted	a Minimum Size ГЭС; b Actual Size ГЭС	a ГЭС; b ТЭЦ ГРЭС Actual Size	Buildings of hydro power stations are put on the annotation ГЭС Buildings of state district power stations are put on the annotation ГРЭС Buildings of heating power stations are put on the annotation ТЭЦ
	48-1	Wind power stations						a; b Actual Size	Buildings of wind power stations are put on the annotation

ITEM	No.	Name	Thematic layer	Feature type	Code	Remarks	Old Symbol	New Symbol	Description
Buildings and Other Structures	49	Electric power stations	Buildings and Residential Districts	Point		No.49-a are accepted. No.49-b ТЭЦ, ГРЭС are unified with No.48	a Minimum Size; b 3.1 mm. ТЭЦ Actual Size		When actual size Electric power stations, refer to No.48.
	50	Cooling towers	Other Constructions	Point		accepted		a; b Actual Size	
	51	Electric power substations (transformer and converter)	Buildings and Residential Districts	a Point b Polygon c Polygon		accepted		b converter substation; a transformer box; c 0.1; Actual Size	
	52	Radio stations and television centers	Other Constructions	Point		accepted			
	53	Television towers	Other Constructions	Point		accepted		50	
	54	Television, radio, radio relay aerial masts	Other Constructions	Point		accepted		80	
	55	Airports	Other Constructions	Point		accepted			
	56	Areas for landing	Other Constructions	Point		accepted			
	57	Capital structures of Tower Type (water towers, etc.) Капитальные сооружения башенного типа (водонапорные башни и т.д.)	Other Constructions	Point		accepted			
	58	Simple towers (watchtowers, etc.)				accepted			
	59	Water Mills and Saw Mills	Other Constructions	Point		accepted			
	60	1)Wind mills; 2)Wind engines				excluded	1 2		

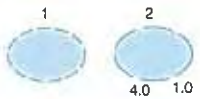
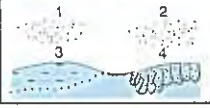
ITEM	No.	Name	Thematic layer	Feature type	Code	Remarks	Old Symbol	New Symbol	Description
Buildings and Other Structures	61	Remarkable lime charcoal kilns	Buildings and Residential Districts	Point		accepted			
	62	Green houses, hot houses, hot beds	Buildings and Residential Districts	Point		accepted			Arrangement is as on the actual ground.
	63	Bee gardens	Buildings and Residential Districts	Point		accepted			
	64	Enclosures for the cattle	Buildings and Residential Districts	a Point b Polygon		accepted		a Minimum Size b Actual Size	
	65	Woodman houses	Buildings and Residential Districts	Point		accepted			
	66	Telegraph, radiotelegraph offices and bureaus, telephone exchanges				excluded			
	67	Meteorological Stations	Buildings and Residential Districts	Point		accepted			
	68	Churches	Buildings and Residential Districts	a Point b Polygon		accepted		a Minimum Size b Actual Size	Even if the church has big building, the symbols are not put in the inside.
	68-1	Sinagogas	Buildings and Residential Districts	a Point b Polygon		accepted		a Minimum Size b Actual Size	Even if the sinagoga has big building, the symbols are not put in the inside.
	69	Mosques				excluded	a 1.0 Minimum Size b Actual Size		
	70	Buddhistic and other temples and pagodas				excluded	a Minimum Size b Actual Size		
	71	1)Chapels; 2)mazars, suburgans, obos and suchlike				excluded	1 2		
	72	Remarkable statues and monuments	Other Constructions	Point		accepted			

ITEM	No.	Name	Thematic layer	Feature type	Code	Remarks	Old Symbol	New Symbol	Description
Buildings and Other Structures	73	Monuments, statues, common graves, and separate graves	Other Constructions	Point		accepted			
	74	Cemeteries	Open Areas	a Point b Polygon		accepted			
	75	Burial grounds of the cattle	Open Areas	a Point b Polygon		accepted			
Infrastructures	76	Communication lines (telephone, telegraph,broadcasting)	Utilities	Line		accepted			
	77	Subwater communication cables	Utilities	Line		accepted			
	78	Electric transmission lines of less than 14m in height on wooden stands and iron concrete posts	Utilities	Line		accepted			When power line is through out dwelling area, it is unnecessary to represent on map.
	79	Electric transmission lines of 14m and over in height on metal and iron concrete posts	Utilities	Line		accepted			
	80	Electric transmission lines closely running	Utilities	Line		accepted			2 - number of electric transmission lines
	81	Oil pipelines: 1) surface; 2) underground, subwater;	Utilities	1 Line 2 Line		accepted			
	82	Gas pipelines: 1) surface; 2) underground, subwater;	Utilities	1 Line 2 Line a Point		accepted			a) pump
	83	Oil or gas pipelines, closely running	Utilities	Line		accepted			3 - number of pipelines
	84	Oil and gas pipe-lines, closely running	Utilities	Line		accepted			2 - number of oil pipelines; 1- number of gas pipelines

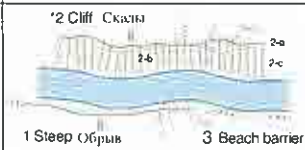
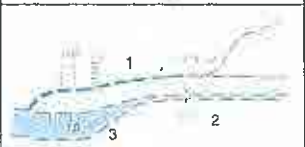
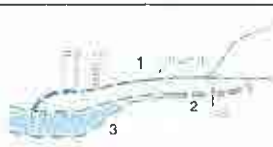
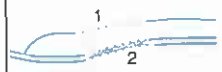
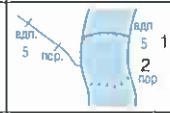
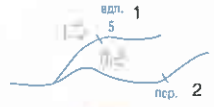
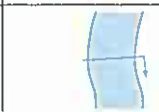
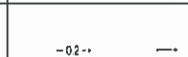
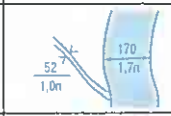
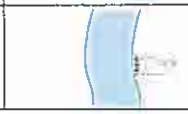
ITEM	No.	Name	Thematic layer	Feature type	Code	Remarks	Old Symbol	New Symbol	Description
Infrastructures	85	Inverted siphons on oil and gas pipelines	Utilities	Line		accepted			
	86	Chutes to launch the forest and other materials				excluded			
	87	Ancient Historical Walls	Walls and Revetments	Line		accepted			
	88	Stone, brick walls and Metal Fences	Walls and Revetments	Line		accepted			
	89	Walls and Revetments for lot space	Walls and Revetments	Line		accepted			
Railways	90	Railways	Railways	1 Line 2 Line		accepted			1 - single line 2 - double lines
	91	Electrified Railways: 1) one-way; 2) two-way; 3) three-way;				excluded			
	92	Mono-Railways				excluded			
	93	Narrow-gauge lines and stations on them	Railways	Line		accepted			
	94	Tram-lines				excluded			
	95	Suspension ways	Railways	Point		accepted			
	96	Railway stations	Railways	Point		accepted			1 - In case of the platform is on the upside of the rail. 2 - Platform between rails. 3 - Cannot recognized.

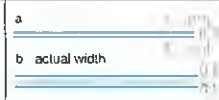
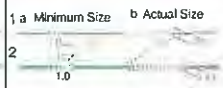
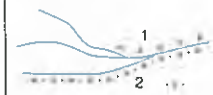
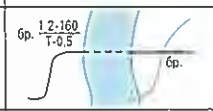
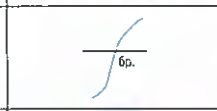
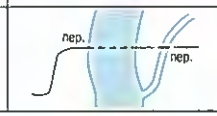
ITEM	No.	Name	Thematic layer	Feature type	Code	Remarks	Old Symbol	New Symbol	Description Пояснение
Railways	97	1) Stations and double tracks, platforms; 2) block posts; 3) posts at secured crossings;	Railways	Point		No.97-1 are accepted. No.97-2, 3 are excluded.			
	98	1) Loading/unloading platforms; 2) line ends and side tracks; 3) railway parts with big slopes (over 20%); 4) pipes;	Railways	2 Line 4 Point		No.98-1are accepted. No.98-2 are accepted and unified with No.104. No.98-3 are excluded. No.98-4 are accepted and unified with No.156.			
	99	Railroad Tunnels and tunnel trunkways	Tunnels	a Point b Polygon		Trunkways are unified with "b"			When a tunnel length is longer than 1.5mm, it is drawn to actual size (scale size)
	100	Trestle bridges, Embankments and cuttings	Railways Walls and Revetments	* Line 1 Line 2 Line		No.100-1 is unified with No.158. No.100-2 are accepted and divided as 1, 2.			1) embankment for railway and its height value. 2) cutting for railway and its height value.
	101	Bed of dismantled railways	Railways	Line		accepted			
	102	Railways under construction: 1) broad-gauge; 2) narrow-gauge;	Railways	Line		accepted			
	103	Subway stations				excluded			Under ground prats of subway are not expressed on the map.
	104	Railways siding, depots, turntables, railway stations	Railways	Line		accepted			Turntable is drawn to scale size when it is larger than1mm.
Roads	105	Highways with more than two lanes per section	Roads	Line		accepted			
	106	Highways with more than two lanes, with improved covering	Roads	Line		accepted			
	107	Motorways with covering	Roads	Line		accepted			
	108	Motorways without covering (improved country roads)	Roads	Line		accepted			

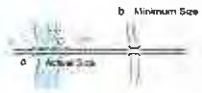
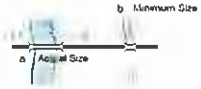
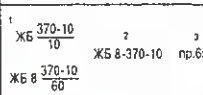
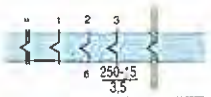
ITEM	No.	Name	Thematic layer	Feature type	Code	Remarks	Old Symbol	New Symbol	Description
Roads	109	Motorways with wooden covering				excluded			
	110	Cart tracks	Roads	Line		accepted			
	111	Forest and country roads	Roads	Line		accepted			
	112	Winter roads				excluded			
	113	Caravan roads and paths of animal packs				excluded			
	114	Pedestrian paths and foot bridges	Roads	*Line **Line		accepted		** foot path bridge *	
	115	Roads under construction	Roads	1 Line 2 Line 3 Line		Line weight shall be corresponded same as each road edge.		1 2 3	1) highway; 2) motorway with covering; 3) motorway without covering;
	116	Embankments and cuttings for roads	Walls and Revetments	1 Line 2 Line 3 Point		accepted No.116-2 are excluded	1 2	4 4 1 2 3	1) embankment for road with height value; 2) cutting for road with height value; 3) slope
	117	Tunnels	Tunnels	Line		Trunkways are unified with "b"		a Minimum Size b Actual Size	When a tunnel length is longer than 1.5mm, it is drawn to actual size (scale size)
	118	Interchanges on motorways				example for interchanges on the map expression		Minimum Size a b Actual Size	Interchanges are shown by bridge symbols and roads.
	119	Auto transport parking areas on the hidhways and motorways with improved covering	Roads	Point		No.119-b is unified with "a".	a P b	P	Put on the annotation P .
	120	Road numbers				accepted		A-100 4.5x2.0	Place Moldovian road number and Euro road number. *It is necessary to offer this data from MRC*

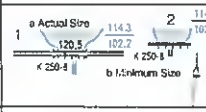
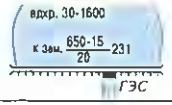
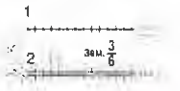
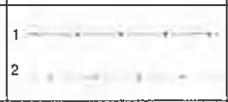
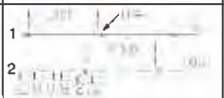
ITEM	No.	Name	Thematic layer	Feature type	Code	Remarks	Old Symbol	New Symbol	Description
Roads and Railways	121	Example for map expression							
	122	Example for map expression							
	123	Example for map expression							
	124	Example for map expression							
	125	Example for map expression							
	126	Example for map expression							
	127	Example for map expression							
	128	Example for map expression							
Hydrography and its Structures	129	Coastal Line of seas, rivers, lakes, reservoirs, permanent and certain	Hydrography	1 Polygon/Line 2 Polygon/Line		accepted			1) coast lines ; 2) lakes, ponds, reservoirs ;
	130	Coastal Line: 1) not permanent; 2) uncertain;	Hydrography	Polygon/Line		No.130-2 is unified with No.130-1			Dashed line is unified with 2.0mm dash and 0.5mm gap.
	131	1) Coast shallows and banks; 2) perilous coasts (character of peril is unknown);				excluded			
	132	Coasts that gets dry				excluded			1) sandy; 2) sandy-stone and pebble-gravel containing; 3) silt; 4) rocky;

*No133-2, -3 are necessary two kind of lines which are limits line and lower line. These lines are meaning width of cliff and steep.
Limits line code are 7211 (for No133-2), 7213 (for No133-3). Lower line code are 7212 (for No133-2), 7214 (for No133-3).

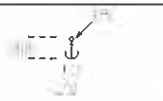
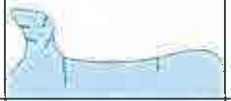
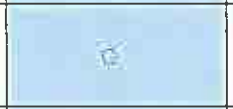
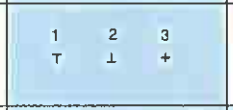
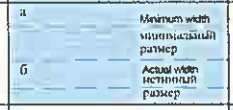
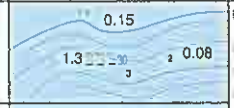
ITEM	No.	Name	Thematic layer	Feature type	Code	Remarks	Old Symbol	New Symbol	Description
Hydrography and Its Structures	133	Steep and cliff, beach barriers, and other ridges	Relief	1 Line 2 Line 3 Line		accepted, No133-2 is changed representation.			2-a Cliff limits is drawn to irregular line, it is avoid sharp angles and vertex. 2-b, 3 Main ticks length is perpendicularly drawn to scale from cliff limits. Ticks alignment is regularly 1.0mm each when ticks overlapped should be appropriately spaced between ticks. 2-c Interior of cliff is shown by 133 tint screen. Contours and other background color should be masked. Place height value.
	134	Permanent rivers and streams	Hydrography	1 Line 2 Line 3 Polygon		accepted, symbols line spec. are changed.			1) with a width of less than 5m; 2) with a wide of from 5 to 30m; 3) with over 30m;
	135	Rivers and streams that gets dry	Hydrography	1 Line 2 Line 3 Polygon		accepted, symbols line spec. are changed.			1) indicated in one line; 2) indicated in double line;
						Remarks	Old Symbol Старый символ	New Symbol Новый символ	
	136	Underground and wasted sections of rivers				excluded			1) indicated in one line; 2) indicated in double line;
	137	Waterfalls and rapids: 1) large waterfall; 2) large rapids;	Hydrography	Line		accepted small symbols, excluded the large waterfall and large rapids symbols			1) waterfall with height value; 2) rapids;
	138	Beginning of regular navigation				accepted			
	139	Markings of water levels	Control Point	Point		accepted			
	140	Arrows to indicate direction of flow, speed of rivers flow	Hydrography	Line					Symbols are shown as existing map.
	141	Specifications of Rivers and Canals (width, depth and bottom ground type)				accepted			
	142	Water gauge stations and foot gauges	Hydrography	Point		accepted			

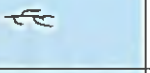
ITEM	No.	Name	Thematic layer	Feature type	Code	Remarks	Old Symbol	New Symbol	Description Пояснение
Hydrography and its Structures	143	Canals and ditches with a width of less than 3m	Hydrography	Line		accepted, 0.2mm lines are unified with 0.15mm			Canals and ditches with a width of less than 3m
	144	Canals and ditches with a width of 3m to 5m	Hydrography	Line		No144 is unified with No.145			
	145	Canals and ditches with a width of 3m to 15m	Hydrography	Line		accepted			Canals and ditches with a width of less than 3m in 15m width
	146	Canals and ditches with a width of 15m to 30m and over 30m	Hydrography	a Line b Polygon		accepted			a) double line canal width of 15m to 30m; b) double line canal width of over 30m;
	147	Underground parts of canals	Hydrography	1 Line 2 Line		accepted, without circle symbols			1) single line canal a width of less than 3m; 2) double line canal with a width of 3 to 15m;
	148	Canals under construction	Hydrography	1 Line 2 Line		accepted, * symbols are unfied with "2"			1) single line canal with a width of less than 3m; 2) double line canal with a width of 3 to 15m;
	149	Irrigation canals (aryks)	Hydrography	Line		accepted			
	150	Water-distributing mechanisms: 1) round-way water diversion: 2) one-way water diversion;				excluded			
	151	Trees and bushes along the rivers, canals and ditches	Vegetation	1 Line 2 Line		example for map expression			
	152	Dry ditches	Hydrography	1 Line 2 Line		accepted			1) single line; 2) double line and its width value;
	153	Fords	Hydrography			accepted			
	154	Transportation for rivers	Hydrography	Line		accepted			

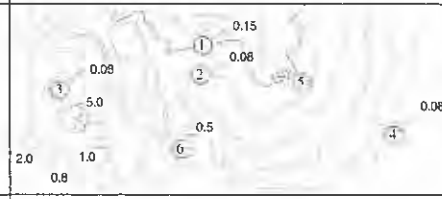
ITEM	No.	Name	Thematic layer	Feature type	Code	Remarks	Old Symbol	New Symbol	Description
Hydrography and Its Structures	155	River Ferries	Hydrography	Line		accepted			1) for wide double line rivers; 2) for narrow rivers;
	156	Culverts	Hydrography	Point		accepted			
	157	Road bridges	Roads	Line		No.157 are unified with No.158			When a bridge length is longer than 1.5mm, it is drawn to actual size (scale size)
	158	Railway bridges	Railways	Line					
	159	Two-tier bridges: 1) motorway under railway; 2) motorway above railway;	Railways	Line		No.159 are unified with No.158			
	160	Bridges on railways and motorways situated	Railways	Line		No.160 are unified with No.158			1) on common bridge span support 2) on separate bridge span supports.
	161	Draw-bridges	Roads	Line		No.161 is unified with No.157			
	162	Floating bridges	Roads	Line		No.162 is unified with No.157			
	163	Specifications of the bridges	Hydrography			accepted			Place this information for over 3m width bridge.
	164	Sluices 1)cameras; 2) gates; 3) underbridge gates				excluded			
	165	Reveted canal bank slopes				accepted			
	166	Embankments: 1) stone, concrete and reinforced concrete; 2) wooden;	Hydrography	Line		accepted "1", excluded "2", "3" is non-applicable at 1:50 000.			

ITEM	No.	Name	Thematic layer	Feature type	Code	Remarks	Old Symbol	New Symbol	Description
Hydrography and Its Structures	167	Dams	Hydrography	1 Line 2 Line b Line		accepted			1) vehicle passable; 2) vehicle not passable Place information.
	168	Underwater dams				excluded			
	169	Example for map expression							
	170	Dikes	Hydrography	1 Line 2 Line		accepted			
	171	Example for map expression of the dikes	Hydrography	Line		accepted			
	172	Aqueducts	Hydrography	Line		excluded			
	173	Boundaries and spaces of the reservoirs under construction				excluded			
	174	Areas of over flow during the rainy seasons (over 2 months)	Hydrography	Polygon		accepted			
	175	Water pipelines	Hydrography	1 Line 2 Line		accepted			1) overland water pipelines; 2) underground water pipelines;
	176	Inverted siphons on the water pipelines	Hydrography	Line		accepted			
	177	Active Karezes				excluded			
	178	Non-active Karezes				excluded			

ITEM	No.	Name	Thematic layer	Feature type	Code	Remarks	Old Symbol	New Symbol	Description Пояснение
Hydrography and Its Structures	179	Wells	Other Constructions	Point		accepted			
	180	Main wells				excluded			
	181	Wells with wind engines				excluded			
	182	Concrete wells with mechanical elevation system	Other Constructions	Point		accepted			
	183	Artesian wells and drill holes	Other Constructions	Point		accepted			
	184	Chigirs				excluded			
	185	Reservoirs	Other Constructions	Point		accepted			
	186	Water sources (springs, streams)	Other Constructions	Point		accepted			
	187	Equipped sources	Other Constructions	Point		accepted			
	188	Geysers				excluded			
	189	Fountains	Other Constructions	Point		accepted			
	190	Sea Ferries: 1) railway ferry; 2) car transportation ferry;				excluded	1 ж.-д. паром 2 авт. паром		

ITEM	No.	Name	Thematic layer	Feature type	Code	Remarks	Old Symbol Старый символ	New Symbol Новый символ	Description Пояснение
Hydrography and its Structures	191	Anchored Stations and Docks	Hydrography	Point		accepted			
	192	Docks with equipped moorages	Hydrography	Point		accepted			Put on annotation
	193	Moles and Moorages	Hydrography	Line		accepted, symbol "a" is excluded.			
	194	Breakwaters				excluded			
	195	Small-sized banks				excluded			
	196	Stones: 1) subwater; 2) above water; 3) dried out;				excluded			
	197	Separate islands and above-water rocks	Hydrography	Point		accepted			
	198	Subwater reefs				excluded			
	199	Dried reefs				excluded			
	200	Sea channels				excluded			
	201	Isobaths and their signs	Contour Lines and Isobaths	Line		accepted			Isobaths and their signs are acquired from existing map. 1 index isobaths 2 regular isobaths 3 isobath value
	202	Markings of the depths	Control Point	Point		accepted			Markings of the depths are acquired from existing map.

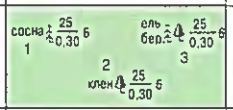
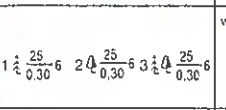
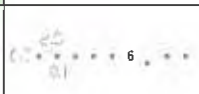
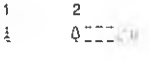
ITEM	No.	Name	Thematic layer	Feature type	Code	Remarks	Old Symbol	New Symbol	Description
Hydrography and Its Structures	203	Beacons				excluded			
	204	Lights	Other Constructions	Point		accepted			
	205	Permanent marks of the coastal alarm, reference marks	Other Constructions	Point		accepted			
	206	Lightships				excluded			
	207	Lighting buoys	Other Constructions	Point		accepted			
	208	Dry docks				excluded			
	209	Spillways and building slips				excluded			
	210	Areas of fin gathering				excluded			
	211	Sea weeds				excluded			
	212	Direction of tidal flows				excluded			

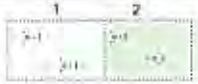
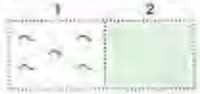
ITEM	No.	Name	Thematic layer	Feature type	Code	Old Symbol	New Symbol	Description
Topography	213	Contour Lines Remarks accepted	Contour Lines and Isobaths	Line				1 index contour line 2 regular contour line 3 additional contour line 4 supplementary contour line 5 contour value 6 depression contour line
	214	Dry channels and hollows of dried-up lakes Remarks accepted	Relief	1 Line 2 Line 3 Polygon				

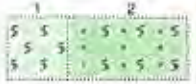
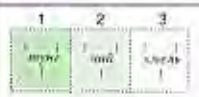
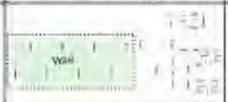
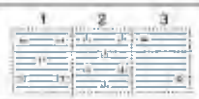
	Name	Thematic layer	Feature type	Code	Remarks	Old Symbol Старый символ	New Symbol Новый символ	
215	Spot heights	Control Point	Point		accepted, all spot height points and their value size are unified in 0.3mm and 1.5mm.	123,4 123,4	size of height value 2mm 123,4	
216	Spot heights by the reference marks	Control Point	Point		accepted, put on the point of height near the object or center of the road junction. All spot height points and their value size are unified in 0.3mm and 1.5mm.	123,4 123,4 123,4	size of height value 1.5mm 123,4 123,4 123,4	
217	Spot heights of points situated below sea level	Control Point	Point		accepted, all spot height points and their value size are unified in 0.3mm and 1.5mm.		size of height value 2mm -54,0	
218	Main Passes, their spot heights and duration				excluded	5043,0 IV-X		
219	Passes, their spot heights and duration				excluded	3525,4		
220	Rock-remains				excluded			
221	1) Isolated stones; 2) Stone accumulations;	Distorted Areas	Point		accepted ※ "1" is excluded.	1 2		
222	a) Pits; b) Hills and hillocks;	Relief	1, 2 Point 3, 4 Line		accepted		1 a 2 3 4 1.0 b	a Minimum Size (place depth or height value) b Actual Size (place depth or height value)
223	Coastal, historical swells etc. not represented by contour lines	Relief	Line		accepted			Draw as slop or cliff.

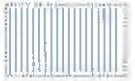
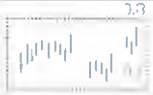
ITEM	No.	Name	Thematic layer	Feature type	Code	Remarks	Old Symbol	New Symbol	Description
Topography	224	Karst and thermo-karst craters	Relief	Point		accepted			Drawn isolated or as scattered; representation comes as the actual ground.
	225	Cave and grotto entrances	Distorted Areas	Point		accepted			
	226	Volcano craters: 1) volcano craters not expressed in the map scale; 2) muddy volcano craters				excluded	1 2		
	227	Dikes and range of narrow rocky steeps				excluded			Draw to apply symbol No. 133-1,-3. Between limits lines space are as scaled
	228	Rock-out crops				excluded			Symbols are irregularly drawn and scatterd as nature. Symbols size are approximate 1.5mmx1.5mm or more or scaled.
	229	Example for map expression	Distorted Areas	Line		accepted	New Symbol		1) moraines. No.281; 2) stone rivers; 3) rocks and rocky cliffs: No.133-2; 4) boundaries of glacier fields; 5) glacier relief; 5-1 index contour, 5-2 regular contour line; 5-3 additional contour line; 5-4 supplementary contour line In glacier area fills in dot. Stone rivers :it is acquired more obviously from aerial photograph. Glacier relief: it is acquired as existing map.
	230	Example for map expression							
	231	Example for map expression							
	232	Debris of crisp rocks	Distorted Areas	Polygon		accepted			Sandy, clayey rocks: Apply sand tint screen, contours and other back -ground color are masked.
	233	Debris of solid rocks	Distorted Areas	Line		accepted			Stone and crushed stone, shingly rocks: Apply 233 tint screen and interior lines are roughly spaced that are between 2mm or more, other background color are masked.
	234	Example for map expression							
	235	Landslips	Distorted Areas			accepted			

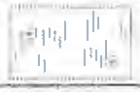
*No233 is necessary two kind of lines which are limits line and lower line. These lines are meaning width of Debris of solid rocks.
Limits line code is 7216. Lower line code are 7217

ITEM	No.	Name	Thematic layer	Feature type	Code	Remarks	Old Symbol	New Symbol	Description
Topography	236	Gorges and water- eroded areas	Distorted Areas	Line					Draw to apply symbol No.133.1-3 Place depth and height value.
	237	a) Slopes, b) solid benches on terraced slope sections	Distorted Areas	Line					Draw to apply symbol No.133.1-3 Place height value.
Vegetation	238	Vegetation and ground boundaries	Vegetation	Line		accepted			
	239	Forests	Vegetation	Polygon		accepted, fill in green screen			
	240	Dominant species of tree in the forest: 1) coniferous; 2) deciduous; 3) mixed;	Vegetation	Point		trees symbols are accepted, green masks are unified with No.239.			with its dimension.
	241	Range of trees and protective afforestation	Vegetation	Line		accepted			If length is less than 2cm, it should be omitted. Place height of tree value.
	242	Small spaces of the dense forest	Vegetation	Point		accepted			
	243	Isolated groves, reference marks: 1) coniferous; 2) decidous; 3) mixed;	Vegetation	Point		accepted			
	244	Isolated trees, reference marks	Vegetation	Point		accepted			1) coniferous; 2) decidous
	245	Isolated trees, not reference marks	Vegetation	Point		accepted			
	246	1) Palm tree groves; 2) isolated palm trees;				excluded			
	247	Stunted forests				excluded			

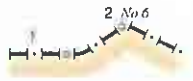
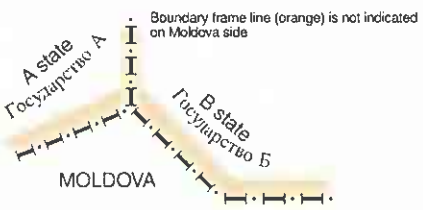
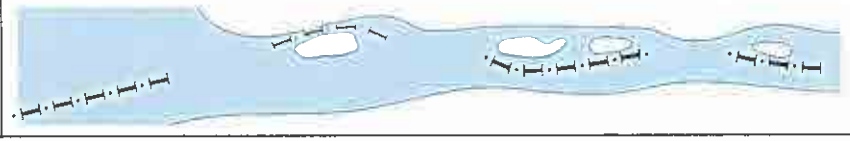
ITEM	No.	Name	Thematic layer	Feature type	Code	Remarks	Old Symbol	New Symbol	Description
Vegetation	248	Nursery forests and young trees planting	Vegetation	Polygon		accepted			
	249	Wind fallen wood				excluded			
	250	1)Thinly growing trees; 2)thinly growing dwarf trees	Vegetation	Point Polygon		accepted. No.250 are united with "1".			As for small group of trees can place a 6363 symbol on as a point, in that case a 6363 symbol is changed code for 6368.
	251	1) Burnt dead-wood land; 2) cut forests;	Vegetation	Polygon		"1" is excluded "2" is accepted			
	252	Cut line in the forest and its example for the map expression							
	253	Bushes	Vegetation	1 Point 2 Polygon 3 Polygon		accepted			1) As for small group of bushes can place 6362 symbol on as a point, in that case a 6362 symbol is changed code for 6369. 2) separate bushes and groups of bushes; 3) dense brushwoods of bushes;
	254	Spiny bushes: 1) separate bushes and groups of bushes; 2) dense brushwoods of bushes;	Vegetation	1 Polygon 2 Polygon		No.254 are united with No.253			
	255	Bush species: 1) coniferous; 2) deciduous;	Vegetation	Point		accepted			1) coniferous; 2) deciduous;
	256	Narrow bush strips and green hedges	Vegetation	Line		accepted			If length is less than 5mm, a should be excluded.
	257	SAKSAUL:1) separate groups; 2) dense brushwoods of bushes;				excluded			
	258	STLANIK1) separate groups; 2) dense brushwoods of bushes;				excluded			1) separate groups 2) dense brushwoods of bushes
	259	Bamboo groves				excluded			

ITEM	No.	Name	Thematic layer	Feature type	Code	Remarks	Old Symbol	New Symbol	Description
Vegetation	260	Mangroves				excluded			
	261	Fruit and citrous orchards	Vegetation	Polygon		accepted			
	262	1)Vine yards; 2)fruit and citrus orchards with vine yards	Vegetation	1 Polygon 2 Polygon		accepted			
	263	1) Berry gardens; 2) fruit-berry orchards.	Vegetation	1 Polygon 2 Polygon		accepted			
	264	Upland rice fields. 1) moisturized during vegetation; 2) submerged during vegetation.	Vegetation	Polygon		accepted. No.264 are unified with "1" of No.264.			
	265	Plantations of industrial crops 1)trees; 2)shrubs; 3)grass	Vegetation	Polygon		accepted. No.265 are unified with "2" of No.265.			with annotation
	266	Meadow grass	Vegetation	Polygon		accepted. No.266 are unified with "1" of No.265.			
	267	Cane and reed thickets	Vegetation	Polygon		accepted			
	268	Example for map expression							
	269	1)Steppe (grassy) vegetation; 2)subshrubs	Vegetation	Polygon		accepted. No269 are unified with "1" symbol.			
	270	Mossy and lichenaceous vegetation				excluded			
	271	Impassable and almost impassable swamps and their vegetation 1)grassy; 2)mossy; 3)cane and reed	Vegetation	1 Polygon 2 Polygon		No271-1 are unified with No272-1. No271-2 are excluded. No271-3 are unified with No272-3.			

ITEM	No.	Name	Thematic layer	Feature type	Code	Remarks	Old Symbol	New Symbol	Description
Vegetation	272	Passable swamps and their vegetation 1)grassy; 2)mossy; 3)cane and reed	Vegetation	Polygon		"2" are excluded.			
	273	Impassable salines				excluded			
	274	Passable salines	Vegetation	Polygon		accepted			
Ground	275	Takhirs				excluded	 symbol before 1982		
	276	Polygonal surfaces				excluded			
	277	Surfaces with mounds				excluded			
	278	Clayey surfaces				excluded			
	279	Surfaces with hillocks	Relief	Polygon		accepted			
	280	Stone surfaces	Relief	Polygon		accepted			a) stone placers and detritus surfaces b) stone surfaces
	281	Pebble and gravel surfaces	Relief	Polygon		accepted			Apply 282 tint screen with symbol No.280.
	282	Plain sands	Relief	Polygon		accepted			Apply 282 tint screen
	283	Mound sands	Relief	Polygon		accepted			

ITEM	No.	Name	Thematic layer	Feature type	Code	Remarks	Old Symbol	New Symbol	Description
Ground	284	Ridge and dune sands	Relief	Polygon		No.284 is united with No.282.			
	285	Holey and cellular sands	Relief	Polygon		No.285 is united with No.282.			
	286	Barkhan sands	Relief	Polygon		No.286 is united with No.282.			
Mixed Vegetation	287	Example for map expression							
	288	Example for map expression							
	289	Cane with separate bushes and groups of bushes on swamp	Vegetation	Polygon		accepted			Mixed appearance: background symbols come as dominant vegetation on the actual ground.
	290	Grass and bushes	Vegetation	Polygon		accepted			Mixed appearance: background symbols come as dominant vegetation on the actual ground.
	291	Separate bushes and groups of bushes on swamp	Vegetation	Polygon		accepted			Mixed appearance: background symbols come as dominant vegetation on the actual ground.
	292	Dense brushwoods of bushes on swamp	Vegetation	Polygon		accepted			Mixed appearance: background symbols come as dominant vegetation on the actual ground.
	293	Separate bushes and groups of bushes on saline	Vegetation	Polygon		excluded			
	294	Grass on saline	Vegetation	Polygon		excluded			
	295	Separate bushes and groups of bushes on stone surface	Vegetation	Polygon		accepted			Mixed appearance: background symbols come as dominant vegetation on the actual ground.
	296	Separate bushes and groups of bushes on sands	Vegetation	Polygon		accepted			Mixed appearance: background symbols come as dominant vegetation on the actual ground.

ITEM	No.	Name	Thematic layer	Feature type	Code	Remarks	Old Symbol	New Symbol	Description
Mixed Vegetation	297	Sparse growth of trees with bushes	Vegetation	Polygon		accepted			Mixed appearance: background symbols come as dominant vegetation on the actual ground.
	298	Sparse growth of trees with grass	Vegetation	Polygon		accepted			Mixed appearance: background symbols come as dominant vegetation on the actual ground.
	299	Sparse growth of trees with bushes and grass	Vegetation	Polygon		accepted			Mixed appearance: background symbols come as dominant vegetation on the actual ground.
	300	Sparse growth of trees on dense brushwoods of bushes	Vegetation	Polygon		accepted			Mixed appearance: background symbols come as dominant vegetation on the actual ground.
	301	Sparse growth of trees with bushes and meadow grass	Vegetation	Polygon		accepted			Mixed appearance: background symbols come as dominant vegetation on the actual ground.
	302	Example for map expression							
	303	Example for map expression							
	304	Example for map expression							
	305	Example for map expression							
	306	Example for map expression							
	307	Example for map expression							
	308	Example for map expression							
	309	Example for map expression							

ITEM	No.	Name	Thematic layer	Feature type	Code	Remarks	Old Symbol Старый символ	New Symbol Новый символ	Description Пояснение
Boundaries	310	State boundaries	Administrative Boundaries	Line		accepted			
	311	Polar Boundaries of U.S.S.R.				excluded			
	312	Boundaries of U.S.S.R. republics				excluded			
	313	Boundaries of Autonomous S.S.R., districts, 1st-order administrative units on the foreign territory.	Administrative Boundaries	Line		accepted			
	314	Boundaries of regions				accepted			
	315	Boundaries of national reservations	Administrative Boundaries	Line		accepted			
		Examples for boundaries expression							
	316	Boundary, passing through the center of the river, canal, road, dike, damb and other line objects shown in 1 or 2 lines with a 1-mm space between them.							
	317	Boundary, passing through the center of the river and canal shown in 2 lines with a 1- to 6-mm space between them.							
	318	Boundary, passing by one side of the line object (lake, river, canal, one side of road, etc.).							
	319	Boundary, passing through the sea, gulf, strait, lake, water reservoir as well as river or canal with a width of 6mm and over at the map scale.							

SPECIFICATION OF ANNOTATIONS

	Name	Code	Layer name	Style of Annotations				Example
				Fonts	Style	Size (point)		
10-1	Schools			Times New Roman	Italic	6pt		шк.
10-2	Hospitals			Times New Roman	Italic	6pt		больн.
48	Electric power stations			Times New Roman	Italic	6pt		ГЭС ГРЭС ТЭЦ
51	Electric power substations (transformer and converter)			Times New Roman	Italic	6pt		э.п. подст
61	Remarkable lime charcoal kilns			Times New Roman	Italic	6pt		изв.
62	Green houses, hot houses, hot beds			Times New Roman	Italic	6pt		ор. тепл.
119	Auto transport parking areas on the hidhways and motorways with improved covering			Times New Roman	Italic	6pt		P
120	Road numbers			Arial	Regular	4.5pt		A-100
192	Docks with equipped moorages			Times New Roman	Italic	6pt		прист.
	Remarkable structuers and prominent buildings			Times New Roman	Italic	6pt		

SPECIFICATION OF ANNOTATIONS

	Name	Code	Layer name	Style of Annotations				Example
				Fonts	Style	Size (point)		
	Administration name Cites, settlements (population: more than 1,000,000)			Times New Roman	Regular	24pt		ABCDefgh
	(100,000-500,000)			Times New Roman	Regular	21pt		ABCDefgh
	(50,000-100,000)			Times New Roman	Regular	18pt		ABCDefgh
	(10,000-50,000)			Times New Roman	Regular	16pt		ABCDefgh
	(less than 10,000)			Times New Roman	Regular	15pt		ABCDefgh ĂÎŞŢÂăîşţâ
	Large village (population: more than 2,000)			Arial	Italic	13pt		*ABCDefgh ĂÎŞŢÂăîşţâ*
	(lesse than 2,000)			Arial	Italic	11pt		*ABCDefgh*
	Small village (population: more more than 1,000)			Arial	Regular	10pt		ABCDefgh ĂÎŞŢÂăîşţâ
	(500-1,000)			Arial	Regular	9pt		ABCDefgh
	(100-500)			Arial	Regular	8pt		ABCDefgh
	(less than 100)			Arial	Regular	6pt		ABCDefgh
	Settlements nearby railway station, electric station (more than 1,000)			Arial	Italic	12pt		*ABCDefgh ĂÎŞŢÂăîşţâ*
	(less than 1,000)			Arial	Italic	9pt		*ABCDefgh*

SPECIFICATION OF ANNOTATIONS

	Name	Code	Layer name	Style of Annotations				Example
				Fonts	Style	Size (point)		
	Railway station, port, moor and airport, etc.			Arial Arial	Italic Italic	 6pt		*ABCDefgh ĂÎŞŢÂăîşţâ* *ABCDefgh*
	Navigable river			Times New Roman Times New Roman Times New Roman Times New Roman	Italic Italic Italic Italic	16pt 13pt 11pt 9pt		*ABCDefgh* *ABCDefgh ĂÎŞŢÂăîşţâ* *ABCDefgh* *ABCDefgh*
	River, canal, valley/dried river			Times New Roman Times New Roman Times New Roman Times New Roman Times New Roman	Italic Italic Italic Italic Italic	21pt 15pt 12pt 11pt 9pt		*ABCDefgh* *ABCDefgh* *ABCDefgh* *ABCDefgh* *ABCDefgh*
	Lake, pond and reservoir, gulf, harbor, sea			Times New Roman Times New Roman Times New Roman Times New Roman Times New Roman Times New Roman Times New Roman	Italic Italic Italic Italic Italic Italic Italic	26pt 24pt 20pt 18pt 15pt 12pt 9pt		*ABCDefgh* *ABCDefgh* *ABCDefgh* *ABCDefgh* *ABCDefgh* *ABCDefgh* *ABCDefgh*

SPECIFICATION OF ANNOTATIONS

	Name	Code	Layer name	Style of Annotations				Example
				Fonts	Style	Size (point)		
	Island, peninsulas, bay, inlets, bay-beaches			Arial	Regular	13pt		ABCDefgh
				Arial	Regular	11pt		ABCDefgh ĂÎŞŢÂăîşţâ
				Arial	Regular	9pt		ABCDefgh
				Arial	Regular	7pt		ABCDefgh
	its second names			Arial Narrow	Regular	13pt		ABCDefgh
				Arial Narrow	Regular	11pt		ABCDefgh ĂÎŞŢÂăîşţâ
				Arial Narrow	Regular	9pt		ABCDefgh
	Plains, lowlands, fields, sands, salines, swamps, forest, valley			Times New Roman	Italic	21pt		*ABCDefgh*
				Times New Roman	Italic	17pt		*ABCDefgh*
				Times New Roman	Italic	12pt		*ABCDefgh ĂÎŞŢÂăîşţâ*
				Times New Roman	Italic	10pt		*ABCDefgh*
				Times New Roman	Italic	8pt		*ABCDefgh*
				Times New Roman	Italic	6pt		*ABCDefgh*
	Mountain name			Arial	Italic	26pt		*ABCDefgh*
				Arial	Italic	22pt		*ABCDefgh*
				Arial	Italic	17pt		*ABCDefgh ĂÎŞŢÂăîşţâ*
				Arial	Italic	12pt		*ABCDefgh*
				Arial	Italic	10pt		*ABCDefgh*
				Arial	Italic	8pt		*ABCDefgh*

SPECIFICATION OF ANNOTATIONS

	Name	Code	Layer name	Style of Annotations				Example
				Fonts	Style	Size (point)		
	Mountain name its second name			Arial Narrow Arial Narrow Arial Narrow	Regular Regular Regular	11pt 9pt 7pt		ABCDefgh ABCDefgh ABCDefgh
	National forest reservations			Arial Narrow Arial Narrow Arial Narrow Arial Narrow Arial Narrow	Regular Regular Regular Regular Regular	15pt 12pt 10pt 8pt 8pt		ABCDefgh ABCDefgh ABCDefgh ABCDefgh ABCDefgh
1	National Geodetic points			Arial Narrow	Regular	7pt		△91,6
139	Markings of water levels			Arial Narrow	Regular	6pt	width: 90%	
140	Arrows to indicate direction of flow, speed of rivers flow			Arial Narrow	Regular	5pt	width: 90%	
201	Isobaths and their signs			Arial Narrow	Regular	6pt	width: 75%	
202	Markings of the depths			Arial Narrow	Regular	6pt	width: 75%	
213	Contour value			Arial Narrow	Regular	5pt		
				Arial Narrow Arial Narrow Arial Narrow Times New Roman	Regular Regular Regular Italic	6pt 6pt 6pt 6pt	 width: 90% width: 75% 	1234567890 ABC abc ĂÎŞŢĂ ăîşţă 1234567890 1234567890 *1234567890 ABC abc ĂÎŞŢĂ ăîşţă*

SPECIFICATION OF ANNOTATIONS

	Name	Code	Layer name	Style of Annotations				Example
				Fonts	Style	Size (point)		
215	Spot heights			Arial Narrow	Regular	6pt	width: 90%	· 123.4
216	Spot heights by the reference marks							■123.4 Q 123.4 123.4
217	Spot heights of points situated below sea level							· -54.0
218	Passes, their spot heights and duration							3525.4
	Longitude / latitude corner values			Times New Roman	Roman	8pt		40° 00' 48° 00'
	Direction town name / distance km			Times New Roman	Roman	7 pt		Tbilisi 303 km Ucar 7 km
	UTM grid No.			Times New Roman	Roman	9pt, 7pt		500
38	Factories, plants and mills without pipes			Times	Italic	6 pt		хим.
40	Areas for out put of minerals by opencut operation (Quarries)			Times	Italic	6 pt		кам. пес.
44	Oil, gas and other wells with derricks			Times	Italic	6 pt		газ. нефт.
45	Oil,gas and other wells without derricks			Times	Italic	6 pt		газ.

SPECIFICATION OF ANNOTATIONS

	Name	Code	Layer name	Style of Annotations				Example
				Fonts	Style	Size (point)		
53	Television towers			Arial Narrow	Regular	6pt	width: 75%	50
54	Television, radio, radio relay aerial masts			Arial Narrow	Regular	6pt	width: 75%	80
64	Enclosures for the cattle			Times New Roman	Italic	6pt		*загон*
65	Woodman houses			Times New Roman	Italic	6pt		*лесн.*
75	Burial grounds of the cattle			Times New Roman	Italic	6pt		*скот. мог.*
79	Electric transmission lines of 14m and over in height on metal and iron concrete posts			Arial Narrow	Regular	6pt, 4pt	width: 90%	110 кВ
80	Electric transmission lines closely running			Arial Narrow	Regular	6pt, 4pt	width: 90%	2Л35Пх110кВ
82	Gas pipelines: 1) surface; 2) underground, subwater;			Times New Roman	Italic	6pt		*компрес. ст.*
83	Oil or gas pipelines, closely running			Times New Roman	Italic	6pt		*3 нефт.*
84	Oil and gas pipe-lines, closely running			Times New Roman	Italic	6pt		*2 нефт. 1 газ.*

SPECIFICATION OF ANNOTATIONS

	Name	Code	Layer name	Style of Annotations				Example Образец
				Fonts	Style	Size (point)		
100	Trestle bridges, Embankments and cuttings			Arial Narrow	Regular	6pt		4
105	Highways with more than two lanes per section			Arial Narrow	Regular	6pt	width: 90%	7.5x2Ц
106	Highways with more than two lanes, with improved covering			Arial Narrow	Regular	6pt	width: 90%	8(12)А
107	Motorways with covering			Arial Narrow	Regular	6pt	width: 90%	6(10)б
108	Motorways without covering (improved country roads)			Arial Narrow	Regular	6pt	width: 90%	8
116	Embankments and cuttings for roads			Arial Narrow	Regular	6pt		4
137	Waterfalls and rapids: 1) large waterfall; 2) large rapids;			Arial Arial Narrow	Regular Regular	6pt 6pt	width: 90%	
152	Dry ditches			Arial Narrow	Regular	6pt		

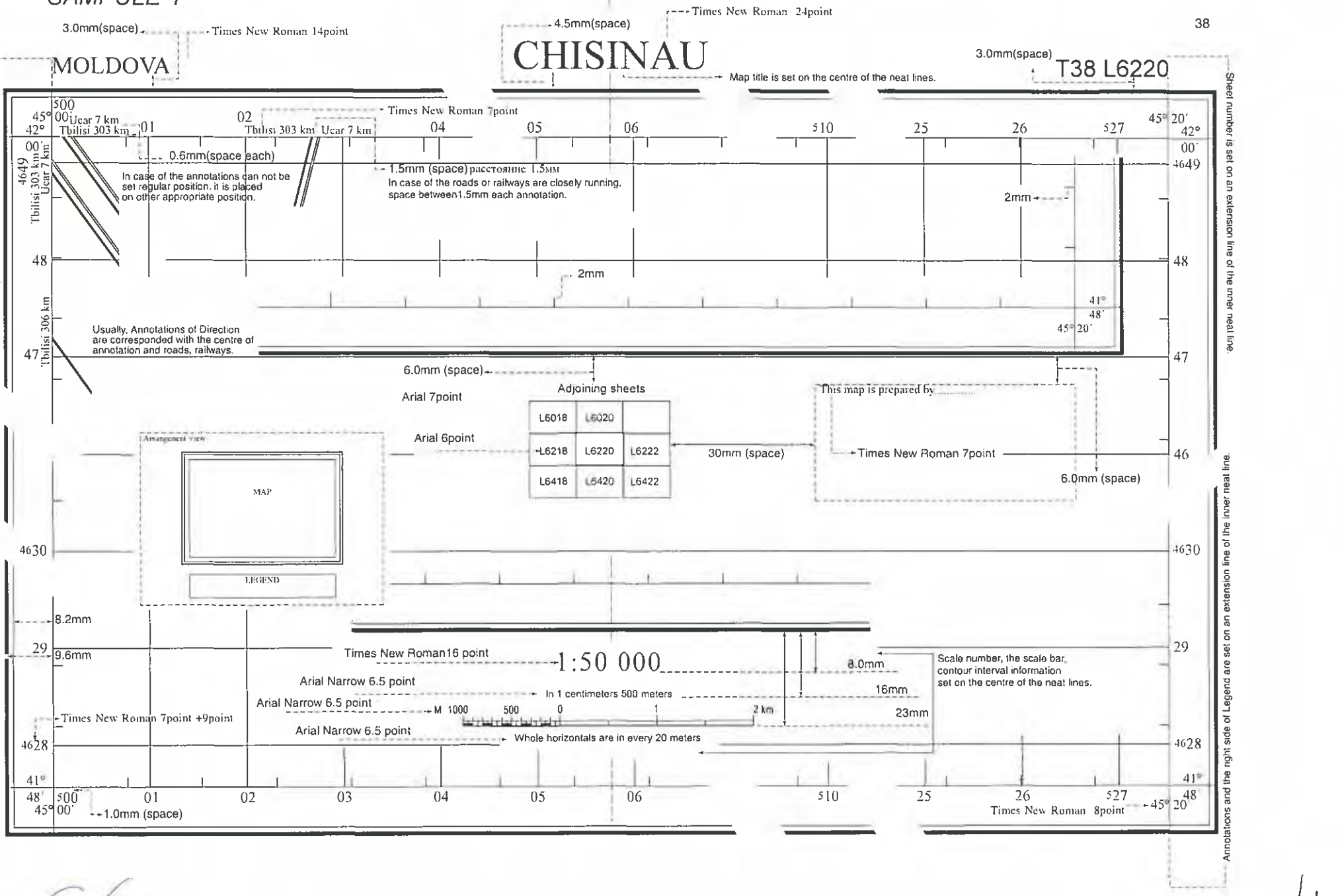
SPECIFICATION OF ANNOTATIONS

	Name	Code	Layer name	Style of Annotations				Example
				Fonts	Style	Size (point)		
153	Fords			Arial	Regular	6pt		бр.
154	Transportation for rivers			Arial	Regular	6pt		пер.
163	Specifications of the bridges			Arial Narrow	Regular	6pt	width: 90%	ЖБ 8 $\frac{370\text{-}10}{60}$ ЖБ $\frac{370\text{-}10}{10}$ ЖБ 8-370-10 пр.6х7
167	Dams			Arial Narrow	Regular	6pt	width: 90%	К 250-8 120.5 $\frac{114.3}{102.2}$
170	Dikes			Arial Narrow	Regular	6pt	width: 90%	зем. $\frac{3}{6}$
179	Wells			Times New Roman	Italic	6pt		
222	a) Pits; b) Hills and hillocks;			Arial Narrow	Regular	6pt	width: 90%	
236	Gorges and water- eroded areas			Arial Narrow	Regular	6pt	width: 90%	$\frac{125}{7}$ $\frac{4}{2}$
237	a) Slopes, b) solid benches on terraced slope sections			Arial Narrow	Regular	6pt	width: 90%	
240	Dominant species of tree in the forest: 1) coniferous; 2) deciduous; 3) mixed:			Arial Narrow	Regular	6pt	width: 90%	$\frac{25}{0.30}$ 6

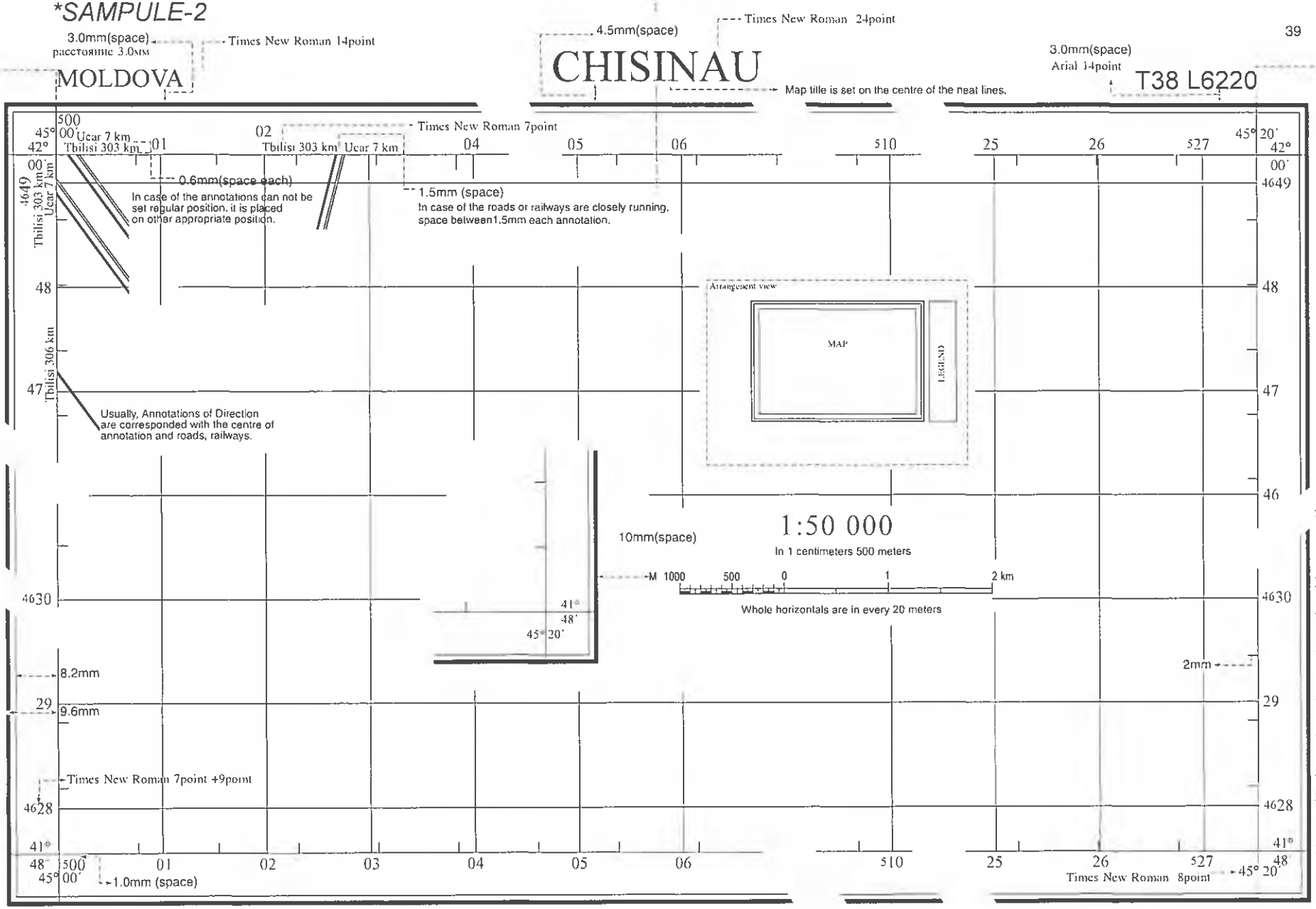
SPECIFICATION OF ANNOTATIONS

	Name	Code	Layer name	Style of Annotations				Example
				Fonts	Style	Size (point)		
248	Nursery forests and young trees planting			Arial Narrow	Regular	6pt	width: 90%	2
265	Plantations of industrial crops 1)trees; 2)shrubs; 3)grass			Times New Roman	Italic	6pt		*myrr wah xuc1b*

*SAMPULE-1


3.0mm(space)
Times New Roman 14point
MOLDOVA
4.5mm(space)
Times New Roman 24point
CHISINAU
Map title is set on the centre of the neat lines.
3.0mm(space)
T38 L6220
38
State name is set on an extension line of the inner neat line.
Sheet number is set on an extension line of the inner neat line.
Times New Roman 7point
0.6mm(space each)
1.5mm (space) расстояние 1.5мм
In case of the annotations can not be set regular position, it is placed on other appropriate position.
In case of the roads or railways are closely running, space between1.5mm each annotation.
2mm
Usually, Annotations of Direction are corresponded with the centre of annotation and roads, railways.
6.0mm (space)
Arial 7point
Adjoining sheets
Arial 6point
L6018
L6020
L6218
L6220
L6222
L6418
L6420
L6422
30mm (space)
This map is prepared by
Times New Roman 7point
6.0mm (space)
Arrangement View
MAP
LEGEND
8.2mm
9.6mm
Times New Roman16 point
1:50 000
8.0mm
Scale number, the scale bar, contour interval information set on the centre of the neat lines.
Arial Narrow 6.5 point
In 1 centimeters 500 meters
16mm
Arial Narrow 6.5 point
M 1000 500 0 1 2 km
23mm
Times New Roman 7point +9point
Arial Narrow 6.5 point
Whole horizontals are in every 20 meters
1.0mm (space)
Times New Roman 8point
Annotations and the right side of Legend are set on an extension line of the inner neat line.

*SAMPULE-2


3.0mm(space)
расстояние 3.0мм
Times New Roman 14point
MOLDOVA
4.5mm(space)
Times New Roman 24point
CHISINAU
3.0mm(space)
Arial 14point
T38 L6220
Map title is set on the centre of the neat lines.
State name is set on an extension line of the inner neat line.
Sheet number is set on an extension line of the inner neat line.
Times New Roman 7point
0.6mm(space each)
In case of the annotations can not be set regular position, it is placed on other appropriate position.
1.5mm (space)
In case of the roads or railways are closely running, space between1.5mm each annotation.
Ucar 7 km
Tbilisi 303 km
Tbilisi 306 km
Usually, Annotations of Direction are corresponded with the centre of annotation and roads, railways.
Arrangement view
MAP
LEGEND
10mm(space)
1:50 000
In 1 centimeters 500 meters
M 1000 500 0 1 2 km
Whole horizontals are in every 20 meters
8.2mm
9.6mm
2mm
Times New Roman 7point +9point
1.0mm (space)
Times New Roman 8point
Annotations and the right side of Legend are set on an extension line of the inner neat line.

Appendix-3

Minutes of Technical Meeting

(June, 2011)

MINUTES OF TECHNICAL MEETING
ON
PROJECT FOR
CREATION OF DATABASE FOR BASE MAP FOR DEVELOPMENT OF NATIONAL SPATIAL DATA INFRASTRACTURE
IN
THE REPUBLIC OF MOLDOVA

AGREED UPON BETWEEN
AGENCY OF LAND RELATIONS AND CADASTER OF THE REPUBLIC OF MOLDOVA (ALRC)
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

Chisinau, Moldova

13th June , 2011

Ms. Ovdii Maria
Head of Department Geodesy, Mapping &GIS, ALRC

Mr. Hisashi Mori
Team leader of the Study Team,
Japan International Cooperation Agency (JICA)

The JICA Study Team (hereinafter referred to as "the Team") headed by Mr. Hisashi MORI visited Republic of Moldova from 24 May, 2011 in order to carry out Project for Creation of Database for Base Map for Development of National Spatial Data Infrastructure in the Republic of Moldova (hereinafter referred to as "the Study"). Agency of Land Relations and Cadastre (hereinafter referred to as "ALRC") is a counterpart of the Team.
During the stay in this session, the Team decided a contractor for carrying out the field verification, and had several meetings to arrange and/or amend crucial issues in the following ways.

1. Contracting field verification

The Team conducted bidding for subcontracting to private company in order to carry out the field verification needed for the succeeding step of stereo plotting. ICS BLOM SRL, Moldova was awarded the contractor to perform the task of field verification eventually.

In the course of the bidding, the Team asked ALRC to be a witness for this procedure and duly decided the above company in justice. The Team notified the result of the bidding to ALRC for official acknowledgement by the counterpart.

2. Amendments

- OJT staff

With regard to the staff of the training involved in OJT, some members were replaced with new staff as shown in the appendix-2 due to the reason that minor movement of personnel had been taken place in ALRC. The team admitted to the replacement for a successful execution of the OJT.

- Change of geodetic datum

ETRS 89, which was mentioned in the Inception Report issued on February,2011, turn out not to be appropriate for the survey datum in Moldova. Meantime, WGS 84 is adopted for the geodetic datum in this country. Therefore, the Team proposed to adopt WGS84 in stead of ETRS89 for mapping in Moldova. The counterpart accepted this proposal.

3. Arrangement of members for managing the Steering Committee

The Team asked the counterpart to organize proper members for participating in the Steering Committee in view of inter-ministries involvement so that we could evolve a use of topographic data to more extensive field. ALRC agreed to call for the concerns from relevant ministries and institutions to come up with practical measures of promising data utilization.

In parallel, to encourage those organizations to have more concern in the effective utilization of created data, the Team requested that ALRC delivers additional questionnaires of which answers did not reach sufficient currently for significant analysis.

Appendix-1

Attendant list

Moldavian side

Mr. Anatolie Ghilas	General Director, ALRC
Ms. Maria Ovdii	Head of Department Geodesy, Mapping &GIS, ALRC

Japanese side : JICA Study Team

Mr. Hisashi Mori	Team Leader
Mr. Saroru Nishio	Supervisor of Ground Control Point Survey
Mr. Kensuke Kimura	Study Coordinator
Mr. Akihiro Sugita	Supervisor of Field Verification

Appendix 2

List of members involved in technology transfer from ALRC/S.E. INGEOCAD

	OJT Task	Tentative Schedule	Nr. of staff	ALRC	S.E. INGEOCAD	Name, Department/section, age
1	Field verification	The middle of May 2011 to the middle of Jul.2011	5	3	2	1.Bolohan Ion, 29/ALRC age/geodesy 2.Danii Ion 23/ALRC age/geodesy 3. Mihov V., 26 age/ALRC/geodesy 4. Pantikin V., 48 age/S.E. Ingeocad/geodesy 5. Chilincarov A/I.S. Ingeocad/geodesy
2	Grand Control Point and Leveling Survey	The middle of Jun.2011 to the end of Jul.2011	5	3	2	1.Bolohan Ion, 29/ALRC age/geodesy 2.Danii Ion 23/ALRC age/geodesy 3.Mihov V., 26 age/ALRC/geodesy 4. Pantikin Vladimir, 48 age/S.I. Ingeocad/ geodesy 5. Chilincarov Serghei/S.E. Ingeocad/ geodesy
	Arial Triangulation and Digital Mapping	The middle of Nov.2011 to the middle of Dec.2011	4	2	2	1.Cebanu Alexandru, 43 age/geodesy 2. Cusnir Lucia, 49 age/ALRC/mapping 3. Zaharchina Svetlana/48 age/S.E. Ingeocad, photogrammetry 4. Nagorneac Constantin/26 age/GIS
4	Digital Editing and Map Symbolization	The middle of Apr. 2012 to the middle of May 2012	4	2	2	1.Cebanu Alexandru, 43 age/ALRC/geodesy 2. Cusnir Lucia, 49 age/ALRC/mapping 3.Nagorneac Constantin/26 age/S.E. Ingeocad/GIS 4. PaharicovIgor/35 age/S.E. Ingeocad/GIS
5	Data Structurization and GIS	The beginning of Aug.2012 to the end of Aug.2012	4	2	2	1. Cebanu Alexandru, 43 age/ALRC/geodesy 2. Cusnir Lucia, 49 age/ALRC/mapping 3. Nagorneac Constantin/26 age/S.E. Ingeocad/GIS 4. Paharicov Igor/35 age/S.E. Ingeocad/GIS

Appendix-4

Minutes of Technical Meeting

(August, 2011)

MINUTES OF TECHNICAL MEETING
ON
PROJECT FOR
CREATION OF DATABASE FOR BASE MAP FOR DEVELOPMENT OF NATIONAL SPATIAL DATA INFRASTRACTURE
IN
THE REPUBLIC OF MOLDOVA

AGREED UPON BETWEEN
AGENCY OF LAND RELATIONS AND CADASTER OF THE REPUBLIC OF MOLDOVA (ALRC)
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

Chisinau, Moldova

1st August, 2011

Ms. Ovdii Maria
Head of Department Geodesy, Mapping &GIS, ALRC

Mr. Akihiro Sugita
Supervisor of Field Verification of the Study Team,
Japan International Cooperation Agency (JICA)

The JICA Study Team (hereinafter referred to as "the Team") headed by Mr. Hisashi MORI visited Republic of Moldova from 24 May, 2011 in order to carry out Project for Creation of Database for Base Map for Development of National Spatial Data Infrastructure in the Republic of Moldova (hereinafter referred to as "the Study"). Agency of Land Relations and Cadastre (hereinafter referred to as "ALRC") is a counterpart of the Team.

During the stay in this session, the Team and ALRC held technical meetings and agreed upon the area to be digitally plotted using satellite imagery in consideration of the result of field verification which was carried out by subcontractor in Moldova and remaining issues mentioned below.

1. Areas to be used satellite imagery

The areas decided are as follows. (See Appendix 2)

✓ Areas of which coverage is missing by the existing aerial photographs

Aerial photographs lacks at anywhere along international boundary. To create digital topographic map, the area has to be covered by satellite imagery in stead.

✓ Flood affected areas

The region along the Nistru River was affected by flood in August, 2008. In addition, the region along the Prut River that shares a common border with Romania was also affected by flood in August 2010. These areas have to be plotted by use of satellite imagery because the floods happened after taking existing aerial photos.

✓ Areas where land use changed

With the result of filed verification, the significant changes of land use are recognized as well as secular changes at the areas surrounding Chisinau, capital city of Moldova.

2. Satellite imagery to be used

The Team would use ALOS satellite imagery (2.5 m resolution) in initial plan, but the ALOS operations completed by power generation anomaly on 12th May, 2011. Therefore, the Team considers the use of other equivalent satellite imagery such as SPOT satellite imagery for substitution to cover the areas where ALOS archive imagery can not have good qualities for digital plotting.

3. Office space for equipment

The Team explained about the equipment which shall be installed during November, 2011 as a part of technology transfer. It is confirmed that ALRC will prepare the spacious office space for this purpose. The list of the equipment is shown in Appendix 3.

4. Schedule of Technology Transfer

Both ALRC and the Team have confirmed next schedule of technology transfer. (See Appendix 4)

5. Map specification

Both ALRC and the Team have agreed that the specification shall be improved in Japan by the Team in consideration of the results from field verification. The improved specification shall be sent via e-mail to ALRC and ALRC shall verify it. The current specification is shown in Appendix 5.

6. Materials from relevant authorities

Necessary materials to put specified information into the topographic maps shall be given to ALRC from relevant authorities. The materials shall be sent via e-mail to the Team after ALRC obtains them because some of them have not been given to ALRC yet. The list of the materials is shown in Appendix 6.

Appendix 1

Attendant list

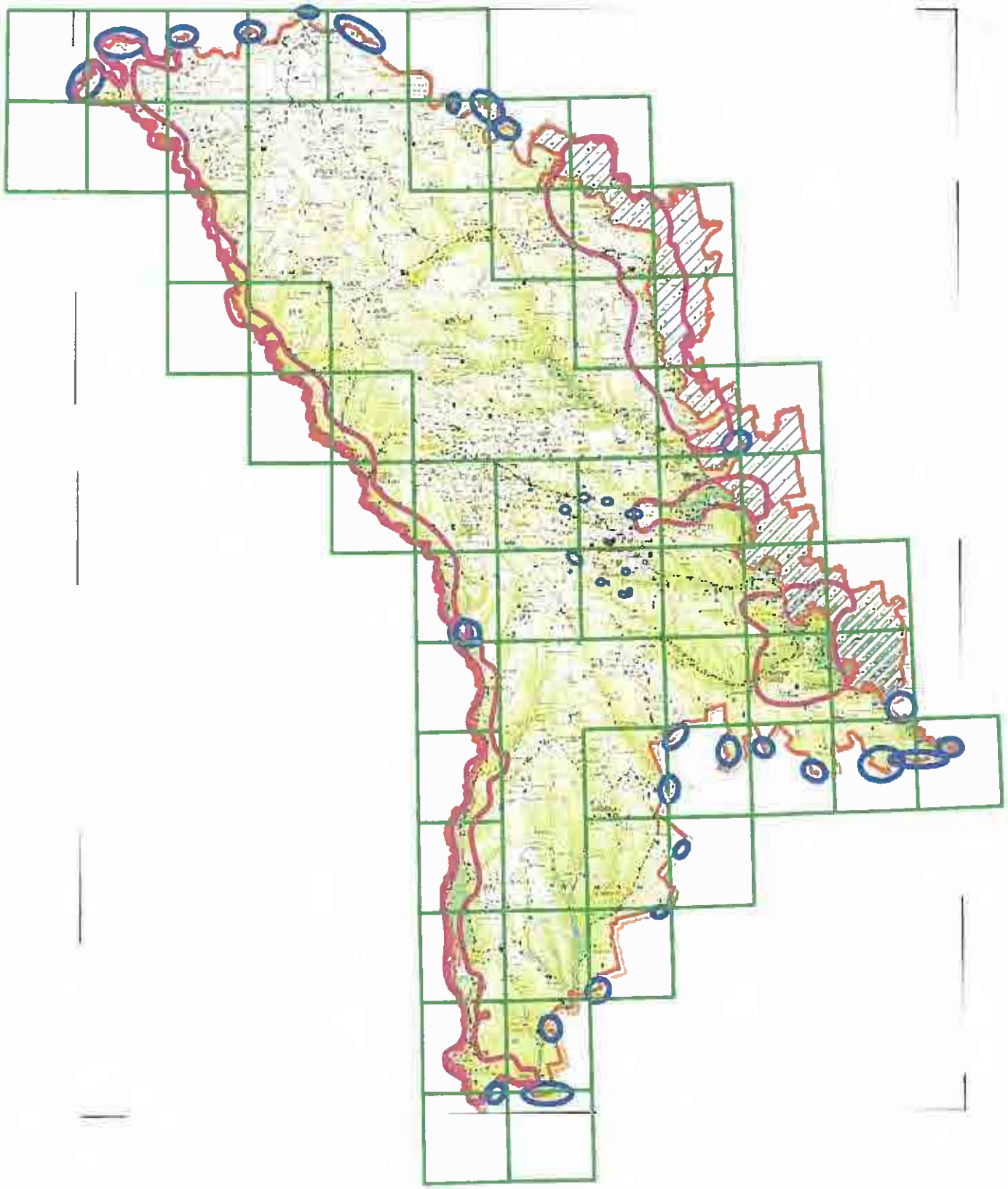
Moldavian side

Mr. Anatolie Ghilas	General Director, ALRC
Ms. Maria Ovdii	Head of Department Geodesy, Mapping &GIS, ALRC

Japanese side JICA Study Team

Mr. Akihiro Sugita	Supervisor of Field Verification

Map sheet to be used Satellite Imagery



Legend

- Map sheet
- Lack of Aerial photos
- Affected Area of Flood
- Land use change

Appendix 3

The List of Equipments which shall be installed on November

Name of Equipment	Reference brand (Manufacturer)	Reference brand / Type, No.	Use application of equipment	Specification	Q'ty	Unit
Software for Aerial triangulation and Mapping	ERDAS (Leica Geosystems)	LPS CORE (Latest version)	Aerial triangulation and Mapping software (Core module of LPS)	The foundation of the LPS photogrammetric software Major function: Project setup and management, Interior orientation, ground control measurement, automatic tie point measurement, multi-image point measurement, triangulation, terrain preparation, orthorectification and mosaicking Supported Sensor ModelFormats: ·ALOS PRISM rigorous and RPC • SPOT 1-4 • SPOT 5 rigorous ·WORLDVIEW-1 rigorous and RPC, including NCDRD format • WORLDVIEW-2 rigorous and RPC (Using QuickBird/WV-1 sensor model) • GeoEye-1/OrbView rigorous and RPC, including NCDRD format • NITF RPC (including National and Tactical sensors) • Digital Cameras (including Leica RCD100, andRCD105, UltraCAM, DMC, Applanix, etc) • EROS A and B • Frame Camera ·etc Language: English Support OS: Windows 7 Ultimate Edition 64 bit	1	License
Software for Aerial triangulation and Mapping	ERDAS (Leica Geosystems)	LPS STEREO (Latest version)	Aerial triangulation and Mapping software (Stereo model display module of LPS)	LPS add-on for extracting geospatial content using stereoscopic image viewing Smooth and Quick Display of Stereo Imagery Multi-image Point Stereo Measurement Interface Image Enhancement Tools Supported Sensor ModelFormats: ·ALOS PRISM rigorous and RPC • SPOT 1-4 • SPOT 5 rigorous ·WORLDVIEW-1 rigorous and RPC, including NCDRD format • WORLDVIEW-2 rigorous and RPC (Using QuickBird/WV-1 sensor model) • GeoEye-1/OrbView rigorous and RPC, including NCDRD format • NITF RPC (including National and Tactical sensors) • Digital Cameras (including Leica RCD100, andRCD105, UltraCAM, DMC, Applanix, etc) • EROS A and B • Frame Camera ·etc Language: English Support OS: Windows 7 Ultimate Edition 64 bit	1	License
Software for Aerial triangulation	ERDAS (Leica Geosystems)	ORIMA/DP-TE/GPS (Latest version)	Aerial triangulation software (Module of LPS)	Orientation and Triangulation Software for Leica Photogrammetry Suite (LPS) State-of-the art bundle adjustment with self-calibration Processing of airborne GPS data and IMU attitude data Multiple image display during point measurement Language: English Support OS: Windows 7 Ultimate Edition 64 bit	1	License
Software for Mapping	ERDAS (Leica Geosystems)	LPS ATE(LPS Automatic Terrain Extraction, Latest Version)	DEM data extraction software (Module of LPS)	LPS add-on module providing automatic extraction of Digital Terrain Models (DTMs) for project areas that may encompass hundreds of images. Language:English Support OS: Windows 7 Ultimate Edition 64 bit	1	License
Software for Mapping	ERDAS (Leica Geosystems)	LPS Pro600 (Latest version)	Mapping software (Module of LPS)	Package for 3D Feature Collection and Editing for Bentley Microstation LPS add-on software Module: PRODPW, PROCART and PRODTM Language: English Support OS: Windows 7 Ultimate Edition 64 bit	1	License
Software for Mapping	ERDAS (Leica Geosystems)	LPS TE (LPS Terrain Editor, Latest version)	DEM data editing software (Module of LPS)	LPS add-on module Visualization, verification and editing of Digital Terrain Models (DTMs) Geomorphic terrain editing tools for DTMs Supports a variety of DTM formats Language: English Support OS: Windows 7 Ultimate Edition 64 bit	1	License
Software for Mapping	Bentley	MicroStation (Latest Version)	Mapping software (Digitaizing mapping information)	CAD software for data digitizing and editing with LPS 2D/3D digitizing 3D design modeling Vector editing, Topology cleanup tool Image Mosaicking animation Support for Map projection Language: English Support OS: Windows 7 Ultimate Edition 64 bit	1	License

The List of Equipments which shall be installed on November

Name of Equipment	Reference brand (Manufacturer)	Reference brand / Type, No.	Use application of equipment	Specification	Q'ty	Unit
Software for Mapping	Bentley	Bentley Map (Latest Version)	Mapping software (Digitaizing mapping information)	CAD software for data digitizing and editing with LPS Data cleanup and integrity tools Map editing system Language: English Support OS: Windows 7 Ultimate Edition 64 bit	1	License
Stereoscopic monitor	Planar	Planar SD2620W	Stereoscopic monitor (3D) for Digital Photogrammetric Workstation	Pixel Format: WUXGA Display Resolution: 1920 X 1200 Megapixel Count: 2.3 Pixel Pitch: 0.2885 (89 lpi) Viewable Size: 25.5 inch diagonal Palette: 16 million colors Stereo Luminance: 240 cd/m² (through glasses) Response Time: 12 ms (5.5 ms rise, 6.5 ms fall) Refresh Rate: 60 Hz Interface: 24-pin DVI, Analog VGA Certifications: UL, CE, FCC-B, RoHS and CCC Power source: AC220V, 50Hz, single phase Standard accessories (Connection code, etc.)Stereoscopic viewing glasses	1	Unit
Mouse for Photogrammetry System	ERDAS (Leica Geosystems)	USB Topo mouse	Digitizing set for photogrammetry sytem	Free-hand device for moving the cursor in the XYZ directions Interface: USB Applicable software: LPS CORE and all LPS module Software Language: English Applicable OS: Windows 7 Ultimate Edition 64 bit	1	Unit
Software for GIS	ESRI	ArcGIS Desktop (ArcInfo, Latest Version)	Advanced analysis and data structurization for GIS	· Performing advanced GIS data analysis and modeling. · Taking advantage of tools designed for overlay analysis, proximity analysis, surface analysis, and raster processing and conversion. · Publishing and converting data in many formats. · Creating and managing personal geodatabases, multiuser geodatabases, and feature datasets. · Using high-end cartography tools to generate professional-quality, publication-ready maps. · Designing customized symbols and place sophisticated annotation and labels on your maps.	1	License
Advanced software for GIS	ESRI	Extention for ArcGIS: ArcGIS 3D Analyst	Effective visualization and analysis of surface data	· Creating 3D views directly using GIS data. · Analyzing 3D data using cut/fill, line-of-sight, and terrain modeling. · Viewing data from a global-to-local perspective. · Navigatation through multiresolution terrain data seamlessly. · Spatial analysis in 2D or 3D. · Visualization of modeling or analysis results in 3D. · Use 3D models and symbols for realism. · Export visualizations into videos.	1	License
Advanced software for GIS	ESRI	Extention for ArcGIS: ArcGIS Network Analyst	network-based spatial analysis	· Drive-time analysis · Point-to-point routing · Fleet routing · Route directions · Service area definition · Shortest path analysis · Optimum route analysis · Closest facility analysis · Origin-destination analysis · Finding suitable locations.	1	License
Advanced software for GIS	ESRI	Extention for ArcGIS: ArcGIS Spatial Analyst	powerful tools for comprehensive, raster-based spatial modeling and analysis	· Calculatting the accumulated cost of traveling from one point to another. · Performing land-use analysis. · Prediction of fire risk. · Analysis of transportation corridors. · Determination of pollution levels. · Performimg crop yield analysis. · Determination of erosion potential. · Performing demographic analysis. · Conducting risk assessments. · Modeling and visualizing crime patterns.	1	License
Software for Map symbolization	Adobe	Adobe Illustrator (Latest version)	Map symbolization software	Vector and Raster data advanced processing system Processing data format: Encapsulated Postscript, Adobe AI Postscript, DXF, TIFF, BMP, JPEG, GIF, etc. Language: English Support OS: Windows 7 Ultimate Edition 64 bit	1	License
Image Editing Software	Adobe	Adobe Photoshop (Latest version) (Creative Suite)		Ability to adjust and enhance color and tone. Ability to adjust the opacity of many layers at once. Ability to adjust the fill of many layers at once. Ability for powerful printing options Ability for batch processing Ability for 16-bit to JPEG conversion Ability for smooth panning and zooing	1	License

Appendix 3

The List of Equipments which shall be installed on November

Name of Equipment	Reference brand (Manufacturer)	Reference brand / Type. No.	Use application of equipment	Specification	Q'ty	Unit
WorkStation	Dell	Dell Precision T7500	Digital Photogrammetric Workstation (and for Digital Editing)	OS: Windows 7 Ultimate Edition 64bit CPU: Quad Core Intel® Xeon® Processer E5630, 2.53GHz, 12M L3, 5.86GT/s or higher Memory: More than 8 GB HardDisk: More than 4TB (No RAID, HDD x 4) Graphic Card: NVIDIA Quadro 4000 or higher x 2 DVD Super Multi Drive 3.5 inch 1.44MB Floppy Drive USB Keyboard: English Optical Mouse Wireless network USB adopter (support 11n/11a/11g/11b) 24inch Wide Monitor Microsoft Office (Professional) Security software (24 months) System Recovery media 2 year Support in Moldova	1	Unit
Personal Computer	Dell	Dell Precision T5500	PC for GIS and Map Symbolization (and Digital Editing)	OS: Windows 7 Ultimate Edition 64bit CPU: Dual Core Intel® Xeon® Processer E5503, 2.0GHz, 4M L3, 4.8GT/s or higher Memory: more than 8GB HardDisk: More than 2TB (RAID 0, HDD x 2) Graphic Card: NVIDIA Quadro 4000 or higher DVD Super Multi Drive Keyboard: English Optical Mouse Wireless network USB adopter (support 11n/11a/11g/11b) 24inch Wide Monitor Microsoft Office (Professional) Security software (24 months) System Recovery media 2 year Support in Moldova	1	Unit
HDD for Server	Dell					
Printer	Hewlett Packard	HP Laserjet CP5525dn		Print speed, black (normal A4): Up to 30 ppm Print speed, color (normal A4): Up to 30 ppm First page out (black): As fast as 10 sec First page out (color): As fast as 10 sec Print resolution, black: Up to 600 x 600 dpi Print resolution, color: Up to 600 x 600 dpi Print technology: Laser Duty cycle (monthly, A4): Up to 120,000 pages Print languages, standard: HP PCL 6, HP PCL 5c (HP PCL 5c driver available from the Web only), HP postscript level 3 emulation, native PDF printing (v1.4) Hard disk: Standard, 8 GB Processor speed: 800 MHz Memory, standard: 1GB Memory, maximum: 1GB Paper tray(s), standard: 3/6 Paper tray(s), maximum: 6 Paper handling standard,input: 100-sheet multipurpose tray, 250-sheet input tray 2, 500-sheet input tray 3, automatic two-sided printing Paper handling optional,input: 500-sheet input tray (add up to 2) or 3 x 500-sheet paper feeder and stand Paper handling standard,output: 300-sheet output bin Duplex printing (printing on both sides of paper): Automatic (standard) Media sizes, standard: Letter, legal, executive, ledger, envelopes (No. 10, Monarch) Media sizes, custom: Tray 1: 3 x 5 to 12.6 x 18.5 in; tray 2, 3, optional tray 4, 5, 6: 5.8 x 8.3 to 11.7 x 17 in Media types: Paper (extra heavy, glossy, heavy, heavy glossy, high gloss images, intermediate, light, plain, recycle, tough), envelopes, la Document finishing: Sheetfed Connectivity, Standard: 1 Hi-Speed USB 2.0; 1 Gigabit Ethernet 10/100/1000, IPv6, BiDi; 1 EIO Connectivity, Optional: 802.11b/g wireless LAN, other networking accessories. Network ready: Standard (built-in Ethernet) Compatible Operating System: Microsoft® Windows®7 32-bit and 64-bit, Windows Vista® 32-bit and 64-bit, Windows® XP 32-bit or 64-bi Warranty: 2 years, next-day, on-site warranty	1	Unit

Appendix 3

The List of Equipments which shall be installed on November

Name of Equipment	Reference brand (Manufacturer)	Reference brand / Type. No.	Use application of equipment	Specification	Q'ty	Unit
Comsumption articles for Printer	Hewlett Packard	Print cartridge		For Black (CE270A)	3	Unit
Comsumption articles for Printer	Hewlett Packard	Print cartridge		For Cyan (CE271A)	3	Unit
Comsumption articles for Printer	Hewlett Packard	Print cartridge		For Magenta (CE273A)	3	Unit
Comsumption articles for Printer	Hewlett Packard	Print cartridge		For Yellow (CE272A)	3	Unit
Comsumption articles for Printer	Hewlett Packard	Toner collection Unit		CE980A	3	Unit
Comsumption articles for Printer	Hewlett Packard	Fuser kit		CE977A	3	Unit
Comsumption articles for Printer	Hewlett Packard	Transfer Kit		CE979A	3	Unit
Comsumption articles for Printer		A4 paper for Printer			30	Unit
Comsumption articles for Printer		A3 paper for Printer			10	Unit

Appendix 3

The List of Equipments which shall be installed on November

Name of Equipment	Reference brand (Manufacturer)	Reference brand / Type, No.	Use application of equipment	Specification	Q'ty	Unit
Larger format printer & Scanner	Hewlett Packard	HP Designjet T1200 HD-MFP		[Print] ・Line drawings: Fast: 28 sec/page, 103 A1 prints per hour ・Print resolution: Up to 2400 x 1200 optimised dpi from 1200 x 1200 input dpi with maximum detail selected ・Margins (top x bottom x left x right): Roll: 5 x 5 x 5 x 5 mm (borderless on photo papers), Sheet: 5 x 16.75 x 5 x 5 mm ・Technology: HP Thermal Inkjet ・Ink types: Dye-based (C, M, Y, G, PK); pigment-based (MK) ・Ink colours: 6 (cyan, grey, magenta, matte black, photo black, yellow) ・Ink drop: 6 pl (C, M, PK, G), 9 pl (Y, MK) ・Line accuracy: +/- 0.1% ・Minimum line width: 0.02 mm (HP-GL/2 addressable) ・Guaranteed minimum line width: 0.06 mm (ISO/IEC 13660:2001(E)) ・Maximum print length: 91 m (application dependent) [Scan] ・Scan speed: Colour (200 dpi/400 dpi Turbo): up to 5.1 cm/sec; Black and white (200 dpi/400 dpi Turbo): up to 15.2 cm/sec ・Scan resolution: Up to 9600 dpi, with variable resolution setting from 50 dpi in increments of 1dpi ・Copy resolution: Up to 9600 dpi ・Maximum scan width: 1067 mm wide ・Maximum scan thickness: 15.2 mm [Copy] ・Reduction/enlargement: 1 to 10000% ・Maximum copies: Up to 1000 copies ・Copier settings: Type of original; image crop and align preview; lightness; saturation and RGB controls; sharpen/blur; mirror copy; enlarge/reduce; paneling; tiling; nesting; accounting; batch [Image quality] ・Maximum optical density: 2.15 maximum black optical density (6 L*min) [Media] ・Handling: Printer: sheet feed, two automatic roll feeds, automatic roll-switching, automatic cutter; scanner: straight-through scan paper path for sheet and cardboard originals ・Types: Printer: bond and coated paper (bond, coated, heavyweight coated, super heavyweight plus matte, coloured), technical paper (natural tracing, translucent bond, vellum), film (clear, matte, polyester), photographic paper (satin, gloss, semi-gloss, matte, high-gloss), backlit, self-adhesive (two-view cling, indoor paper, polypropylene, vinyl), scanner: non-abrasive paper, vellum, Mylar, sepia, blueprints, plastic, film, plastic laminate, foam board, cardboard (No plywood, stone plates, metal plates or abrasive, dirty, rough, sharp edged, metal clamped, or burned surfaces or transparencies) ・Weight: 60 to 328 g/m² ・Size: 210 x 279 to 1118 x 1676 mm ・Thickness: Up to 0.8 mm [Memory] ・Standard: Printer: 32 GB (dedicated file-processing memory); scanner: 1 GB ・Hard disk: Printer: standard, 160 GB; scanner: standard, 40 GB [Connectivity] ・Interfaces (standard): Printer: (1000Base-T), Hi-Speed USB 2.0, EIO Jetdirect accessory slot; scanner: Gigabit Ethernet (1000Base-T), Hi-Speed USB 2.0, FireWire (IEEE-1394a compliant) ・Interfaces (optional): HP Jetdirect internal print servers ・Print languages (standard): Adobe® PostScript® 3, Adobe® PDF 1.7, TIFF, JPEG, HP-GL/2, HP-RTL, CALS G4, HP PCL 3 GUI ・Drivers included: HP-GL/2, HP-RTL, PostScript® drivers for Windows (optimised for AutoCAD 2000 and higher), PostScript® drivers for Mac OS X and Linux; support for Citrix® XenApp and Citrix® XenServer environments	1	Unit

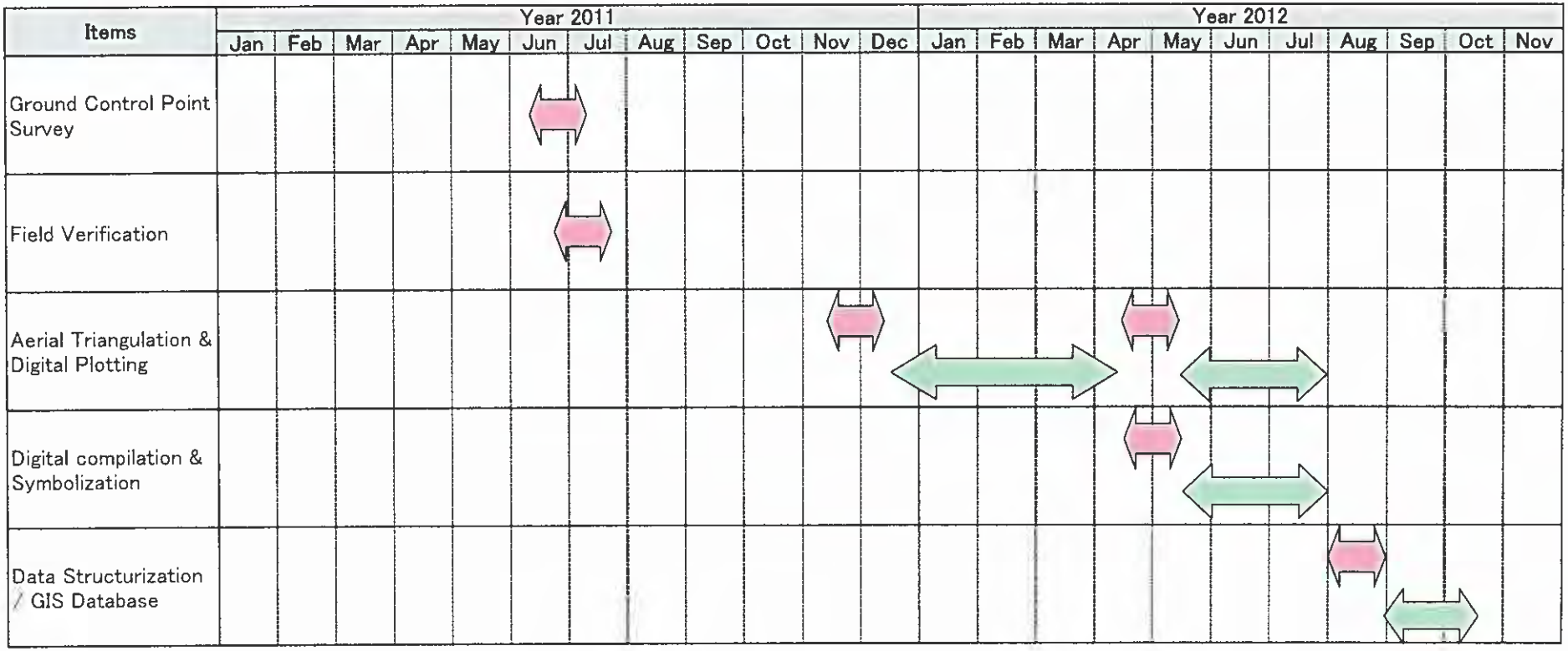
The List of Equipments which shall be installed on November

Name of Equipment	Reference brand (Manufacturer)	Reference brand / Type. No.	Use application of equipment	Specification	Q'ty	Unit
Comsumption articles for Larger format printer	Hewlett Packard	Paper A0		C6020B	10	Unit
Comsumption articles for Larger format printer	Hewlett Packard	Paper A1		C6019B	10	Unit
Comsumption articles for Larger format printer	Hewlett Packard	Printhead		Gray and Photo Black Printhead (C9380A)	6	Unit
Comsumption articles for Larger format printer	Hewlett Packard	Printhead		Magenta and Cyan Printhead (C9383A)	6	Unit
Comsumption articles for Larger format printer	Hewlett Packard	Printhead		Matte Black and Yellow Printhead (C9384A)	6	Unit
Comsumption articles for Larger format printer	Hewlett Packard	Ink cartridge		130-ml Gray Ink Cartridge (C9374A)	6	Unit
Comsumption articles for Larger format printer	Hewlett Packard	Ink cartridge		130-ml Photo Black Ink Cartridge (C9370A)	6	Unit
Comsumption articles for Larger format printer	Hewlett Packard	Ink cartridge		130-ml Cyan Ink Cartridge (C9371A)	6	Unit
Comsumption articles for Larger format printer	Hewlett Packard	Ink cartridge		130-ml Magenta Ink Cartridge (C9372A)	6	Unit
Comsumption articles for Larger format printer	Hewlett Packard	Ink cartridge		130-ml Yellow Ink Cartridge (C9373A)	6	Unit
Comsumption articles for Larger format printer	Hewlett Packard	Ink cartridge		130-ml Matte Black Ink Cartridge (C9403A)	6	Unit
Uninterruptible Power Supply (UPS)	APC(American Power Conversion Corp)	APC Smart-UPS 1500VA USB & Serial 230V	Uninterruptible Power Supply	Output Power Capacity: 980 Watts / 1500 VA, Max Configurable Power: 980 Watts / 1500 VA, Nominal Output Voltage: 230V, Output Voltage Note: Configurable for 220 : 230 or 240 nominal output voltage, Output Voltage Distortion: Less than 5% at full load, Output Frequency (sync to mains) 47 - 53 Hz for 50 Hz nominal,57 - 63 Hz for 60 Hz nominal, Crest Factor: up to 5 : 1 Waveform Type Sine wave Input: Nominal Input Voltage 230V, Input Frequency 50/60 Hz +/- 3 Hz (auto sensing), Input Connections: IEC-320 C14, Input voltage range for main operations: 160 - 286V, Input voltage adjustable range for mains operation: 151 - 302V, Estimated runtime: more than 5	2	Unit

Office Space for above equipments

Appendix 4

Schedule of Technology Transfer



Remarks: Pink Arrows : Technology Transfer by the JICA Study Team in Moldova

Cyan Arrows : Exercise and data creation by Agency itself

Technology Transfer by the Study Team (Pink Arrows) will be carried out normally from 10:00 to 17:00 on everyday. But, details of schedule like time and contents will be planned by the member of Study Team who in charge of, after evaluation of current skill of trainees by questionnaire.

Appendix 5

Classification	Acquisition Item	Symbol No. in Russian Spec	New Code	Acquisition Rule	Reguli de Achizitionare	Type	Information	Symbol for the New Maps	Symbol for Field Verification
ControlPoint									
ControlPoint	国家基準点 State geodetic network points Puncte geodezice nationale	1	2101	Acquire according to existing materials. Put the elevation value as text data. The elevation value should be input the elevation (attribute item) by which the second place below decimal point is rounded off.	Achizitionarea conform materialelor existente. Se inscrie valoarea de elevatie ca text de date. Valoarea de elevatie trebuie sa corespunda elevatiei, prin care unitatile de sutime sunt rotungite pina la sistemul zecimal.	Point	Height	91.6	
ControlPoint	国家電子基準点 Electrical National Geodetic points Puncte geodezice Nationale de Electricitate	1-1	2102	Acquire according to existing materials. Put the elevation value as text data. The elevation value should be input the elevation (attribute item) by which the second place below decimal point is rounded off.	Achizitionarea conform materialelor existente. Se inscrie valoarea de elevatie ca text de date. Valoarea de elevatie trebuie sa corespunda elevatiei, prin care unitatile de sutime sunt rotungite pina la sistemul zecimal.	Point	Height	93.8	
ControlPoint	山頂にある国家基準点 State geodetic network points on burial mounds Puncte geodezice nationale pe munti	2	2103	Acquire according to existing materials. Put the elevation value as text data. The elevation value should be input the elevation (attribute item) by which the second place below decimal point is rounded off.	Achizitionarea conform materialelor existente. Se inscrie valoarea de elevatie ca text de date. Valoarea de elevatie trebuie sa corespunda elevatiei, prin care unitatile de sutime sunt rotungite pina la sistemul zecimal.	Point	Height	99,7	
ControlPoint	建物上にある基準点 State geodetic network points on buildings Punte geodezice nationale pe cladiri	3	2104	Acquire according to existing materials. Put the elevation value as text data. The elevation value should be input the elevation (attribute item) by which the second place below decimal point is rounded off.	Achizitionarea conform materialelor existente. Se inscrie valoarea de elevatie ca text de date. Valoarea de elevatie trebuie sa corespunda elevatiei, prin care unitatile de sutime sunt rotungite pina la sistemul zecimal.	Point	Height		
ControlPoint	教会上にある基準点 State geodetic network points on churches Puncte geodezice pe biserici	4	2105	Acquire according to existing materials. Put the elevation value as text data. The elevation value should be input the elevation (attribute item) by which the second place below decimal point is rounded off.	Achizitionarea conform materialelor existente. Se inscrie valoarea de elevatie ca text de date. Valoarea de elevatie trebuie sa corespunda elevatiei, prin care unitatile de sutime sunt rotungite pina la sistemul zecimal.	Point	Height	a b	
ControlPoint	多角点 Survey network points fixed to terrain by center points Reteа de Puncte ale Studiului, fixate pe teren de punctele centrale.	5	2106	Acquire according to existing materials. Put the elevation value as text data. The elevation value should be input the elevation (attribute item) by which the second place below decimal point is rounded off.	Achizitionarea conform materialelor existente. Se inscrie valoarea de elevatie ca text de date. Valoarea de elevatie trebuie sa corespunda elevatiei, prin care unitatile de sutime sunt rotungite pina la sistemul zecimal.	Point	Height	51.1	
ControlPoint	山頂にある測量網点 Survey network points on burial mounds Retea de puncte fixate pe munti	6	2107	Acquire according to existing materials. Put the elevation value as text data. The elevation value should be input the elevation (attribute item) by which the second place below decimal point is rounded off.	Achizitionarea conform materialelor existente. Se inscrie valoarea de elevatie ca text de date. Valoarea de elevatie trebuie sa corespunda elevatiei, prin care unitatile de sutime sunt rotungite pina la sistemul zecimal.	Point	Height	125.5	
ControlPoint	水準点 Reference datum points of the state leveling network Puncte de referinta a retelei de nivelare	7	2108	Acquire according to existing materials. Put the elevation value as text data. The elevation value should be input the elevation (attribute item) by which the second place below decimal point is rounded off.	Achizitionarea conform materialelor existente. Se inscrie valoarea de elevatie ca text de date. Valoarea de elevatie trebuie sa corespunda elevatiei, prin care unitatile de sutime sunt rotungite pina la sistemul zecimal.	Point	Height	71.9	
ControlPoint	天測点 Astronomical points Puncte astronomice	8	2109	Acquire according to existing materials. Put the elevation value as text data. The elevation value should be input the elevation (attribute item) by which the second place below decimal point is rounded off.	Achizitionarea conform materialelor existente. Se inscrie valoarea de elevatie ca text de date. Valoarea de elevatie trebuie sa corespunda elevatiei, prin care unitatile de sutime sunt rotungite pina la sistemul zecimal.	Point	Height		

Appendix 5

Classification	Acquisition Item	Symbol No. in Russian Spec	New Code	Acquisition Rule	Regull de Achizitionare	Type	Information	Symbol for the New Maps	Symbol for Field Verification
Building									
Building	建物(極小) Residential and non-residential structures (Small) Structuri rezidentiale si nerezidentiale	9	5001	To put one point on the center of the houses, buildings (less than 25m x 25m) by photo interpretation.	Se pune un punct in mijloc (mai putin de 25 x 25 m) dupa interpretarea fotografica.	Point			
Building	建物(実形) Residential and non-residential structures (Large) Structuri rezidentiale si nerezidentiale	9	5002	To acquire the periphery of the houses, buildings (25m x 25m or more) by photo interpretation.	Sa obtina marginea (25 x 25 m sau mai mult)	Polygon			
Building	役所等の主要な耐火建物(極小) Especially proeminent fire-resistant buildings (Small) Cladiri proeminente rezistente la foc	10	5003	To put one point on the center of the remarkable fire-proof buildings (less than 50m x 70m).	Se pune un punct in mijloc (mai putin de 50m x 70 m)	Point			adm
Building	役所等の主要な耐火建物(実形) Especially proeminent fire-resistant buildings (Large) Cladiri proeminente rezistente la foc	10	5004	To acquire the periphery of the remarkable fire-proof buildings (50m x 70m or more).	Sa se obtina periferia (50m x 70 m sau mai mare)	Polygon			adm
Building	学校(極小) Schools (small) Scoli (mici)	10-1	5005	To put one point on the center of the schools (less than 25m x 25m).	Se pune un punct in mijloc (mai putin de 25 x 25 m)	Point	Annotation	ШК	sch
Building	学校 (実形) Schools (large) Scoli (mari)	10-1	5006	To acquire the periphery of the schools (25m x 25m or more).	Sa obtina marginea (25 m x 25 m sau mai mare)	Polygon	Annotation	ШК.	sch
Building	病院(極小) Hospitals (small) Spitale(mici)	10-2	5007	To put one point on the center of the hospitals (less than 25m x 25m).	Se pune un punct in mijloc (mai putin de 25m x 25m)	Point	Annotation	больн.	hosp
Building	病院(実形) Hospitals (large) Spitale (mari)	10-2	5008	To acquire the periphery of the hospitals (25m x 25m or more)	Sa se obtina marginea (mai mare decat 25m x 25m)	Polygon	Annotation	больн.	hosp
Building	教会(極小) Chrestian churches(Small) Biserici crestine (mici)	68	5009	To put one point on the center of the churches (less than 75m x 75m).	Se pune un punct in mijloc (mai putin de 75m x 75m)	Point			
Building	教会(実形) Chrestian churches (Large) Biserici crestine (mari)	68	5010	To acquire the periphery of the churches (75m x 75m or more)	Sa obtina marginea (mai mare decat 75m x 75m)	Polygon			

Appendix 5

Classification	Acquisition Item	Symbol No. in Russian Spec	New Code	Acquisition Rule	Regull de Achizitionare	Type	Information	Symbol for the New Maps	Symbol for Field Verification
Building	シナゴーグ(極小) Synagogues (small) Sinagogi (mici)	68-1	5011	To put one point on the center of the Synagoges (less than 75m x 75m).	Se pune un punct in mijloc (mai putin de 75m x 75m)	Point			·
Building	シナゴーグ(実形) Synagogues (large) Sinagogi (mari)	68-1	5012	To acquire the periphery of the Synagoges (75m x 75m or more).	Sa obtina marginea (mai mare decat 75m x 75m)	Polygon			
Building	煙突あり工場(極小) Plants, factories and mills with smokestacks (Small) Fabrici, mori cu turnuri de fum (mici)	37	5013	To put one point on the center of the factories, plants and mills (less than 65m x 65m).	Se pune un punct in mijloc (mai putin de 65m x 65m)	Point	Height	50	· fct
Building	煙突あり工場(実形) Plants, factories and mills with smokestacks (Large) Fabrici, mori cu turnuri de evacuare a fumului (mari)	37	5014	To acquire the periphery of the factories, plants and mills (65m x 65m or more).	Sa obtina marginea (65m x 65m sau mai mult)	Polygon	Height		fct
Building	煙突なし工場(極小) Plants, factories and mills without smokestacks (Small) Fabrici, mori fara turnuri de evacuare a fumului (mici)	38	5015	To put one point on the center of the factories, plants and mills (less than 65m x 65m).	Se pune un punct in mijloc (mai putin de 65m x 65m)	Point	Annotation	КОЖ.	· fct(???)
Building	煙突なし工場(実形) Plants, factories and mills without smokestacks (Large) Fabrici, mori fara turnuri de evacuare a fumului (mari)	38	5016	To acquire the periphery of the factories, plants and mills (65m x 65m or more).	Sa obtina marginea (65m x 65m sau mai mult)	Polygon	Annotation	КОЖ.	fct(???)
Building	森林監督官(労働者)用建物 Forest warden houses Casele padurarilor	65	5017	To put one point on the center of the Houses of foresters	Se pune un punct in mijloc	Point	Annotation		· forest
Building	廃墟(極小) Damaged and destroyed structures (Small) Structuri deteriorate sau distruse	12	5018	To put one point on the center of the ruined and half-ruined buildings (less than 50m x 80m).	Se pune un punct in mijloc (mai putin de 50m x 80m)	Point		1.6	· ruin
Building	廃墟(実形) Damaged and destroyed structures (Large) Structuri deteriorate sau distruse	12	5019	To acquire the periphery of the ruined and half-ruined buildings (50m x 80m or more).	Sa obtina marginea (50m x 80m sau mai mare)	Polygon			ruin
Building	密集耐火建物エリア(大都市) Heavily developed blocks with prominent fire-resistant buildings (in large cities) Terenuri cu constructii proeminente rezistente la foc (orase mari)	14	5101	To acquire the periphery of closely built-on parts of estates with predominance of fire-proof buildings (100m x 100m or more). If roads, canals, etc. are parts of the periphery, make the periphery by copying them. Acquire according to existing materials or (Refer to the existing maps.)	Sa obtina marginea (100m x 100m sau mai mult). Daca drumurile, canalele etc sunt parti componente ale periferiei, se creaza marginea copiindu-le pe acestea. Obtinerea conform materialelor existente (se refera la hartile existente)	Polygon			Fp1

Appendix 5

Classification	Acquisition Item	Symbol No. in Russian Spec	New Code	Acquisition Rule	Reguli de Achizitionare	Type	Information	Symbol for the New Maps	Symbol for Field Verification
Building	密集耐火建物エリア(市町村・大きな集落) Heavily developed blocks with proeminent fire-resistand buildings (othe population centers) Terenuri cu constructii proeminente rezistente la foc (alte centre populate)	14	5102	To acquire the periphery of closely built-on parts of estates wit predominance of fire-proof buildings (100m x 100m or more). If roads, canals, etc. are parts of the periphery make the periphery by copying them. Acquire according to existing materials or (Refer to the existing maps.)	Se obtine marginea (100m x 100m sau mai mult). Daca drumurile, canalele etc sunt parti componente ale periferiei, se creaza marginea copiindu-le Obtinerea conform materialelor existente (se refera la hartile existente)	Polygon			Fp2
Building	密集非耐火建物エリア(大都市) Heavily developed blocks with predominately non-fire-resistant building (large cities) Terenuri cu constructii proeminente nerezistente la foc (orase mari)	15	5103	To acquire the periphery of closely built-on parts of estates with predominance of non- fire-proof buildings(100m x 100m or more). If roads, canals, etc. are parts of the periphery make the periphery by copying them. Acquire according to existing materials or (Refer to the existing maps.)	Sa obtina marginea (100m x 100m sau mai mult). Daca drumurile, canalele etc sunt parti ale periferiei, se creaza periferia copiindu-le Obtinerea conform materialelor existente (se refera la hartile existente)	Polygon			Nfp1
Building	密集非耐火建物エリア(市町村・大きな集落) Heavily developed blocks with proeminent fire-resistand buildings (in other population centers) Terenuri cu constructii proeminente rezistente la foc (alte centre populate)	15	5104	To acquire the periphery of closely built-on parts of estates with predominance of non- fire-proof buildings (100m x 100m or more). If roads, canals, etc. are parts of the periphery make the periphery by copying them. Acquire according to existing materials or (Refer to the existing maps.)	Sa obtina marginea(100m x 100m sau mai mult) Daca drumurile, canalurile etc sunt parti componente ale periferiei, se creaza marginea copiindu-le Obtinerea conform materialelor existente (se refera la hartile existente)	Polygon			Nfp2
Building	散在建物エリア Sparsely developed blocks in cities and other population centers Cladiri dispersate sau proprietati construite in orase si in alte asezari umane	17	5105	To acquire the periphery of the scattered buildings or built up estates in city and other settlements (100m x 100m or more). roads, canals, etc. are parts of the periphery, make the periphery by copying them. (Refer to the existing maps.)	Sa obtina marginea (100m x 100m si mai mult). Daca drumurile, canalele etc. sunt parti componente ale periferiei, se creeaza marginea copiindu-le.	Polygon			Sc
Building	廃墟エリア Destroyed and semi-destroyed blocks Proprietati distruse si semi-distruse	20	5106	To acquire the periphery of the wrecked and half-wrecked estates (100m x 100m or more) by photo interpretation. If roads, canals, etc. are parts of the periphery, make the periphery by copying them.	Sa obtina marginea (100m x 100m si mai mult) dupa interpretarea fotografiei. Daca drumurile, canalele etc, sunt parti componente ale periferiei, se creeaza marginea copiindu-le.	Polygon			Wr
Building	別荘地 Suburban settelements Asezari suburbane	24	5107	To acquire the periphery of the suburban settlement estates with lots of trees (100m x 100m or more). If roads, canals, etc. are parts of the periphery, make the periphery by copying them (Refer to the existing maps.)	Sa obtina marginea (100m x 100m), Daca drumurile, canalele etc. sunt parti componente ale periferiei, se creeaza marginea copiindu-le. (Se refera la hartile existente)	Polygon			Su
Road									
Road	40m以上の市街地道路(真幅) Streets (closely built-on parts of estates) (40m or more in width) Autostrazi si drumuri principale	16	7001	To acquire the periphery of the street (40m or more in width). (Refer to the existing maps.)	Sa obtina marginea (40m sau mai lat) (se refera la hartile existente)	Polygon			15
Road	40m以上の市街地道路(中心線) Streets (closely built-on parts of estates) (40m or more in width) Autostrazi si drumuri principale	16	7002	To acquire the center line of the street (40m or more in width). (Refer to the existing maps.)	Sa obtina linia de mijloc (40m sau mai lat) (se refera la hartile existente)	Line			
Road	4車線以上のメインとなる市街地道路 Streets (closely built-on parts of estates) (main streets, 4 lanes or more) Autostrazi si drumuri principale	16	7003	To acquire the center line of the street (main street, 4 traffic lanes or more) by photo interpretation. (Refer to the existing maps.)	Sa obtina linia de mijloc (strada principala, mai mult de 4 benzi). (Se refera la hartile existente)	Line			25

Appendix 5

Classification	Acquisition Item	Symbol No. in Russian Spec	New Code	Acquisition Rule	Reguli de Achizitionare	Type	Information	Symbol for the New Maps	Symbol for Field Verification
Road	2車線以下の市街地道路 Streets (closely built-on parts of estates) (other streets, less than 2 lanes) Alte drumuri si sosele	16	7004	To acquire the center line of the street (other street, 2 traffic lanes or less) by photo interpretation.. (Refer to the existing maps.)	Sa obtina linia de mijloc (alte strazi, mai putin de 2 benzi), (se refera la hartile existente)	Line			3S
Road	高速道路(舗装) Highways with more than two lanes with improved covering Autostrazi principale cu doua benzi	105	7005	To acquire the center line of the highways with more than two lanes, with improved coverring. (Refer to the existing maps)	Sa obtina linia de mijloc	Line	Annotation		HW
Road	高速道路(建設中) Highways with more than two lanes with improved covering (under construction) Drumuri in curs de constructie	115	7006	To acquire the center line of the highways with more than two lanes, with improved coverring (under construction)	Sa obtina linia de mijloc.	Line			HWu
Road	国道(舗装) National roads with more than two lanes, with improved covering Autostrazi cu pavaj imbunatatit	106	7007	To acquire the center line of the national roads with more than two lanes, with improved coverring.	Sa obtina linia de mijloc.	Line	Annotation		1
Road	国道(建設中) National roads with more than two lanes, with improved covering (under construction) Drumuri in curs de constructie	115	7008	To acquire the center line of the national roads with more than two lanes, with improved coverring (under construction)	Sa obtina linia de mijloc .	Line			1u
Road	舗装道路 Motorways with covering Drumuri pavate	107	7009	To acquire the center line of the motorways with coverring	Sa obtina linia de mijloc.	Line	Annotation		2
Road	舗装道路(建設中) Motorways with covering (under construction) Drumuri in curs de constructie	115	7010	To acquire the center line of the motorways with coverring (under construction)	Sa obtina linia de mijloc.	Line			2u
Road	未舗装道路(幅5m以上) Unpaved roads difficult sections of roads (5m or more in width) Drumuri nepavate, sectoare dificile ale drumurilor	108	7011	To acquire the center line of the motorways without coverring (improved country roads). (5m or more in width)	Sa obtina linia da mijloc (5m sau mai lat)	Line			3
Road	未舗装道路(建設中) Unpaved roads under construction Drumuri nepavate in curs de construire	115	7012	To acquire the center line of the motorways without coverring with improved country roads. (5m or more in width)	Sa obtina linia de mijloc (5m sau mai lat)	Line			3u
Road	未舗装道路(1車線) Unpaved dirt roads and difficult sections of roads (3m or more and less than 5m in width) Drumuri nepavale si sectoare dificile ale drumurilor	110	7013	To acquire the center line of the cart tracks. (3m or more and less than 5m in width)	Sa obtina linia de mijloc (mai mult de 3m si mai putin de 5m in latime)	Line			4
Road	軽車道(4輪駆動車で通行可) Field and forest roads (Passible by 4WD car) Drumuri de padure si de camp	111	7014	To acquire the center line of the forest and country roads. (3m or more and less than 5m in width). (Passible by 4WD car)	Sa obtina linia de mijloc (mai mult de 3m si mai putin de 5m in latime) (traversabile de catre masini 4WD)	Line			5

Classification	Acquisition Item	Symbol No. in Russian Spec	New Code	Acquisition Rule	Reguli de Achiziționare	Type	Information	Symbol for the New Maps	Symbol for Field Verification
Road	徒歩道 Footpaths and foot bridges Cai de pietoni si pasarele	114	7015	To acquire the center line of the pedestrian paths by photo interpretation. (Refer to the existing maps.)	Sa obtina linia de mijloc. (se refera la hartile existente)	Line			6
Railway									
Railway	鉄道(広軌？！) Railroads (single-track) Cai ferate (cu o singura pista)	90	7801	To acquire the center line of the railways. (Refer to the existing maps.)	Sa obtina linia de mijloc.	Line			1R
Railway	鉄道(広軌？！) Railroads (two-track) Cai ferate (cu doua piste)	90	7802	To acquire the center line of the railways. (Refer to the existing maps.)	Sa obtina linia de mijloc (Se refera la hartile existente)	Line			2R
Railway	Railways under construction Broad-gauge 建設中の鉄道(広軌) Railroads under construction (wide-gauge) Cai ferate in constructie (ecartament larg	102	7803	To acquire the center line of the railways under construction (Refer to the existing maps.)	Sa obtina linia de mijloc (Se refera la hartile existente)	Line			Ru
Railway	狭軌線路(狭軌) Narrow-gauge railroads Cai ferate si statii de ecartament ingust	93	7804	To acquire the center line of the narrow-gauge lines (Refer to the existing maps.)	Sa obtina linia de mijloc (Se refera la hartile existente)	Line			3R
Railway	建設中の鉄道(狭軌) Railroads under construction (narrow-gauge) Cai ferate in constructie (ecartament ingust)	102	7805	To acquire the center line of the railways under construction (Refer to the existing maps.)	Sa obtina linia de mijloc (Se refera la hartile existente)	Line			3R u
Railway	索道(ロープウェイ・ケーブルカー) Suspended railroads Cai ferate suspendate	95	7806	To acquire the center line of the suspension railways (Refer to the existing maps.)	Sa obtina linia de mijloc (Se refera la hartile existente)	Line	Annotation		KD
Railway	小さな鉄道駅 Sidetracks, Platforms, passing tracks and stopping points Platforme, piste de trecere si statii de oprire	97	7821	To put one point on the center of the railway stations (Refer to the existing maps.)	Se pune un punct in mijloc (Se refera la hartile existente)	Point			
Railway	主な鉄道駅 (プラットホームが片側に存在) Railroad main stations (to the side of tracks) Statii de cai ferate (pe piste)	96	7822	To put one point on the center of the railway stations. When the plotting, the line must be drawn on the side of platform in the same layer. (Refer to the existing maps.)	Se pune un punct in mijloc. Cand se face trasarea, linia trebuie sa fie trasata pe partea platformei cu acelasi strat. (Se refera la hartile existente).	Point			
Railway	主な鉄道駅 (プラットホームが真ん中) Railroad main stations (between tracks) Statii de cai ferate (intre piste)	96	7823	To put one point on the center of the railway stations. (Refer to the existing maps.)	Se pune un punct in mijloc (Se refera la hartile existente)	Point			

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Railway	主な鉄道駅 (プラットホーム不明) Railroad main stations (location not known) Statii de cai ferate (localia nu e cunoscuta)	96	7824	To put one point on the center of the railway stations (Refer to the existing maps.)	Se pune un punct in mijloc. (Se refera la hartile existente)	Point			
Railway	(貨物積み下ろし用プラットホーム) Loading and unloading platforms Platforme de incarcare si descarcare	98	7825	To put one point on the center of the loading/unloading platforms (Refer to the existing maps.)	Se pune un punct in mijloc (Se refera la hartile existente).	Point			
Railway	廃線の路床 Disassembled railroad bed Cai ferate dezasamblate	101	7826	To acquire the center line of the Bed of dismantled railways (Refer to the existing maps.)	Sa obtina linia de mijloc (Se refera la hartile existente).	Line			Dis
Railway	側線 Depots, railway stations, railroad tracks Depozite, statii de cai ferate, piste de cai ferate	104	7827	To acquire the center line of the railway sidings (Refer to the existing maps.)	Sa obtina linia de mijloc. (Se refera la hartile existente).	Line			
Construction									
Construction	煙突(目標となる大きい物) Smokestacks (remarkable large one) Fabrici si alte semnee	36	6001	To put one point on the center of the chimneys by photo interpretation (Refer to the existing maps.)	Se pune un punct in mijloc (Se refera la hartile existente).	Point	Height	2.3 60 1.2	
Construction	鉱山 Mine shafts and other entrances (active) Mine si alte intrari (active)	39	6002	To put one point on the center of the entrance to mines and adits (operating) (Refer to the existing maps.)	Se pune un punct in mijloc (operate) (Se refera la hartile existente).	Point			
Construction	鉱山(廃鉱) Mine shafts and other entrances (inactive) Mine si alte intrari (inactive)	39	6003	To put one point on the center of the entrance to mines and adits (inoperating) (Refer to the existing maps.)	Se pune un punct in mijloc (Se refera la hartile existente).	Point			
Construction	砕石場 Surface mineral mining sites (Quarries) (Small) Terenuri de extragere a minereurilor, la suprafata	40	6004	To put one point on the center of the areas for output of minerals by opencut operation (3m or more in height, less than 150m in length) by photo interpretation. (Refer to the existing maps.)	Se pune un punct in mijlo(mai mult de 3m inaltime, mai mult de 150m in lungime) dupa interpretarea fotografica. (Se refera la hartile existente).	Point	Annotation		???
Construction	砕石場 Surface mineral mining sites (Quarries) (Large) Terenuri de extragere a minereurilor, la suprafata	40	6005	To acquire the upper line of the areas for output of minerals by opencut operation (3m or more in height, 150m or more in length) by phoyo interpretation. (Refer to the existing maps.)	Sa obtina linia superioara(mai mult de 3m inaltime, mai mult de 150m in lungime) dupa interpretarea fotografica. (Se refera la hartile existente).	Line	Annotation		???
Construction	やぐら有り油井・ガス井他(水井戸は除く) Oil, gas and other wells with derricks Fantani de gaz si petrol cu sonde de extragere	44	6006	To put one point on the center of the oil, gas and other wells without derricks.	Se pune un punct in mijlo	Point	Annotation		????

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Classification	Acquisition Item	Symbol No. in Russian Spec	New Code	Acquisition Rule	Reguli de Achizitionare	Type	Information	Symbol for the New Maps	Symbol for Field Verification
Constraction	やぐら無し油井・ガス井他(水井戸は除く) Oil, gas and other wells without derricks Fantani de gaz si petrol fara sonde de extragere	45	6007	To put one point on the center of the oil, gas and other wells without derricks.	Se pune un punct in mijloc	Point	Annotation		
Constraction	オイル・ガスタンク Fuel depots and gas holders Depozite de combustibili si holde de gaz	46	6008	To put one point on the center of the fuel stores and gas holders	Se pune un punct in mijloc	Point			
Constraction	ガソリンスタンド Gasoline pumps and filling stations Pompe de petrol si statii de umplere	47	6009	To put one point on the center of the petrol pumps and filling stations (excluding urban area)	Se pune un punct in mijloc	Point			
Constraction	塔タイプのタンク Major tower-type structures Structuri principale de tip-turn	57	6010	To put one point on the center of the capital structures of tower type (water towers etc) by photo interpretation (Refer to the existing maps.)	Se pune un punct in mijloc (Se refera la hartile existente).	Point			
Constraction	監視塔等 Light-type towers (observation, searchlight) Turnuri de lumina (observatoare, proiectoare)	58	6011	To put one point on the center of the tower type (observation, searchlight, etc) by photo interpretation. (Refer to the existing maps.)	Se pune un punct in mijloc (Se refera la hartile existente).	Point			
Constraction	水車・製材所 Water-powered mills and sawmills Mori de apa si de carestea	59	6012	To put one point on the center of the water mills and sawmills	Se pune un punct in mijloc	Point			
Constraction	ライム炭の窯(石灰窯)(目標となる物) Lime and charcoal kilns significant as landmarks Cuptoare de carbune remarcabile	61	6013	To put one point on the center of the remarkable lime charcoal kilns. (Refer to the existing maps.)	Se pune un punct in mijloc (Se refera la hartile existente).	Point	Annotation		????
Constraction	ビニールハウス Orangeries, greenhouses, hothouses Orangerii, sere, focare	62	6014	To put one point on the center of the green houses, hot houses, hot beds	Se pune un punct in mijloc	Point	Annotation		????
Constraction	養蜂場 Apiaries Stuparii	63	6015	To put one point on the center of the apiary	Se pune un punct in mijloc	Point			
Constraction	放牧地 (種小) Enclosures for livestocks (small) Imprejmuiri pentru septeluri (mici)	64	6016	To put one point on the center of the enclosures for the cattle (less than 60m x 60m).	Se pune un punct in mijloc (mai putin de 60m x 60m)	Point			
Constraction	放牧地 (大) Enclosures for livestocks (Large) Ingradiri pentru septeluri (mari)	64	6017	To acquire the periphery of the enclosures for the cattle (60m x 60m or more).	Se obtina marginea (mai mare de 60m x 60m)	Polygon	Annotation		????

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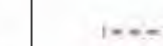
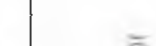
Constraction	目標物となる記念碑 Proeminent memorials and monuments Memorialuri si monumente remarcabile	72	6018	To put one point on the center of the remarkable statues and monuments.	Se pune un punct in mijloc	Point			
Constraction	記念碑、銅像、墓霊碑、墓碑 Memorials and monuments, common graves, and individual graves significant as landmarks Memorialuri si monumente, cimitire comune si individuale de importanta topografica	73	6019	To put one point on the center of the monuments, statues, common grave and separate grave.	Se pune un punct in mijloc	Point			
Constraction	トンネル(極小)(長さ75m未満) Tunnels (small) (less than 75m in length) Tunele	99,117	6101	To put one point on the center of the railroad tunnels and road tunnels (less than 75m in length) (Refer to the existing maps.)	Se pune un punct in mijloc (mai putin de 75m in lungime) (Se refera la hartile existente).	Point			
Constraction	トンネル(大)(長さ75m以上) Tunnels (Large) (75m or more in length) Tunele	99,117	6102	To acquire the center line of the railroad tunnels and road tunnels by copying the road/railway (75m or more in length) (Refer to the existing maps.)	Sa obtina linia de mijloc, prin copierea drumului/ caii ferate. (mai mult de 75m in lungime) (Se refera la hartile existente).	Line	Specification		
Constraction	橋(極小)(長さ75m未満) Small Bridges (roads and railways) (less than 75m in length) Poduri si pasaje neindicate pe harta	157,158	6103	To put one point on the center of the bridges (less than 75m in length)	Se pune un punct in mijloc (mai putin de 75m in lungime)	Point	Specification		
Constraction	橋(大)(長さ75m以上) Large Bridges (75m or more in length) Poduri si pasaje neindicate pe harta	157,158	6104	To acquire the center line of the bridges by copying the road/railway (75m or more in length)	Se obtine linia de mijloc (mai mult de 75m lungime)	Line	Specification		
Constraction	徒歩橋 Footpaths and foot bridges Treceri de pietoni si pasarele	114	6105	To put one point on the center of the foot bridges by photo interpretation. (Refer to the existing maps.)	Se pune un punct in mijloc (Se refera la hartile existente).	Point			
Constraction	高速道路のパーキング Vehicle parking lots on major highways and improved highways Locuri de parcare a autovehiculelor pe autostrazi principale si pe autostrazi imbunatatite	119	6106	To put one point on the center of the auto transport parking areas on the highways and motorways with improved covering (Refer to the existing maps.)	Se pune un punct in mijloc (Se refera la hartile existente).	Point	Annotation		
Constraction	カルバート(2条道路・鉄道と2条河川の交差部) Culverts (roads and railways) Poduri peste obstacole minore	156	6107	To put one point on the center. A culvert is applied to double line roads, railways, double line canals and double line rivers crossing.	Se pune un punct in mijloc. Canalul de scurgere este folosit pentru a dubla linia soselelor a cailor ferate, sa dubleze linia canalelor si linia de traversare a raului.	Point			
Constraction	用水路護岸(長さ150m以上) Shores with reinforced banks on canals and channeled sections of rivers (150m or more in length) Tarmuri cu armatura pe canale si sectoare canalizate ale raurilor	165	6108	To acquire the reveted canal bank slopes by copying the canal line. (150m or more in length) (Refer to the existing maps.)	Sa obtina linia, prin copierea liniei canalului, (mai mult de 150m lungime) (Se refera la hartile existente).	Line			

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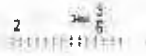
Constraction	堤防 （石、コンクリ、鉄筋）(長さ150m以上) Embankments (stone, concrete, reinforced concrete) (150m or more in length) Diguri (piatra, beton, beton armat, lemn)	166	6109	To acquire the shore side of the shore protections by copying the coastal line of seas/rivers/canals /lakes, ponds,reservoirs. (Refer to the existing maps.)	Sa obtina partea tarmului aflat sub protectie prin copierea coastei marilor/ raurilor/ canalelor/ lacurilor lazurilor rezervoarelor. (Se refera la hartile existente).	Line			
Constraction	ダム（車両通行可能） Dams carrying traffic Baraje cu trafic	167	6110	To acquire the center line by copying the road. (Refer to the existing maps.)	Sa obtina linia de mijloc prin copierea drumului. (Se refera la hartile existente).	Line	Specification		
Constraction	ダム（長さ50m未満の車両通行不可能） Dams not carrying traffic (less than 50m in length) Baraje fara trafic	167	6111	To acquire the center line (less than 50m in length) (Refer to the existing maps.)	Sa obtina linia de mijloc(mai putin de 50m lungime). (Se refera la hartile existente).	Line			
Constraction	ダム（長さ50m以上の車両通行不可能） Dams not carrying traffic (50m or more in length) Baraje cu trafic	167	6112	To acquire the center line (50m or more in length) (Refer to the existing maps.)	Sa obtina linia de mijloc (mai mult de 50m lungime) (Se refera la hartile existente).	Line	Specification		
Constraction	Dikes (less than 5m in width) 土手 あぜ道 （幅5m以下） （荒川河川敷のように河に直接接してない場合？） Dams and dikes Baraje si santuri	170	6113	To acquire the center line (less than 5m in width) (Refer to the existing maps.)	Sa obtina linia de mijloc(mai putin de 5m latime) (Se refera la hartile existente).	Line	Specification		
Constraction	土手 あぜ道 （幅5m以上25m以下） Dikes (5m or more - less than 25m in width) Dams and dikes Baraje si santuri	170	6114	To acquire the center line (5m or more - less than 25m in width) (Refer to the existing maps.)	Sa obtina linia de mijloc (mai mult de 5m si mai putin de 25m latime) (Se refera la hartile existente).	Line	Specification		
Constraction	停泊地 Anchorages and landings without equipped moorings Statii de ancorari si debarcari neechipate cu acostament	191	6115	To put one point on the center (Refer to the existing maps.)	Se pune un punct in mijloc (Se refera la hartile existente).	Point			
Constraction	整備された停泊地、ドック Landings with equipped moorings Debarcari echipate cu acostament neindicate pe harta	192	6116	To put one point on the center	Se pune un punct in mijloc	Point			
Constraction	波止場・桟橋 Moles and moorings Baraje si acostamente	193	6117	To acquire the periphery by copying the coastal line of the sea. (Refer to the existing maps.)	Sa obtina marginea, prin copierea liniei de coasta a marii. (Se refera la hartile existente).	Line			
Constraction	河岸にある永久標識 Permanent signs and structures for coastal signaling important as landmark Structuri si semne stabile pentru semnalizarea pe coasta, de importanta topografica	205	6118	To put one point on the center (Refer to the existing maps.)	Se pune un punct in mijloc. (Se refera la hartile existente).	Point			