Number	No 505-L	***Type***	Main
Mode	Local decision	***Status***	In force
Source	Published on the single website on 10 April 2021	***Place of adoption***	Yerevan
Adopting body	Government of the Republic of Armenia	***Date of adoption***	8 April 2021
Signing body	Prime Minister of the Republic of Armenia	***Date of signing***	8 April 2021
Ratifying body		***Date of ratification***	
Date of entry into force	11 April 2021	***Date of repeal***	

+ Links to other documents

DECISION OF THE GOVERNMENT OF THE REPUBLIC OF ARMENIA ON APPROVING THE STRATEGIC PROGRAMME FOR ESTABLISHMENT OF THE INTEGRATED CADASTRE

GOVERNMENT OF THE REPUBLIC OF ARMENIA

DECISION

No 505-L of 8 April 2021

ON APPROVING THE STRATEGIC PROGRAMME FOR ESTABLISHMENT OF THE INTEGRATED CADASTRE

Based on the requirements of Article 146 of the Constitution of the Republic of Armenia, those of Article 11 of the Law of the Republic of Armenia "On the structure and activities of the Government", the Government of the Republic of Armenia ***decides:***

1. To approve:

   (1) the Strategic Programme for Establishment of the Integrated Cadastre, pursuant to Annex No 1;

   (2) the Action Plan deriving from the Strategic Programme for Establishment of the Integrated Cadastre, pursuant to Annex No 2;

Prime Minister **N. Pashinyan**

of the Republic of Armenia

Yerevan

8 April 2021

CERTIFIED

BY ELECTRONIC SIGNATURE

Annex No 1

to Decision of the Government

of the Republic of Armenia

No 505-L of 8 April 2021

STRATEGIC PROGRAMME FOR ESTABLISHMENT OF THE INTEGRATED CADASTRE

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LIST OF ABBREVIATION

NSDI — National Spatial Data Infrastructure

EU — European Union

GIS — Geographic information system

API — Application Programming Interface INSPIRE — Infrastructure for Spatial Information in the European Community OGC — Open Geospatial Consortium WMS — Web Mapping Service

WFS — Web Feature Service WCS — Web Coverage Service ARPIS — Armenian Real Property Information System

ARPAC — Digital cadastral map management system SWOT — Strengths, weaknesses, opportunities, and threats ISO — International Organization for Standardization RDBMS — Relational Database Management System PORSN — permanently operating reference stations' network

1. PREAMBLE

One of the challenges in the field of public administration proves to be the issue of having complete, systematic, reliable data on changes caused by the impact of natural elements — rivers, lakes, forests, etc., property, constructions and other anthropogenic impact in the territory of the Republic of Armenia, and that of effectively managing them. Such information constitutes the set of data collected in different types of sector-based databases, some of which have spatial nature. These data are deemed as spatial data, which, in general, are processed on the basis of a cartographic base maintained by the Cadastre Committee. Based on the given circumstance, in order to facilitate the exchange of data between the Cadastre Committee and other public administration bodies and to increase their reliability, it is appropriate for such bodies to work directly through the same geographic information system (GIS) with appropriate access to different types of spatial data, rather than to receive the necessary cartographic and other data by correspondence or by downloading them online.

For this very purpose, the Cadastre Committee has initiated the establishment of the Integrated Cadastre, which will enable the same bodies to collect, process, store and exchange the standardised spatial data in one single system. The requirements to the given system must be data reliability, speed and security.

The System will not only solve the mentioned issues for public bodies, but may also serve as a useful tool for the implementation of sector-based policies, as well as for the modernisation of the activities carried out within the scope of powers of the bodies. Such System may be operational for various sector-based research, scientific, analytical organisations, as well as for organisations and individuals engaged in entrepreneurial activities. Similar entities in different countries wish to have such systems, nevertheless in many cases decentralised governance and long-lasting crystallised systems of state administration, as well as the size of areas, do not give the opportunity to operate a centralized GIS during a short period of time. In case of

Armenia, the absence of mentioned circumstances and the development of information technologies give a wide range of opportunities for implementing such project during a relatively short period of time.

The Republic of Armenia indicates, under the introduced Strategy, its willingness to establish an ultramodern, open and effective public administration system, thus contributing to economic growth and sustainable development of the country.

2. SUMMARY

This Document is the Strategic Programme for Establishment of the Integrated Cadastre, which introduces the description of current state of existing cadastral systems and spatial data and the prospects for further development of each of them, as well as the technical and organisational preconditions and conditions for the integration of separate sectors (local systems) into a single system. The existence of the Strategy is an important precondition, which will serve as a basis for full operation of the Integrated Cadastre, as well as for planning and implementing the whole process during 2020-2023.

The Strategic Programme pursues the following final objectives:

- **Establishment of management and organisational bodies of the Integrated Cadastre**

  In order to achieve this objective, it is recommended to implement the following measures:

  (a) to establish an advisory body adjunct to the Head of the Cadastre Committee;

  (b) to create, as a result of structural changes in the Cadastre Committee, an Organisational Management Division of the Integrated Cadastre and a

Geomatics Centre for Technical Management with relevant professional divisions;

(c) to elaborate and adopt relevant regulatory legal acts.

- **Real estate development and modernisation of information system of Armenia**

In order to achieve this objective, it is recommended to implement the following measures:

(a) adjustment, modernisation and optimisation of the database of spatial data;

(b) modernisation of hardware and software and introduction of new software in order to ensure the online editing of cadastral maps;

(c) elaboration of mechanisms for adjustment of cadastral maps and adjustment of topological relations of cadastral maps;

(d) adjustment and completion of text data of real estate;

(e) integration of a single register system of addresses and the NSDI;

(f) training of employees of the Cadastre.

- **Elaboration and adoption of relevant legal acts on regulation of relations pertaining to the establishment and operation of the Integrated Cadastre/NSDI system and its separate elements**

In order to achieve this objective, it is recommended to implement the following measures:

(a) making amendments and supplements to existing legal acts;

(b) elaborating regulatory legal acts which will ensure the introduction of the National Spatial Data Infrastructure (Standards);

(c) elaborating legal acts which will regulate the relations with new units applying for integration with the system (continuous).

- **Distribution of the roles of system participants and determination of data access levels for all users**

In order to achieve this objective, it is recommended to implement the following measures:

(a) introduction of a security system into the Integrated Cadastre, in accordance with the standards ISO 27000;

(b) determination of different levels of user access by the system administrator, including in real-time mode;

(c) integration, where necessary, of the system with the EKENG e-governance platform.

- **Establishment of the National Spatial Data Infrastructure**

In order to achieve this objective, it is recommended to implement the following measures:

(a) creation of databases of spatial layer metadata;

(b) introduction and operation of Geoportal, which will enable to view, analyse and process spatial data, obtained from different sources, on a single platform;

(c) import of spatial layers created by public administration bodies and other bodies into the spatial data infrastructure;

(d) providing the Geoportal users and operators, with appropriate powers to use the system.

- **Integration of sector-based cadastres and full operation thereof based on common standards**

  In order to achieve this objective, it is recommended to implement the following measures:

  (a) elaboration of common standards for submitting spatial data;

  (b) introduction of relevant hardware tools in order to include sector-based cadastres in the Integrated Cadastre System;

  (c) training of employees of the Sector-Based Cadastre.

3. ANALYSIS OF CURRENT STATE

3.1 CADASTRAL SYSTEMS

The functions of maintaining the cadastres (registers) of objects, property and resources under the management of a number of economic management bodies of the Republic of Armenia have mostly not been performed or have been performed incompletely, in addition they operate independently of each other, with data being repeated or sometimes contradicting each other, which significantly complicates the process of providing the necessary information to administration bodies and sometimes makes impossible the use of information or information systems, available in different information databases, aimed at ensuring the efficiency of governance, elaboration of effective programmes, or effective implementation of programmes of state significance.

3.1.1. State Register of Real Estate (Cadastre)

With the aim performing the functions of providing information on state registration proceedings, on property as well as on rights and restrictions thereto (pursuant to point 1 of Article 31 of the Law of the Republic of Armenia "On state registration of rights to property"), starting from 1 January 2012 the Armenian Real Property Information System (hereinafter referred to as "the ARPIS") has been put into operation. The ARPIS is composed of the following sub-systems:

- Documentation flow;
- Documentation management (electronic archive);
- Storage and processing of cadastral text data;
- Maintenance of digital cadastral maps (not in effect);

The following functions are performed through the ARPIS:

- Electronic documentation submitted for state registration and provision of information between operating offices of the Cadastre Committee, operators authorised by the Government of the Republic of Armenia, notary offices, as well as territorial (separated) sub-divisions of the Committee ensuring state registration and provision of information;
- Preparation of final documents provided as a result of performance of functions of electronic state registration and provision of information;
- Creation and maintenance of a single centralised database of information on state registration of property rights, cadastral assessment, qualitative and quantitative characteristics of property;
- Provision of information on inquiries through WEB services.

The standby electronic cadastral maps of the communities of the Republic of Armenia are currently maintained through the ARPAC system, which is based on «Bentley

Microstation» software. The cadastral maps included in the ARPAC are composed of the following thematic groups:

1. Administrative and territorial,
2. Real estate,
3. Land fund,
4. Infrastructure,
5. Assessment,
6. Hydrography,
7. Restriction,
8. Geodesy,
9. Entity.

The ARPI System and ARPAC system are not integrated and no automatic exchange of data is carried out.

3.1.2. Maintenance of sector-based (thematic) cadastres

Pursuant to the powers prescribed by the laws of the Republic of Armenia and other legal acts for authorised state administration bodies, the following portal cadastres are maintained:

(1) Forest Cadastre

The regulating documents are as follows:

- Forest Code of the Republic of Armenia (Chapter 6).
- Decision of the Government of the Republic of Armenia No 198-N of 25 January 2007.

- Decision of the Government of the Republic of Armenia No 133-N of 7 February 2008.

According to the mentioned documents, both the Ministry of Agriculture and the Ministry of Nature Protection were reserved with the powers of maintaining the forest cadastre. Currently, these powers have been fully transferred to the Ministry of Environment, and the cadastre maintenance functions will be carried out through "Hayantar" SNCO.

(2) State Cadastre of Water Resources

- Water Code of the Republic of Armenia (Article 19.2).
- Decision of the Government of the Republic of Armenia No 639-N of 22 May 2003.
- Order of the Minister of Nature Protection of the Republic of Armenia No 514-N of 30 December 2003.
- Decision of the Government of the Republic of Armenia No 571-N of 5 May 2005.
- Decision of the Government of the Republic of Armenia No 68-N of 2 February 2017. The Ministry of Environment will act as the authorised body; the functions are performed through the Water Resources Management Agency.

(3) Cadastre of Specially Protected Areas of Nature

The regulating documents are as follows:

- Law of the Republic of Armenia "On Specially Protected Areas of Nature".
- Decision of the Government of the Republic of Armenia No 639-N of 29 April 2004.

- Decision of the Government of the Republic of Armenia No 1044-N of 30 August 2007.
- Decision of the Government of the Republic of Armenia No 967-N of 14 August 2008.
- Order of the Minister of Nature Protection of the Republic of Armenia No 364-A of 27 October 2008.
- Decision of the Government of the Republic of Armenia No 259-N of 20 March 2008.
- Decision of the Government of the Republic of Armenia No 1059-A of 25 September 2014.
- Order of the Minister of Nature Protection of the Republic of Armenia No 393-A of 22 December 2015.
- Order of the Minister of Nature Protection of the Republic of Armenia No 275-A of 28 September 2015.
- Protocol Decision of the Government of the Republic of Armenia No 54 of 10 December 2015.

The Ministry of Environment will act as the authorised body; the functions will be performed through the Bioresource Management Agency.

(4) Flora Cadastre

The regulating documents are as follows:

- Law of the Republic of Armenia "On Flora" (Article 13).
- Decision of the Government of the Republic of Armenia No 1440-N of 13 November 2008.

- Order of the Minister of Nature Protection of the Republic of Armenia No 140-N of 13 July 2009.
- Decision of the Government of the Republic of Armenia No 974-N of 13 August 2009.
- Protocol Decision of the Government of the Republic of Armenia No 33 of 13 August 2009.
- Decision of the Government of the Republic of Armenia No 831-N of 23 July 2009.

The Ministry of Environment will act as the authorised body; the functions will be performed through the Bioresource Management Agency.

(5) Fauna Cadastre

The regulating documents are as follows:

- Law of the Republic of Armenia "On Fauna" (Article 13).
- Decision of the Government of the Republic of Armenia No 1441-N of 13 November 2008.
- Order of the Minister of Nature Protection of the Republic of Armenia No 145-N of 16 July 2009.
- Decision of the Government of the Republic of Armenia No 975-N of 13 August 2009.
- Protocol Decision of the Government of the Republic of Armenia No 34 of 13 August 2009.
- Decision of the Government of the Republic of Armenia No 832-N of 23 July 2009.

The Ministry of Environment will act as the authorised body; the functions will be performed through the Bioresource Management Agency.

(6) State Cadastre of Wastes

The regulating documents are as follows:

- Law of the Republic of Armenia "On wastes" (Article 14).
- Decision of the Government of the Republic of Armenia No 47-N of 19 January 2006.
- Decision of the Government of the Republic of Armenia No 500-N of 20 April 2006.
- Decision of the Government of the Republic of Armenia No 1180-N of 13 July 2006.
- Annex 1 to the Order of the Minister of Nature Protection of the Republic of Armenia No 359-N of 7 November 2006.
- Annex 1 to the Order of the Minister of Nature Protection of the Republic of Armenia No 387-N of 24 November 2006.
- Order of the Minister of Nature Protection of the Republic of Armenia No 430-N of 25 December 2006.
- Order of the Minister of Nature Protection of the Republic of Armenia of 26 October 2006.
- Decision of the Government of the Republic of Armenia No 144-N of 18 January 2007.

The Ministry of Environment will act as the authorised body; the functions will be performed through the Waste and Atmospheric Emissions Management Agency.

(7) State Cadastre of Mineral Deposits and Manifestations

The regulatory documents are as follows:

- Subsoil Code of the Republic of Armenia (Article 63).

- Decision of the Government of the Republic of Armenia No 1571-N of 22 November 2012.

The Ministry of Territorial Administration and Infrastructures will act as the authorised body; currently, there is no unit dealing with the issue.

(8) State Cadastre of Immovable Monuments of History and Culture

The regulating documents are as follows:

- Law of the Republic of Armenia "On the protection and use of immovable monuments of history and culture and historical environment".
- Decision of the Government of the Republic of Armenia No 438 of 20 April 2002.
- Decision of the Government of the Republic of Armenia No 104-N of 5 February 2009. The Ministry of Education, Science, Culture and Sports will act as the authorised body; currently, there is no unit dealing with the issue.

(9) Urban Development Cadastre

The regulatory documents are as follows:

- Law of the Republic of Armenia "On urban development" (point 16 of part 3 of Article 10.1, Article 20).
- Decision of the Government of the Republic of Armenia No 802 of 31 December 1999.
- HHShN I-2.03-03: Order of the Minister of Urban Development of the Republic of Armenia No 38-N of 5 June 2003.

The Urban Development Cadastre of the territory of the Republic of Armenia is maintained and the cadastral summary is drawn up by the authorised state administration body in the field of urban development.

The maintenance of the State Urban Development Cadastre and the monitoring of urban development activities are carried out in the community by the head of community, whereas in the marz [region] taken as a whole — the marzpet [regional governor].

(10) Cadastre of Agricultural Soil Types

The regulatory documents are as follows:

- Decision of the Council of Ministers of the Republic of Armenia No 179 of 6 March 1991.
- Decision of the Government of the Republic of Armenia No 124 of 3 March 1999.

The Ministry of Economy will act as the authorised body; currently, there is no unit dealing with the issue.

3.2 CURRENT STATE OF THE USE OF SPATIAL DATA IN THE STATE ADMINISTRATION SYSTEM OF THE REPUBLIC OF ARMENIA

A survey was conducted for acquiring understanding of the current state of spatial data. The aim was to ascertain as to what extent the bodies of state administration system of the Republic of Armenia deal with spatial data, how effective is the exchange of data between them and what issues do exist. The survey put forward the following questions:

- To what extent does Your institution deal with spatial data?
- What spatial data do You use?
- Who collects and/or creates the spatial data base (layers) used by You?
- What aim do You pursue in using spatial data?
- What regulatory legal act covers Your competence of collecting or creating spatial data?

- Do You make an exchange of data with other entities possessing other spatial data, or are their data available to You?

The questionnaire was forwarded to relevant bodies, in particular, the Ministry of Territorial Administration and Infrastructures of the Republic of Armenia, the Urban Development Committee of the Republic of Armenia, the Waste and Atmospheric Emissions Management Agency, the Bioresource Management Agency, the "Hayantar" SNCO of the Forest Committee, the Water Resources Management Agency of the Ministry of Environment of the Republic of Armenia.

By summarising the answers received from the mentioned entities, it becomes clear that these entities are mostly collectors and/or creators of spatial data, as well as operators of spatial data. They use vector maps, raster maps (for example, DRM, aerospace pictures), paper maps (for example, topographic maps, atlases) and internet maps (openstreetmap, yandex map, google maps, google earth).

The spatial data base (layers) used by them are collected and/or created by their organisation, state authorised body regulating the cartographic sector — the Cadastre Committee, other state entities (state, local self-government bodies), from entities carrying out scientific and educational activities, the data of which are open and accessible to everyone, from global organisations providing geospatial data (such as USGS Earth Explorer, Sentinel Satellite Data, Terra Populus, OpenStreetMap, Open Topography, NASA Earth Observations, Esri Open Data, etc.).

Their activities are directly related to the collection and storage of spatial data; the spatial data are used by them in management, decision-making process; they carry out certain analyses, planning and coordinate their activities, as well as they use spatial data just for determining respective location and for finding the location of either object.

Their competence of collecting or creating spatial data is regulated by regulatory and legal acts in force in the Republic of Armenia (for example, Land Code, Water Code, Subsoil Code of the Republic of Armenia, Laws of the Republic of Armenia "On local

self-government", "On wastes", "On specially protected areas of nature", "On urban development", etc.).

The mentioned entities exchange spatial data with other entities possessing spatial data, as well as provide and receive, where necessary, up-to-date data on a regular basis. However, at the same time, it is noted that significant data are provided upon state request, whereas some are provided on a paid basis or are simply provided on the basis of interpersonal agreements reached.

Almost all entities were aware of the initiative of the Cadastre Committee to establish a National Spatial Data Infrastructure (NSDI), they welcomed and attached importance to its role in carrying out their activities.

3.3 ANALYSIS OF STRENGTHS AND WEAKNESSES, OPPORTUNITIES AND THREATS (SWOT) OF THE INTEGRATED CADASTRE

SWOT analysis was carried out during the preparation of the Strategy of the Integrated Cadastre. The latter enables to identify the strengths and weaknesses of the system, as well as to overcome the obstacles to achievement of strategic objectives. The analysis indicates strengths, weaknesses, threats and opportunities.

Strengths

- The Cadastre Committee involves the main part of basic spatial data (topographic maps, cadastral maps, ortholayouts), which will be provided for the establishment of the Integrated Cadastre.
- Experienced specialists in GIS and cartography are employed at the Cadastre Committee, who may edit and store the spatial data.

- Availability of ARPIS cartographic module at the Cadastre Committee.
- Improvement of business environment.

Weaknesses

- Lack of practical experience of dealing with large-scale spatial data in the Republic of Armenia.
- Insufficient knowledge in order to create metadata for spatial data and services.
- Lack of adequately trained GIS specialists at public administration bodies.
- Incompatibility of data, created by public administration bodies, with spatial data provided by the Cadastre.
- Almost absence of legal regulations and policy on the use, dissemination and exchange of spatial data and services.

Opportunities

- Establishing a single spatial platform for the creation and maintenance of spatial data on a single basis.
- Keeping updated and modernising the information system of real estate of Armenia.
- Establishing the National Spatial Data Infrastructure.
- Full operation of sector-based cadastres based on common standards.
- Distributing the roles of system participants and defining data access levels for all users.

Threats

- Centralisation of data in one place without archiving may lead to data loss. Therefore, it is necessary to save a copy of the data added and changed during each day, in another place.

4. MANAGEMENT COMPONENT OF THE INTEGRATED CADASTRE

4.1. Management and organisation structure

Elaborate and introduce an integrated cadastre management and organisation structure with proportional representation, which will be necessary for coordination of the activities of co-operation. The management, maintenance and organisation of the Integrated Cadastre will be carried out on the basis of relevant legal acts. As a result, the following bodies will be separated:

- Advisory body of the Integrated Cadastre/NSDI adjunct to the Head of the Cadastre Committee.
- Organisational Management Division of the Integrated Cadastre will be established within the composition of the Cadastre Committee.
- Geomatics Centre with relevant professional divisions will be established within the composition of the Committee in respect of technical management and research activities of the Integrated Cadastre.

4.2. Advisory body for the Integrated Cadastre/NSDI

By the order of the Head of the Cadastre Committee, an advisory body for implementation of the activities of the Integrated Cadastre/NSDI will be established, wherein organisational, technical and scientific-methodological issues of the NSDI

management, data access, as well as problems related to spatial data standardisation and policy will be discussed and registered. The advisory body will include representatives (upon their consent) from state administration and other bodies providing spatial data, as well as from non-governmental organisations, private organisations providing public services, scientific and research centres and educational complexes.

4.3. Organisational Management Division of the Integrated Cadastre

Organisational management will be carried out by the new Department for Geodesy and Land Management established upon merger of the Department for Record-Registration and Land Management and the Department for Geodesy and Cartography within the Cadastre Committee. Relevant division will be established in the Department which will be composed of main permanent staff.

The division will include the following functions.

- Providing institutional and technical bases, elaborating financial principles and contractual agreements.
- Co-operation with the EU and other international organisations.
- Elaborating guidelines for standards.
- Providing answers to the advisory body.
- Carrying out monitoring of activities.
- Supporting beneficiaries (beneficiary groups) for data standardisation.
- Organising consultations, workshops and seminars.
- Preparing topics for discussion at the advisory body, organising meetings.
- Continuous support for the implementation of the EU INSPIRE Directive.
- Ensuring introduction of the results of various researches.

4.4. Geomatics Centre for technical management of the Integrated Cadastre and research activities

The Cadastre Committee will guarantee the smooth operation of the Integrated Cadastre, which will ensure the operation of servers and software. For the purpose of ensuring such functions, the Cadastre Committee will play the role of system administrator.

By means of making changes in the structure of the Cadastre Committee, the Geomatics Centre will be established which will be headed by the Head of the Centre. It will be staffed with relevant specialists (in further, where necessary, the number of employees may be increased) who must have high professional skills. In order to have relevant specialists, the relations between the Cadastre Committee and professional educational institutions will be deepened and the qualitative characteristics of specialists graduating from universities will be increased through investments in educational system.

The Centre will carry out professional activities by developing the spatial data infrastructure, as well as will provide respective basis for the Cadastre Committee in order to shift from a two-dimensional plan cartographic system to a three-dimensional spatial cartographic system. The functions of the Geomatics Centre will be approved by relevant legal act and the Statute approved by the Head of the Cadastre Committee.

It is intended to include in the Statute the following functions:

- Editing geographic information, cadastral layers and entry thereof into the Geoportal.
- Creating, editing, managing databases of geographic information layers.
- Ensuring data exchange between servers and geoportals.
- Creating standardised geospatial data and metadata.
- Supervision over the activities related to metadata database, harmonisation of standards.

- Regular checks of the accuracy of spatial data and cartographic layers by use of the network of permanent reference stations (NPRS) and by check measurements of the field-based activities.
- Receiving and entering new geospatial data for the Geoportal, including through decoding of remote sensing data, digitisation of analogue thematic maps by means of GIS modelling and field-based extractions.
- Management of reference stations.

Four professional divisions will be formed in the Geomatics Centre, through which professional coordination activities will be carried out:

- Division for Organisation and Coordination of Field-Based Activities.
- Division for Management of Geospatial Data.
- Division for Permanent Reference Stations and Automated Management Systems.
- Sales Division.

Decisions taken by Management Divisions and the Geomatics Centre will contain provisions which will prescribe job responsibilities or obligations for each employee.

5 TECHNOLOGICAL COMPONENT OF THE INTEGRATED CADASTRE

5.1. Structure of the Integrated Cadastre, ensuring data access and interoperability

The Integrated Cadastre within single geodetic coordinate system proves to be a GIS of cartographic layers and layer groups with a centralised structure of data storage, preservation, security, accessibility and system operation (Diagram 1, page 44). It proves to be a relational national geospatial database rather than simply a centralised

data warehouse. Access to the Integrated Cadastre must be regulated by a common security system, authorisation or restriction groups, and an application programming interface (API) within the framework of data accessibility. The interoperability of the Integrated Cadastre System will be ensured according to the scheme diagram shown in Diagram 2; the public and private sectors will have the opportunity to view and request data through Public APIs and Public Geoportal. State, local self-government bodies, as well as private organisations providing public service, will have both the option to view, download and to edit data. Except for state bodies, all other operators will use the System in return for relevant fees prescribed, based on the subscription fee. Integration of cartographic layers and registers of addresses and geographical names, of cadastral archive and text data of real estate will be carried out. Moreover, the addresses, text data and the archive will be linked to the cadastral maps of the real estate, whereas the geographical names — to topographic maps. In addition, the information will be automatically reflected in the maps available online.

Any changes in renaming or numbering of the real estate address, being made in the register of addresses, will be reflected also on online cadastral maps and will be available to users.

In the course of providing for the Integrated Cadastre, it is designed to carry out integration of the System with EKENG e-governance platform in order to exercise transactions with identification cards and to use the services of the Integrated Cadastre.

5.2. Development of the State Register of Real Estate

In the context of full operation of the Integrated Cadastre, it is envisaged to link it to the ARPIS by establishing a link between text and cartographic databases (currently missing). As a result, several functions performed automatically by the Cadastre Committee are as follows:

- provision of cartographic information;
- editing cartographic objects and making changes in a single spatial layer, by excluding duplication of data;
- changes made in cadastral maps during the performance of the functions of state registration of rights will be reflected in the text database through automatic link identification, by excluding inconsistencies. For example, the area, intended purpose of the land parcel, land type or operational significance of the land parcel will be registered as attribute data in the GIS, whereas for the purpose of summarising them within the framework of other systems and software applications (also in the ARPIS) the link to relevant field of the GIS database will be registered in the database of the latter;
- non-spatial information provided through the GIS, such as the date of registration of the property, type of the right or identification of the entity will, in pursuance of the same logic of the previous paragraph, be registered in the GIS exclusively in the form of a link;
- changes made in cadastral maps, resulting from any proceedings on registration of rights over real estate, will be fixed only after completion of the proceedings by automatic registration of relevant mutual links;
- with a view of increasing productivity, a generator of reports will be introduced in the GIS, which will enable to export relevant information or the results of analysis in accordance with the programmed parameters from the geospatial database. Currently, this is done through an organisation supporting information system.

5.3. Integration of sector-based cadastres

The Strategy for the Integration of Sector-Based Cadastres is based on the principles of effective planning and management of natural and economic resources in the Republic of Armenia.

The Integrated Cadastre System will provide the above-mentioned cadastres with basic maps (cadastral, topographic and orthophotos) through online services/APIs, which will eliminate duplication of data, as well as will enable all sector-based cadastres to work in a single spatial environment by using standards and processes of common spatial data. Therefore, the above-mentioned sector-based cadastres will be provided with space in the server of Integrated Cadastre for the import, storage and visualisation of spatial data.

As a result, such spatial data may be provided online to state administration bodies and other bodies for the purpose of carrying out urban development, spatial planning and other actions with different levels of accessibility, which will be prescribed by the decision of the Government of the Republic of Armenia.

5.4. Establishing, elaborating the National Spatial Data Infrastructure (Standards)

The elaboration of the National Spatial Data Infrastructure (hereinafter referred to as the "NSDI") and the operation of the Geoportal are considered as necessary and fundamental conditions for the coordination, management of spatial data and integration of sector-based cadastres. The components of the NSDI are as follows: information technologies, legal documents, standards and human resources, which are necessary for the collection, processing, storage, exchange and effective use of spatial data.

Establishment of the NSDI will contribute to the following:

- collection, processing and use of single spatial and cadastral data necessary for management;
- elaboration of effective economic development programmes for the marzes, communities of the Republic of Armenia;

- proper planning, effective management of emergency situations, transport and communication, natural resources;
- exclusion of repetition of data and inconsistency of data used in different sectors of economy;
- facilitation of the process of creating reserve copies of spatial data, increase in operational efficiency and reduction of support costs;
- ensuring access to spatial data through a metadata database;
- ensuring accessibility of information for the public;
- elaboration of internal mechanisms for verification of completeness, reliability and accuracy of data;
- reduction of the time for providing complete spatial information to the body acting as beneficiary and reduction of labor intensity due to ensuring automatic access.

One of the most important imperatives in elaborating the structure and scope of functions of the NSDI is the use of the experience of leading countries, in particular, the EU INSPIRE Directive, and its localisation to the conditions of the Republic of Armenia, as a result of which the local geospatial data will be brought into compliance with international standards.

The main purpose of creating a Geoportal as an important component of the NSDI is to ensure an online environment that will enable the operators to view, analyse and process spatial data obtained from various sources on a single platform.

5.5. Standards (criteria)

Standards are considered as the basis (nature) of the NSDI due to the lack whereof the exchange of data and co-operation between bodies has faced a number of

difficulties. In addition to reaching agreements on technical solutions and exchange formats, it is also necessary to harmonise the content of spatial data through specially developed standards. Standards are important for integrating data more efficiently and easily, as well as for ensuring the interrelated nature of spatial data and services. With the aim of effective exchange of spatial information, it is necessary to have standards that provide a common and acceptable structure. In such case, the data provider and the recipient will be able to understand each other.

Free accessible international standards and relevant protocols (instructions, regulations) will be used for elaboration of spatial data/services and metadata during the establishment of the NSDI, which will include guidelines for standards of basic/thematic layers provided for by ISO, OGC and the EU INSPIRE Directive. In addition, in order to localise the standards, a number of laws of the Republic of Armenia and decisions of the Government of the Republic of Armenia will be taken into account.

The ISO (International Organization for Standardization) is a world organisation of standards. International standards embody the basic principles of global obviousness and transparency, agreement and technical consolidation. Elaboration of standards is carried out through the ISO Technical Department (ISO/TC), which involves the representatives of all interested parties. There is an ISO 19100 family of standards that focuses on different components of spatial infrastructures. Most of such standards relate to technical operation of services, exchange formats, syntax, languages, and encoding technical issues.

The OGC (Open Geospatial Consortium) is a leading international non-profit organisation which elaborates geospatial service standards (WMS, WCS, WPS, WFS) for web access.

5.6. Single coordinate system

All spatial data and services of the NSDI need to be introduced in a single coordinate system so that the collected spatial data are consistent and interactive. Whereas WGS-84 (ARMREF 02) coordinate system has been introduced in the territory of the Republic of Armenia since 2002 by the Decision of the Government of the Republic of Armenia No 225 of 11 March 2002, and the coordinates of the main points of the National Geodetic Network have been declared as open for use by the Decision of the Government of the Republic of Armenia No 763-N of 16 October 2016, the points of both state and national geodetic planning and elevation networks, as well as the thematic and base layers, will be interrelated within the WGS-84 (ARMREF 02) Single National Coordinate System, which complies with international geodetic and cartographic standards.

5.7. Metadata

Metadata constitute a set of data which enable to describe the characteristics of spatial data, (or are considered as data on data), and help to assess and use data correctly for various purposes. Metadata enable to ensure effective identification of data through special surveys. The size of data sets of the entities providing geospatial data may reach terabytes, therefore the operator must be guided and directed in order to be able to find the information he or she needs. There are mandatory metadata such as scale, coordinate system, date and several keywords. Without such information, the data are simply useless.

Different standards of metadata are adopted by different countries and organisations. For example, the US Federal Geographic Data Committee has developed the “FGDC Metadata” Standard which is widely used in the United States of America. The following principles will be applied for processing of metadata of spatial data of the Integrated Cadastre in the Republic of Armenia.

1. The metadata will be created in Geoportal according to ISO standards (ISO 19115, ISO 19119 and ISO 19139), taking into account the structure of INSPIRE metadata profile.
2. The metadata will be published in a metadata database (catalogue), through which the beneficiaries may search for and access databases or services.
3. All bodies providing spatial data must create their own metadata and ensure their modernisation.
4. Providers of spatial data must be able to publish metadata by two methods:
    - download the metadata in the centralised metadata catalogue through the national geoportal;
    - publish the metadata on their own portals, then link it to the metadata catalogue of the national geoportal.
5. For the purpose of creating metadata, a freely accessible Geonetwork and commercial software packages will be offered.

The published metadata will enable the operator to identify the existence of spatial data, the purpose of use, existing restrictions, etc.

5.8. Policy on use and exchange of spatial data

The data policy must be based on the principles of clarity, transparency and fairness. Currently, the provision of cadastral data and pricing policy are implemented according to the requirements of Article 73 of the Law of the Republic of Armenia "On state registration of rights to property". For example, it is provided, free of charge, to the state administration bodies of the Republic of Armenia.

Data exchange agreements: it is envisaged to sign agreements on exchange, access and use of data between private beneficiaries of the Integrated Cadastre and Cadastre Committee.

Levels of data provision, availability and reliability: it is assumed that the Ministries and other state and private organisations providing geospatial data to the Integrated Cadastre and receiving data therefrom will have different levels of provision and access to these data, which will be defined by relevant decisions of the Government of the Republic of Armenia. At the same time, state administration bodies which provide spatial data to the Integrated Cadastre System (thematic maps, other information) will be granted the status of a "user". The remaining of those availing of the System will be granted the status of an "operator". Moreover, the operators will also have different levels of data access. For example, several layers introduced in the Integrated Cadastre (which will be defined by the advisory body adjunct to the Head of the Integrated Cadastre) will be made available to the public, while other layers will be available only to specific operators. In the Integrated Cadastre System, the data entry authority ("user") is responsible for reliability of the data.

Pricing policy of data: the pricing policy of spatial data of the Integrated Cadastre will be implemented as of the following groups:

- Thematic spatial data and services exchanged between state administration bodies will be free of charge, whereas in case of private data they may be delivered on paid basis.
- For the purpose of ensuring scientific and research, educational activities of state bodies, the basic spatial data will be provided upon the decisions of the advisory body of the NSDI on non-gratuitous basis.
- Only metadata and several spatial layers will be available, free of charge, to private beneficiaries and the public, whereas the remaining geospatial data will be provided on paid basis.

5.9. Inclusion of other information databases in the Integrated Cadastre System

It is envisaged to include other information databases in the Integrated Cadastre System by different methods:

(a) allocating certain space in the spatial database for data storage;

(b) providing access, through the Geoportal, to OGC compatible services (WMS, WFS, WCS) created by other organisations. This approach will give a possibility to include in the Integrated Cadastre, for example, data provided by Openstreetmaps, Bing, Yandex and other online services;

(c) collecting and integrating spatial data on water supply, electricity supply, communication, etc., of organisations providing public services through relevant mechanisms. Currently, the Cadastre Committee has created an online platform, through which the above-mentioned companies have been granted an opportunity to view on the map the location of the infrastructure online.

Thus, the inclusion and comparison of data created by other organisations in the Integrated Cadastre will enable to perform spatial analysis for the implementation of certain economic programmes.

6. LEGAL COMPONENT OF THE INTEGRATED CADASTRE

The prescribed legal component describes the precise scope of roles and responsibilities, as well as the opportunities of data access and exchange.

6.1. Elaborating legislation on the Integrated Cadastre/NSDI and adopting other regulatory legal acts

The full implementation of the Integrated Cadastre at the national level is impossible without legal regulations. The latter may be ensured only with availability of legislation on the Integrated Cadastre/NSDI legislation.

The legislation of the Integrated Cadsatre/NSDI will give an opportunity to create a legal basis which will define the use and accessibility of spatial data and services, sources of metadata and services, conditions and methods of exchange.

- Elaborating and submitting for approval the general rules and procedure for the creation (formation, use), maintenance of the NSDI and management of spatial data (decision of the Government of the Republic of Armenia).
- Defining the principles of access to spatial data, in particular, to the spatial data protected as prescribed by law, based on security considerations and international relations.
- Elaborating and approving a regulation for adoption of standards (guidelines, instructions).
- Adopting regulatory acts on the protection of dissemination of spatial information.
- Establishing and adopting agreements on exchange of spatial data in the state system.

Parties signing the agreement will maintain their spatial data and services; the parties will acquire the same rights against others; each signed agreement will be published in order to inform the other parties.

6.2. Elaboration of draft legislative amendments for prescribing powers and regulating relations

1. Prescribe for authorised bodies competencies and responsibilities of maintaining a sector-based (thematic) cadastre as of the legal acts included in the concept of the Integrated Cadastre.
2. Make changes in the names of the authorised bodies, by bringing them into compliance with the structure of the Government of the Republic of Armenia.
3. Inevitably, there may be a need for clarification of functions and, as a consequence, a need for certain review of competences or new regulation of mutual relations. Determine, for each component of common functions

(collection, registration and storage of data, maintenance of cadastre and provision of information), the execution mechanisms and the executors, regulate the relations between them.

For example, under existing regulations, in one case the data collector and the cadastre manager are the same body, whereas in the other case the cadastre is maintained by one body and the obligations of data collection are imposed on another body or bodies.

a. In case of urban development cadastre, the territorial principle is applied where the community acts both as data collector, as cadastre manager and as provider of information in its territory. The marzpetarans [regional governor's office] and the Urban Development Committee have similar functions with regard to the territory of the marz and territory of the Republic of Armenia, respectively.

b. In case of the Water Resources Cadastre, the power of maintenance thereof is granted to the Ministry of Environment of the Republic of Armenia, and the responsibilities of collecting data and submitting them to the authorised body are assigned to the Ministry of Emergency Situations of the Republic of Armenia, Ministry of Territorial Administration and Infrastructures of the Republic of Armenia, to the State Water Committee subordinate thereto under separate point, and to the Cadastre Committee.

Therefore, having considered the components of general functions separately, i.e. data collection, registration and storage, maintenance of cadastre and provision of information, it is necessary to determine the mechanisms of execution and the executors, and then to regulate the relations between them.

4. After final solution of practical mechanisms of the Integrated Cadastre, new regulatory legal acts will be elaborated, where necessary, in order to define powers or to regulate the newly emerged relations.

7. ACTION IMPLEMENTATION PLAN

7.1. DEVELOPMENT PROGRAMME FOR THE STATE REGISTER OF REAL ESTATE

7.1.1. Adjustment, modernisation, optimisation and standardisation of the database of basic spatial data

7.1.1.1. Checking and preparing cartographic materials available at the Cadastre Committee in order to download them to the cartographic module

In order to download the cartographic materials, available at the Cadastre Committee, to the cartographic module, it is necessary to:

- check the maps in the System wherein maps are currently being edited;
- convert it, thereafter, to an ESRI Shapefile format for GIS interoperability;
- use software packages of any universal long-term information system — ArcGIS, QGIS, etc., in order to acquire maps that are technically clean and are in operational ESRI Shapefile format;
- correct the detected errors, in the initial stage, in the operating systems, as a result of which it will be possible, at any time, to convert technically clean maps to ESRI Shapefile format;
- conduct analysis on appropriateness of several layers. Most of the layers currently used are likely to become descriptions in order to further exclude duplications; for example, after editing the land parcel, there will be no need to do the same in the layers of land fund or property type;
- download maps to the cartographic module, perform testing of integrated works of text and cartographic systems.

7.1.1.2. Comparison of information in cadastral maps with text database and land balance, as well as inventory of inconsistencies

The issue of existing inconsistencies has arisen as a result of maintaining graphic and text data in different systems. The actual cadastral map, as well as the target and operational layers of the land fund have been maintained in the ARPAC software system, and the text-based information related thereto — in the ARPIS. Therefore, in order to ensure the interrelated nature of objects of different nature with the correct perception of information, it is necessary to represent the stored data on common cartographic base and database, by carrying out the following measures*:*

- collect the existing cadastral, land management, cartographic materials and text-based information;
- study the data entered in the text database and make supplements to the information having not been entered;
- make comparisons between the text database and graphic layers for the purpose of detecting inconsistencies;
- reveal differences having arisen as a result of the comparison between text data and land balance;
- classify the issues obtained as a result of the analysis and elaborate the procedure for correction;
- integrate graphic and text data and agree the new balance with all interested bodies.

7.1.1.3. Adjustment of the digital map of administrative boundaries of the communities and settlements of the Republic of Armenia

Pursuant to the requirements of the Law of the Republic of Armenia "On administrative and territorial division of the Republic of Armenia", the territory of the Republic of Armenia is divided into marzes, communities and settlements; moreover, only the boundaries of marzes and communities are described.

The boundaries are composed of the following elements:

- boundary stones which are classified as nodal and turning;
- boundary lines;

Previously, when there were no digital mapping opportunities, electronic equipment, the boundaries were described in text format, and the graphic section thereof was illustrated on a wax paper. Initially, boundary stones were introduced according to the description, and later coordinates were added. Over the years, within the framework of adjustment activities of boundary lines, the coordinates of their boundary stones have been changed as well, which has not always been correct. There was a need to review the boundary lines dividing the existing units of real estate, which were described according to topographic indicators.

In order to correct the boundary lines and to create a new digital map, it is necessary to carry out the following processes:

- reveal the text descriptions of boundary stones and boundary lines of the marzes and communities of the Republic of Armenia;
- study the changes in boundary lines in the following years;
- resolve all boundary disputes between communities (support of other state bodies will be needed);
- submit the newly verified data on coordinates of boundary lines and breaking points to the Government in the form of a draft law after having agreed with relevant local self-government bodies;
- inventory the preserved nodal and turning boundary stones;
- restore all nodal boundary stones of high significance and display, in other places, the boundaries on geo-oriented aerial photos;
- coordinate all turning points and changing sections of boundary lines with topographic indicators;

- digitise the boundary line of the new settlement by taking into account the construction boundaries added in recent years.

7.1.2. Modernising and keeping updated the information system of real estate of the Republic of Armenia

7.1.2.1. Keeping updated the ARPI System, as well as operating and integrating the cartographic module

7.1.2.1.1. Issues of application of the ARPAC software package, ways of solution

A special ARPAC software package is currently used for keeping updated the cadastral maps by territorial subdivisions of the Cadastre Committee. However, the updating procedure has several shortcomings:

- the software package runs only on Windows XP operating system, which causes compatibility problems with modern versions of software packages used in parallel;
- currently, the cadastral layers of communities are introduced in thematic groups as separate files, due to which keeping data updated becomes time-consuming;
- the cadastral districts, land parcels and buildings are introduced as linear objects, which makes impossible to conduct surveys, area calculations, topology checks, etc., in real mode.

In order to avoid the above-mentioned problems, it is necessary to resort to more up-to-date software packages, through which it will be possible to make edits of cadastral layers in an online, single spatial database. For this purpose, it is necessary to take the steps referred to in sub-chapter 7.1.1, as well as to obtain relevant GIS software packages — ArcGIs, QGIS, etc., and then to localise them and elaborate relevant software.

7.1.2.1.2. Provision of additional information through the ARPI System

Additional information on the entity — type of ownership, date of registration of the right, reference number of registration certificate, entities attached to relevant right with their data and shares, type of transaction, date of transaction, will be provided by linking the code of the land parcel with relevant information available in the ARPIS data base.

7.1.2.1.3. Operation and integration of cadastral and cartographic modules of the ARPI System

After downloading the cadastral layer, integration activities of cadastral and cartographic modules will be carried out. The key for connection will be the cadastral code of property.

An opportunity of directing the cartographic module will be added in the list of functions to be created for applications being entered for obtaining information on property, rights and restrictions thereto.

As a result:

(1) changes made in cartographic module will be automatically reflected in the text database and in the documents of cadastral file;

(2) changes made to the map will be approved in the case where the final document is drawn up;

(3) in case the transaction is rejected or suspended, the changes will remain in operating mode;

(4) export of reports ,for example, land balance, changes of the land fund, etc., will be carried out,

As a result of operating and keeping updated the cartographic modules of the ARPI System, we will have the following toolkit:

- integration with the register of addresses;
- opportunity to search and make queries;
- opportunity to enter coordinates;
- tool for dynamic generalisation (zoom in, zoom out);
- tool for object identification (identifier);
- opportunity to make changes, edits (editing);
- opportunity to create a new layer and save any added object in the new layer (for example, where the land was divided but yet not registered in the register);
- automatic encoding in accordance with the procedure for cadastral encoding of real estate (in accordance with the provisions of sub-point 4 of point 79 of Section 2 of the Order of the Chairperson of the State Committee of the Real Estate Cadastre adjunct to the Government of the Republic of Armenia No 51-N of 26 February 2009 "On approving the instruction for carrying out cadastral mapping"), as well as opportunity for manual change of the code;
- opportunity to enter new data (layer) (".shp" or ".dwg");
- access to data provided to several operators working in parallel and opportunity to save the changes made simultaneously;
- opportunity of archiving and storage (backup);
- opportunity to create a separate username and password for each editor/employee;
- opportunity to check and compare the sum of areas of land plots in the district and the area of the district.

7.2. PROGRAMME FOR INTEGRATION OF SECTOR-BASED CADASTRES AND ESTABLISHMENT OF THE NSDI

7.2.1. Structure of spatial data, guidelines for elaborating common databases (standards)

Standardisation of spatial data is the most important condition for the integration of sector-based cadastres. In order to implement it, the structure of spatial data will be brought into compliance with the principles of the EU INSPIRE National Spatial Data Infrastructure Directive and will be localised to the conditions of the Republic of Armenia.

Receipt of spatial data and elaboration of guidelines envisaged for their standards will be carried out as of the following groups and sub-groups of cartographic layers

a) basic cartographic layers.

Such layers are cartographic layers not containing confidential content, those separated by a sustainable spatial position in time, serving as a basis for orientation for other spatial objects and mostly needed for operators.

Basic cartographic layers are composed of 3 sub-groups:

I. Cadastral layers

II. Topographic layers

III. Orthophotos (Orthophoto layout/map)

I. The cadastral layers include the following:

1. Administrative boundaries:

- State
- Marzes

- Communities
- Settlements

2. Real estate:

- Buildings and premises
- Land parcels
- Districts
- Assessment
- Servitude
- Fences
- Restrictions
- Property type
- Targeted and operational lands

II. The topographic layers include the following:

1. Relief:

- Isolines
- Digital relief model
- Mountains

2. Superficial waters (Hydrological network):

- River network
- Lakes
- Reservoirs

3. Transport network:

- Automobile roads
- Railways

4. Geographical names.
5. Planning and elevation basis:

- Pickets
- Planning basis
- Elevation basis

b) thematic cartographic layers.

Thematic (sector-based) layers imply cadastres of different sectors, those of objects, property and resources under the management of different entities, as well as geographic informatve thematic materials necessary for effective management of the economy. The list of sector-based layers, unlike the basic layer, is subject to rearrangement. Thematic cartographic layers are introduced by the following layers and layer groups (Diagram 3, page 46):

1. Specially protected areas
2. Natural disasters
3. Agriculture
4. Climate
5. Infrastructures
6. Environmental pollution and monitoring
7. Forests
8. Geology
9. Production

10. Distribution of animal and plant species
11. Natural, as well as historical and cultural monuments
12. Hydrography
13. Transport network
14. Geography of lands

The cartographic layer, regarded as a unit, may be:

a. a spatial model separated in a complete (real) general coordinate system with its own typical and attribute structure, with some dependence on another complete layer or independently therefrom; for example, layer of administrative boundaries or a layer of spatial assessment zoning,

b. partial (virtual), separate attribute model within the framework of existing complete layer with separate access to management: for example, separate attribute models of urban development passporting (building, premise) or construction permit (land parcel) attached to the layer of real estate units.

Creation of basic cartographic layers, elaboration of their relevant standards and downloading to NSDI will be carried out by the Cadastre Committee. The elaboration of guidelines for the standards of several thematic cartographic layers will also be carried out by the Cadastre Committee, and a general methodological guideline will be drawn up for the remaining thematic directions. In addition, the Cadastre Committee will organise training courses for relevant specialists of state administration bodies in order to elaborate guidelines for standards of thematic layers.

7.2.2. Spatial and non-spatial data base of the NSDI and storage thereof

The spatial data base will be introduced in the following formats: ESRI shapefile; ESRI File Geodatabase; ESRI Personal Geodatabase; Autodesk *.dwg, dxf; MapInfo *.tab,

*.mif, Bentley *.dgn; GeoJSON; KML/KMZ; PostGIS/PostgreSQL, SQL Server, Oracle Spatial, ERDAS *.img, *.ecw; *.sid; GeoJPEG/jpeg2000; Tiff (GeoTiff); ESRI GRID, whereas the non-spatial data base — in *.csv, *.mdb, *, json formats. The latter enables the administrators to link the map to the database and then to use any column in the table of the linked database in order to connect to another database and so on. This will enable the operators to obtain data from external databases and to make such information available to individual operators.

The data warehouse of the System must be based on relational databases and relational database management systems (RDMS), which, in case of spatial data, will have the opportunity of appropriate application. A Copy- on-Write system will underlie the warehouse, which will preclude any changes in the data having been ever entered by enabling the entry of new data only in the form of a copy. The warehouse must have also a current mirror of changes, as well as a regular, backup copy of the entire warehouse. The given system will give an opportunity to always have an up-to-date integration situation, as well as to go back to any point in the history of the system over time.

7.2.2. Establishment (structure) of the NSDI Geoportal and the functions thereof

7.2.4.2. The main functions and structure of the Geoportal

The following main functions will be ensured through the Geoportal:

- preserving basic and thematic spatial layers (vector and raster) on a single server;
- creating and editing metadata;.
- importing thematic maps form state administration bodies and other bodies;
- visualising base and thematic layers;

- providing access to spatial layers depending on the status of operators;
- providing and viewing addresses.

The security system of the NSDI Geoportal will comply with modern standards, as well as will be compatible with all browsers, and the interface will be available in Armenian and English. The design of the Geoportal interface will be approved by relevant body. The administrator will be able to change and customise the interface at any time. Based on the modern requirements, Geoportal site map will be designed for the SEO in both "xml" and "html" formats. The Geoportal cartography module will include a complete set of toolkit for using online maps (increase/decrease the scale, select, exercise identification, measurement of cartographic objects, make queries from attributive tables from spatial layers, etc.). The connection of "operators" and "users" with Geoportal and data access will be ensured through software applications. All spatial data with their respective metadata links will be downloaded to Geoportal, whereas the spatial data will be located in SQL Server or Oracle relational databases whereon ESRI's ArcSDE (Arc Spatial Database Engine) spatial data application (add-on) may run.

7.2.4.3. Other opportunities of the Geoportal

1. Possibility for importing information, by users, also from major mapping services: Google maps, Bing maps, ESRI imagery, Yandex maps:
2. Making queries both from maps and through spatial data attributes.
3. Drawing up maps by comparing spatial data introduced in the Geoportal and generating a permalink for these maps in order to post them on other sites.
4. Ensuring the opportunity of storing, searching for and keeping updated the spatial data, as well as the scalability, compatibility, interoperability thereof.
5. Ensuring web-services in accordance with the OGC criteria, such as: WMS, WFS, WCS and ArcGIS Map Service.

6. Collecting and creating automatically metadata and footprints.
7. Downloading style configuration (SLD) for spatial layers for the purpose of drawing up thematic maps.
8. Searching for and localising spatial data and metadata services.
9. Caching and tiling of raster and vector data.
10. Comparing GIS files (shape files, KML, etc.) on Geoportal spatial data.
11. Adjusting the server load depending on the number of scalable operators and adding new capabilities.
12. Overlaying spatial data obtained from different coordinate systems.
13. Ensuring the possibility for different users for simultaneously downloading, editing and viewing spatial data.
14. Ensuring the possibility for at least 100 users for simultaneously having access to the Geoportal, in no more than 5 seconds.

7.2.3. Processes of creating metadata and elaborating standards

The System will enable the providers of spatial data to publish (import, edit) their metadata sets in a centralised spatial database, by creating a database and an editor of metadata. Moreover, they may be directly or remotely registered in the NSDI, by using the Internet.

The whole process of creating metadata will include the following actions:

- state administration bodies which are responsible for providing spatial data must ensure the implementation of standards of general metadata in their field of operation;
- creating models and tools for the metadata complying with the ISO, INSPIRE and national requirements;

- elaborating practical guidelines for using and drawing up metadata;
- elaborating a database and an editor of metadata which will enable all parties to collect and store the metadata. The editor will enable to import the metadata in accordance with the criteria prescribed;
- mandatory, non-mandatory and conditional metadata will be separated.

1. Classes or attributes of mandatory metadata will be mandatorily documented.
2. Documentation of the classes or attributes of non-mandatory metadata will not be mandatory.
3. Documentation of the classes or attributes of conditional metadata will be carried out depending on certain conditions.

Not all elements of the metadata specified in ISO 19115 standard will be used for describing either geographic information. The basis for formation of metadata is considered to be the following set of basic, mandatory elements of the metadata:

- general description of the data,
- location of the data,
- time of creation of data,
- organisation-producer.

Mandatory metadata must provide information on the following:

- data quality,
- spatial imaging,
- references and responsible party,
- restrictions,
- coordinate system,

- data set: it is important also to indicate the following:
- name of the data set,
- time of publication/creation/correction of data,
- summary content of the data set,
- purpose of data creation /assignment,
- data submission format (in the form of a file along with specified name, paper-based or other formats),
- the language in which the data were submitted (used within the data set),
- scale (for spatial data),
- responsible contact entity,
- information on the restrictions on data,
- information on the scope and frequency of data updates,
- spatial resolution of the data set.

7.2.4. Prescribing for the users and operators of the Geoportal relevant powers of using the System, ensuring access to the basic components of the Integrated Cadastre in real time mode

The system for collection and storage of spatial data includes management of data flow and management of activities. To this regard, it is necessary to separate the definitions of “operator” and “user” of the Geoportal.

The “operators” will only have the right to view or make queries. The “users” will be granted the right to download spatial data to the Geoportal, as well as to add and edit metadata for such spatial data, i.e.

- to enter, create/change passwords and to view the sections of the Geoportal that are available to them,

- to download spatial data to the spatial database of the Geoportal,
- to find the information they need by using keywords/coordinates,
- to be able to create new queries and to change the predetermined rules of queries,
- to be able to view the data catalogue.

In addition to the "operators" and "users" of the System, the Geoportal must have an "administrator(s)" that must be reserved with relevant powers, i.e.

- adding users to the System;
- adding news and other information to the homepage of the Geoportal;
- granting powers to different users and their groups and revoking them;
- determining the status of all processes available in the System;
- determining the status of disc sub-systems in the System;
- restarting the processes;
- terminating the processes;
- exercising supervision over the accessibility of the data provided to operators;
- adding and removing spatial layers and metadata;
- restricting access by operators to the information classified in a certain manner;
- creating profiles/accounts of users. In this case, the System will inform the respective user about it*;*
- obtaining statistics on the queries conducted within the Geoportal.

It is intended to ensure access, through the Geoportal, to basic cartographic layers by state bodies with powers vested by law, in real time mode. Currently, state bodies have access only to the basic components available on the Geoportal.

7.2.5. Drawing up, acquisition, installation and submission of the terms of reference for technical means of the System (server system and management centre)

According to the software tests, the server node supporting the cadastre functions is running at 30% load, thus, initially, the software and the relevant modules will be installed in the existing server node, which will be expanded with new servers and equipment, where necessary.

The server system will consist of 3 nodes, i.e.

- Server for orthophotos, space and other raster files, with at least the following parameters:

  CPU >=3.5 GHz (4 Core) RAM > 32 GB

  Storage > 45 TB SSD

- Geobase server, with at least the following parameters: CPU >=3.5 GHz (4 Core)

  RAM > 32 GB

  Storage > 20 TB SSD

- Geobase server, with at least the following parameters: CPU >=3.5 GHz (4 Core)

  RAM > 64 GB

  Storage > 10 TB SSD

The above-mentioned servers will have the opportunity of duplication of data.

7.2.6. Training of specialists of the management of geospatial data (GIS)

For the purpose of ensuring the effective operation of the System and the introduction, use, management/preservation of the NSDI system, it is necessary to conduct training courses for the technical staff of the entities involved in the System, to provide them with practical and theoretical knowledge, as well as to provide them manuals.

The course will be arranged with 2 separate groups, according to the required knowledge and the requirements prescribed. The participants of the 2nd group will be provided with in-depth knowledge so that they are able to make comprehensive use of the data available in the System, as well as to carry out analysis by comparing them.

The aim of the course is to introduce the participants the following:

1. Need for creating the NSDI and its goals.
2. Structure of existing database and that of the NSDI.
3. Principles of logging into and using the system.
4. Interested parties and entities.
5. Technical and technological means.
6. Legal grounds and regulations.
7. Spatial data management policy.
8. Forms of data entry and those for drawing up queries.
9. Main components of the NSDI, basic and thematic layers and the principles of their separation.
10. Characteristics of the work with geospatial database.

- creation of spatial layers,
- keeping updated,

- regulation,
- management.

Fundamental and basic GIS knowledge will be provided by using the opportunities of the ESRI and other software packages (ArcGIS Desktop, ArcGIS Pro, ArcGIS Server).

In addition to all mentioned above, the participants of the 2nd group will be also trained the following:

11. Principles of management of large-scale spatial data.
12. Skills for building metadata of spatial data and services.
13. Conversion of cadastral data, basic cartographic layers, editing and importing them into the Integrated Cadastre System.
14. Analytical skills.
15. Introduction to the QGIS software toolkit.
16. Drawing up maps in ArcGIS Desktop, QGIS and other software environments.

7.2.7. Elaboration of new regulations, including standards of national spatial data infrastructure, and drafts

Necessary legal acts, as well as guidelines envisaged for the standards of national spatial data infrastructure, may be elaborated, where necessary, during the process of creation and introduction of the National Spatial Data Infrastructure.

Elaboration and introduction of standards will contribute to the following:

- expansion of data exchange opportunities at national and international levels;
- perception and use of spatial data;
- establishment of spatial infrastructures at national and regional levels;

- common approach to the solution of global, local ecological issues and sustainable development.

7.2.8. Establishment and introduction of a pilot sector-based cadastre

The establishment and introduction of a cadastre for one sector is aimed at identifying practical issues of integration and making editions, where necessary, to the legal acts elaborated by previous steps and other operational documents.

The responsible body will, jointly with the Ministry of Territorial Administration and Infrastructures of co-executing body, carry out standardisation of thematic (sector-based) layers of infrastructure data per one urban and rural community of the Republic of Armenia, by applying the standards of spatial data of the EU INSPIRE Directive. Thereafter, it will be entered into the Geoportal, and data exchange, interaction and access to relevant bodies will be provided. The co-executing agency will have the powers to keep updated and edit the data. The responsible body will support the process of elaborating, localising and applying the standards.

8. FINAL PROVISIONS

Consequently, this document proves to be the Strategic Programme for Establishment of the Integrated Cadastre, which will serve as a basis for full operation of the Integrated Cadastre, as well as for effective planning and implementation of the whole process during 2020-2023, by involving all interested parties and constantly introducing best international practice.

The introduction of the Integrated Cadastre will enable to coordinate the geospatial data available in the territory of the Republic of Armenia and to create a single automated information resource based on interrelated information documents.

As a result, the following will be ensured over here:

1. Fast and efficient management of areas, economy, natural resources, environmental, urban development and other processes.
2. Saving funds and labour resources.
3. Raising the level of awareness of the public.

Diagram. 1. Structure and functional links of the Integrated Cadastre

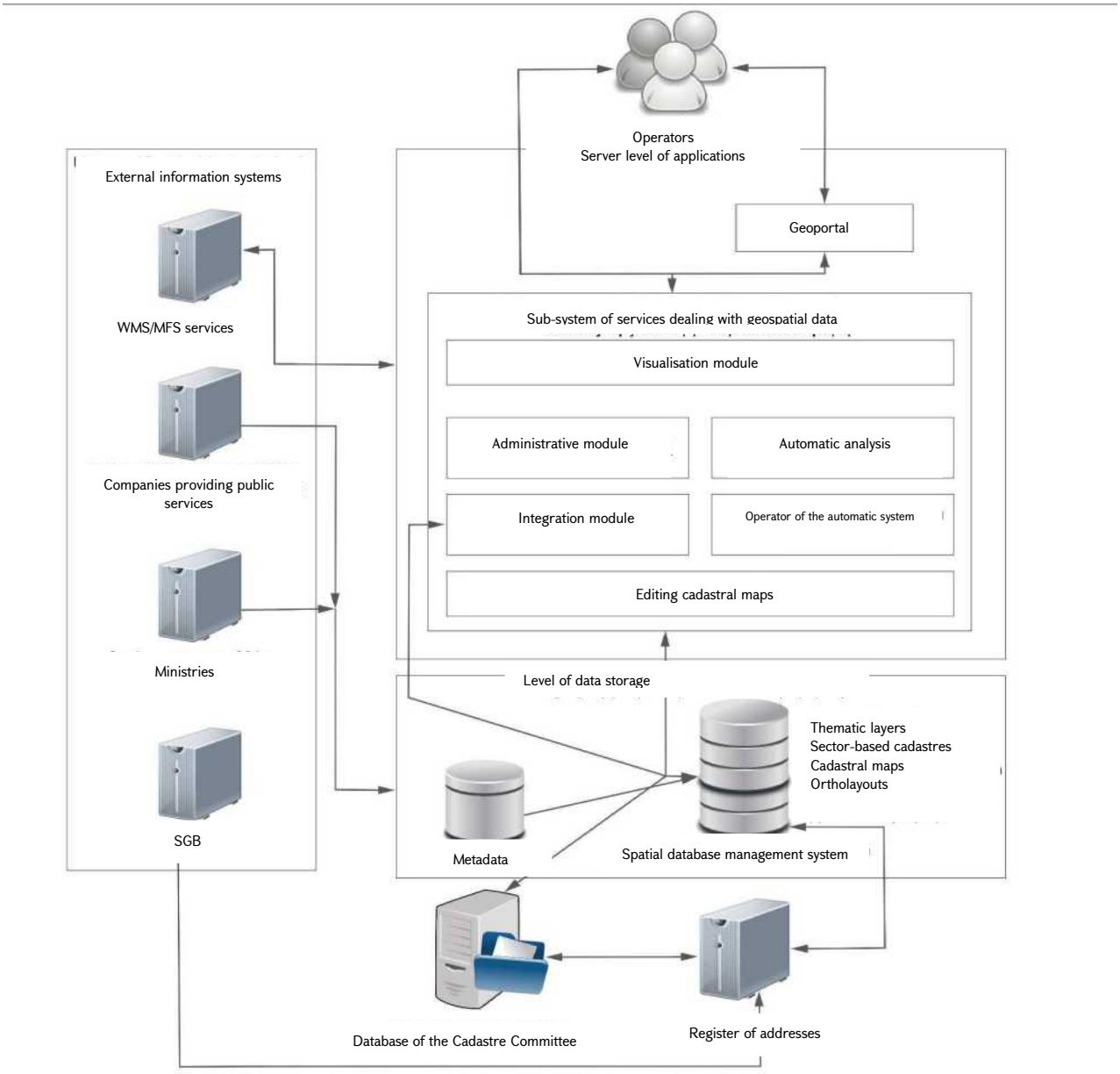


Diagram 2. Interoperability scheme in the Integrated Cadastre System

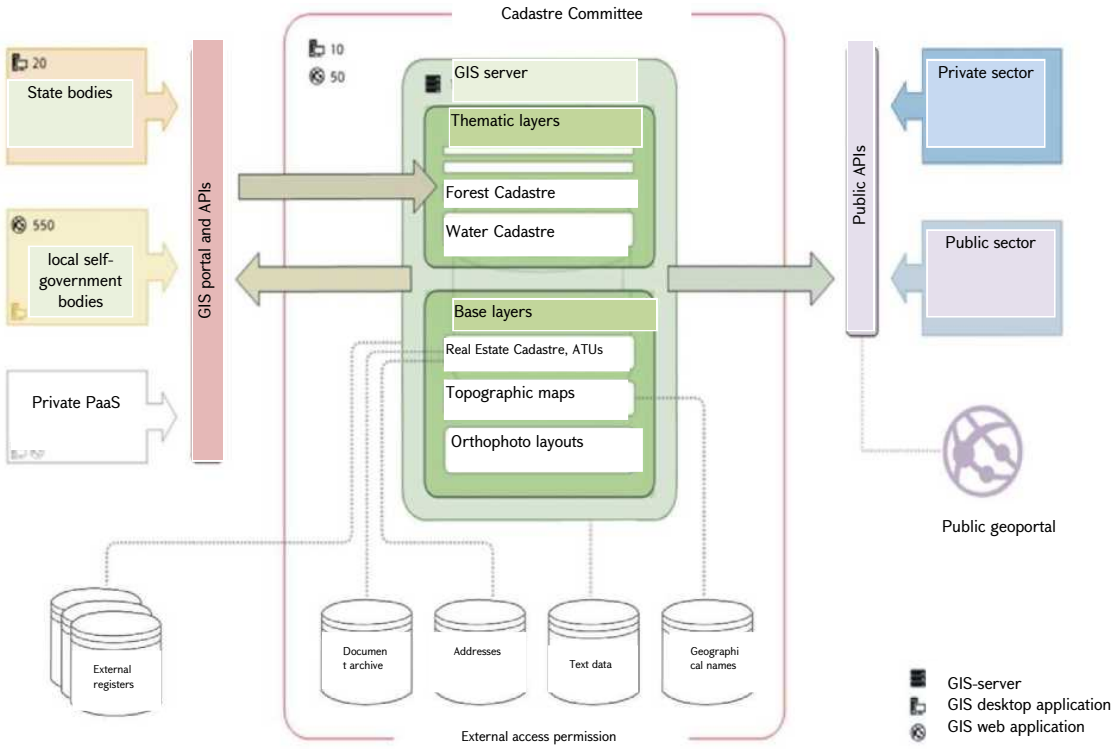
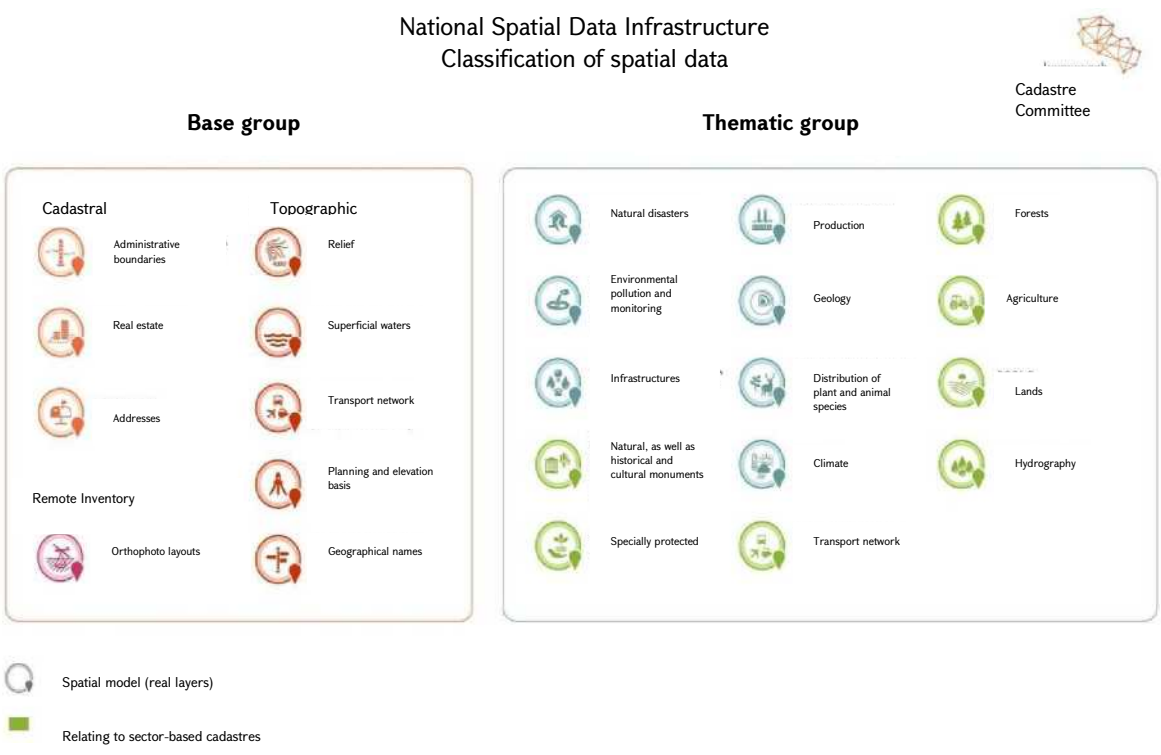


Diagram 3. Classification of spatial data of base and thematic groups



Chief of Staff
to the Prime Minister
of the Republic of Armenia

A. Torosyan

8 APRIL 2021

CERTIFIED BY

ELECTRONIC SIGNATURE

Annex No 2

To the Decision of the Government of the Republic of Armenia No 505-L of 8 April 2021

ACTION PLAN DERIVING FROM THE STRATEGY FOR ESTABLISHING AN INTEGRATED CADASTRE

NN in sequence	Description of activities	Results to be achieved	Responsible body (First executor)	Co-executing agency	Time limits	Source of funding and predictable amount
1	2	3		4	5	6
1.	Establishment of management, organisation and advisory bodies of the Integrated Cadastre	Establishing an advisory body (working group) adjunct to the Head of the Committee	Cadastre Committee of the Republic of Armenia	Ministry of Environment, Ministry of Economy, Ministry of Territorial Administration and Infrastructures, Ministry of Education, Science, Culture and Sports Ministry of High-Tech Industry, Ministry of Emergency Situations, Urban Development Committee, Police, Yerevan Municipality (with consent) "EKENG" CJSC (upon consent)	3rd ten-day period of May 2021	No financing is required
2	Training of specialists of Spatial Data Management (GIS)	Involvement of qualified specialists in the management of the spatial data aimed at maintenance of basic and sector-based components of the Integrated Cadastre	Cadastre Committee of the Republic of Armenia	-	1st ten-day period of December 2022 (ongoing)	State Budget of the Republic of Armenia and other means not prohibited by law; AMD 40 million
3	Adjustment, modernisation, optimisation and standardisation of the database of	Creating a modern single geographic database and bringing it into compliance with international standards.	Cadastre Committee of the Republic of Armenia	-	3rd ten-day period of January 2023	No financing is required

NN in sequence	Description of activities	Results to be achieved	Responsible body (First executor)	Co-executing agency	Time limits	Source of funding and predictable amount
1	2	3		4	5	6
	basic spatial data					
4	Modernising and keeping updated the information system of real estate of the Republic of Armenia	Keeping updated the ARPIS, refusal from the ARPAC system, introduction of GIS technologies, operation, integration of the cartographic module.	Cadastre Committee of the Republic of Armenia	-	3rd ten-day period of December 2022	No financing is required
5	Reserving Geoportal users and operators with relevant powers of using the system.	Prescribing different powers of data access	Cadastre Committee of the Republic of Armenia	-	3rd ten-day period of December 2021	No financing is required
6	Ensuring access to the basic components of the Integrated Cadastre in real time mode	Ensuring the opportunity of obtaining, by state bodies with relevant powers vested by law, the spatial data available in real time mode	Cadastre Committee of the Republic of Armenia	-	3rd ten-day period of December 2023	State Budget of the Republic of Armenia and other means not prohibited by law; AMD 185 million 22
7	Introduction of security system in accordance with international ISO standards in the Integrated Cadastre, integration, where necessary, with the EKENG e-governance platform.	Introduction of a security system in accordance with international standards	Cadastre Committee of the Republic of Armenia	Ministry of High-Tech Industry National Security Service of the Republic of Armenia “EKENG” CJSC (upon consent)	3rd ten-day period of December 2022	No financing is required
8	Elaboration, where necessary, of new regulations, including standards of national spatial data infrastructure, and drafts	Legal acts necessary for the establishment and introduction of the National Spatial Data Infrastructure. Guidelines envisaged for the standards of the National Spatial Data Infrastructure.	Cadastre Committee of the Republic of Armenia	-	3rd ten-day period of December 2021	No financing is required
9	Drawing up, where necessary, the terms of reference for the Integrated	Operation of software cadastral cartographic (basic layers) modules	Cadastre Committee of the Republic of	Ministry of Environment, Ministry of Economy,	3rd ten-day period of December 2022	State Budget of the Republic of Armenia and other means

NN in sequence	Description of activities	Results to be achieved	Responsible body (First executor)	Co-executing agency	Time limits	Source of funding and predictable amount
1	2	3		4	5	6
	Cadastre Software, acquisition and introduction of the programme		Armenia	Ministry of Territorial Administration and Infrastructures, Ministry of Education, Science, Culture and Sports, Ministry of High-Tech Industry, Ministry of Emergency Situations, Urban Development Committee, Police, Yerevan Municipality (upon consent)		not prohibited by law; AMD 500 million
10	Drawing up, acquiring and installing the terms of reference for technical means of the system (server system and management centre)	Installation of server system and establishment of management centre	Cadastre Committee of the Republic of Armenia	Ministry of High-Tech Industry	3rd ten-day period of December 2022	State Budget of the Republic of Armenia and other means not prohibited by law; AMD 400 million
11	Establishment and introduction of a pilot sector-based cadastre	The establishment and introduction of a cadastre for one sector, which will enable to identify practical issues of integration and to make, where necessary, editions to the legal acts elaborated by previous steps and other operational documents.	Cadastre Committee of the Republic of Armenia	Ministry of Territorial Administration and Infrastructures	3rd ten-day period of December 2023	State Budget of the Republic of Armenia and other means not prohibited by law; AMD 300 million
12	Introduction and full re-operation of the Geoportal and metadata database	Introduction of accessible NSDI Geoportal and online metadata database	Cadastre Committee of the Republic of Armenia	Ministry of High-Tech Industry National Security Service of the Republic of Armenia	3rd ten-day period of March 2023	No financing is required
13	Integration of the single register of addresses and the	Reflecting any changes in renaming or numbering of the real	Cadastre Committee of the	-	2nd ten-day period of December 2023	No financing is required

NN in sequence	Description of activities	Results to be achieved	Responsible body (First executor)	Co-executing agency	Time limits	Source of funding and predictable amount
1	2	3		4	5	6
	NSDI	estate address, being made in the register of addresses, on online cadastral maps, as well as providing the operators with access thereto.	Republic of Armenia			
14	Creating portal components of the Integrated Cadastre, introduction of relevant hardware and full operation of the system according to the readiness of the sectors	1. Creating a single automated information resource based on interrelated information documents by making references to spatial data and by combining the branch cadastres, possessing geographical dimensions, with registers. 2. Fast and efficient management of areas, economy, natural resources, environmental, urban development and other processes. 3. Saving funds and labour resources. 4. Raising public awareness. 5. Ensuring the speed and efficiency of the introduction of information technologies and technical means.	Cadastre Committee,	Ministry of Environment, Ministry of Economy, Ministry of Territorial Administration and Infrastructures, Ministry of Education, Science, Culture and Sports, Ministry of High-Tech Industry, Ministry of Emergency Situations, Urban Development Committee, Police, Yerevan Municipality (upon consent) Infrastructure management organisations (upon consent)	2nd ten-day period of December 2023 (ongoing)	No financing is required

Chief of Staff to the Prime Minister

of the Republic of Armenia **A. Torosyan**

8 April 2021

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ELECTRONIC SIGNATURE