# National Spatial Data Infrastructure in Georgia: From Policy to an Operational Geoportal

**Elene GRIGOLIA and Teimuraz GABRIADZE, Georgia**

**Key words**: Geoinformation; Information Systems; NSDI/SDI;

**SUMMARY**

The establishment of the National Spatial Data Infrastructure (NSDI) represents a central component of Georgia's digital governance transformation and geospatial data modernization agenda. The formal adoption of the Law on the National Spatial Data Infrastructure by the Parliament of Georgia on November 16, 2023, marked a significant milestone in institutionalizing a unified national framework for spatial data management. Entering into force on December 5, 2023, the law designates the National Agency of Public Registry (NAPR) as the national NSDI coordinator, responsible for supporting implementation and ensuring compliance with legislative and policy frameworks.

This paper examines the evolution, governance model, and operationalization of NSDI in Georgia, highlighting its role as a coordinated national system integrating policies, institutions, technologies, standards, and stakeholders to enable data-driven decision-making. NSDI functions as a network-based virtual infrastructure that integrates spatial datasets, metadata, and interoperable network services supported by legal frameworks, inter-agency agreements, and international standards, including alignment with the EU INSPIRE directive.

Paper analyzes the operational implementation of NSDI through the National Geoportal, which serves as a unified national access point for harmonized geospatial data and services. The Geoportal integrates spatial datasets, metadata documentation, analytical and visualization tools, and interoperability mechanisms, enabling access and data sharing among public institutions, municipalities, academia, private sector stakeholders, civil society, and citizens. Socio-economic impact assessments indicate substantial economic benefits, estimating a net present value of approximately USD 30 million derived from partial implementation of identified NSDI use cases, while also supporting land tenure security, EU integration objectives, and investment attractiveness in sectors such as agriculture.

Findings position Georgia as a developing case study of how coordinated spatial data governance, supported by legislative frameworks and digital infrastructure, can strengthen public administration efficiency, promote transparency, and support sustainable socio-economic development.

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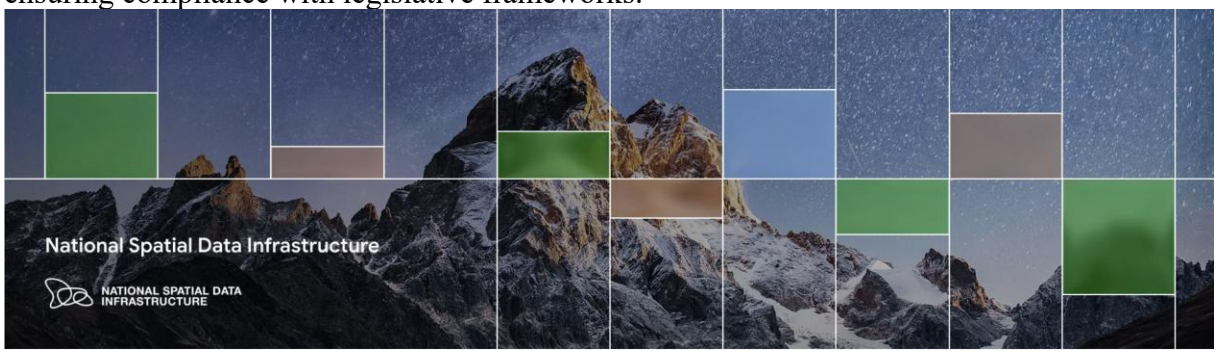
## 1. INTRODUCTION

The establishment of the National Spatial Data Infrastructure (NSDI) represents a central component of Georgia's digital governance transformation and geospatial data modernization agenda. The formal adoption of the Law on the National Spatial Data Infrastructure by the Parliament of Georgia on November 16, 2023, marked a significant milestone in operationalizing a unified national framework for spatial data management. Entering into force on December 5, 2023, the law designates the National Agency of Public Registry (NAPR) as the national NSDI coordinator. NAPR will be responsible for supporting implementation and ensuring compliance with legislative frameworks.




Geospatial data in Georgia has long been scattered across dozens of public agencies. Datasets exist in different formats and behind formal request procedures. The National Spatial Data Infrastructure was established to solve this problem.

NSDI is a shared system in which public institutions publish spatial data through common standards, describe each dataset with proper metadata and make it discoverable through a single online platform, the national geoportal. Building one requires legislation, institutional coordination, technical infrastructure, licensing agreements, a data exchange model and a shift in how agencies think about sharing.

Law on the National Spatial Data Infrastructure designated the National Agency of Public Registry (NAPR) as the NSDI Coordinator, established a Coordination Council, and mandated normative acts on metadata profiles, technical specifications, licensing terms, a data exchange model and an overall strategy. Within roughly two years, the geoportal went live at www.nsdi.gov.ge.

This paper examines the road from legal foundation to the operational geoportal. It covers the institutional and legal setup, the technical architecture, the licensing and data exchange frameworks, the current state of the metadata catalogue and lessons from international experience. The analysis also draws on live data from catalog.nsdi.gov.ge as of mid-2026.

Georgia's experience serves as a test case for how a small, non-EU state with limited resources can build an INSPIRE compatible spatial data infrastructure from scratch. The choices being made on licensing, data exchange, and the balance between open and restricted access are the same ones that countries across Eastern Europe, Central Asia andthe Global South are facing.

## 2. INSTITUTIONAL AND LEGAL FRAMEWORK

The origins for the development of the NSDI in Georgia go back over a decade. First steps were undertaken through the institutional and financial support of the donor organizations, EU and its member states. EU Twinning Project on e-governance in 2013 to 2014 surveyed 42 respondents across Georgian ministries, agencies, and universities. It found that the country lacked the legal, financial, and technical basis for a functioning NSDI. Several international partnerships followed. GIZ helped review an early draft of the NSDI law between 2015 and 2018. Sweden's Lantmäteriet conducted a readiness study involving 126 officials from 14 ministries. Norway's Kartverket supported orthophoto production and, in 2021, facilitated a baseline assessment using the World Bank's Integrated Geospatial Information Framework (IGIF) methodology.

### 2.1.Governance Model

The governance model of Georgia's National Spatial Data Infrastructure is established under the Law of Georgia on National Spatial Data Infrastructure. It is based on coordination and decentralization of institutional responsibilities for spatial data management.
NAPR serves as the national NSDI coordinator pursuant to Article 10(1) of the law. NAPR functions as the principal operational and technical authority, responsible for managing the national geoportal and metadata catalogue, developing technical standards, ensuring dataset interoperability, and supporting alignment with international frameworks, including INSPIRE principles. Under Article 10(2), NAPR also prepares technical and regulatory proposals on metadata, interoperability, and data exchange mechanisms for governmental approval.

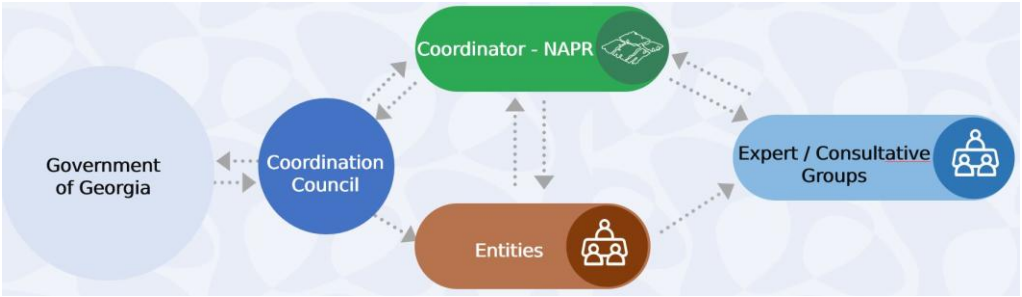



*Figure 1. Diagram of the NSDI Governance Structure.*

Strategic oversight is provided by the NSDI Coordination Council, established under Article 13 by ordinance of the Government of Georgia. The Council includes representatives of relevant ministries, public agencies and other NSDI subjects. It supports implementation of the national NSDI Strategy and Annual Action Plan, facilitates inter-institutional coordination, and contributes to spatial data governance decisions.

At the operational level, Article 9 requires each NSDI subject to designate a contact person responsible for liaison with NAPR, supporting day to day cooperation on metadata, data harmonization and geoportal integration.
Strategic planning is provided by Article 14, which mandates adoption of a four-year NSDI Strategy and Annual Action Plans approved by the Government.
The law applies ISO, OGC and INSPIRE standards. NSDI subjects, the agencies that produce and hold spatial data, are required to publish their datasets and metadata through the geoportal using the technical framework the law establishes. The law also introduced the requirement that data resources on the geoportal carry clear, understandable, and consistent licensing terms.
The NSDI operates at governmental, sectoral and municipal levels. It aims to support optimal planning of resource use, efficient process management, and higher-quality decisions by state institutions and municipal administrations. It is also intended to promote electronic governance and to support Georgia's integration with European structures. A key benefit is the reduction of costs through eliminating duplication of data production across agencies. The broader technology agenda is preparation for future innovations such as digital twins and the integration of artificial intelligence into spatial analysis workflows.

## 3. STAKEHOLDERS

NSDI is a multi-stakeholder endeavor, with potentially hundreds and thousands of individual stakeholders intertwined in its wider structure, however it can be segregated in six major stakeholder groups: citizens, NSDI subjects, business sector, NAPR, and academic sector.
Citizens interact with NSDI through Geoportal, where they access search, view, and download data.
NAPR serves as both coordinator and major data provider through its Geodesy and Geoinformation Department (Geodesy and Cartography Service, Spatial Information Service, Cadastre Support Service) and Address Department.
NSDI subjects are the primary data providers. Registered subjects include the Ministry of Justice, Ministry of Environment and Natural Resources Protection, Ministry of Culture, Ministry of Labour, Health and Social Affairs, National Agency for Cultural Heritage Preservation Georgia.
The business sector requires standardized, downloadable geospatial data for construction planning, logistics, agricultural management, insurance risk modelling and location-based services.
The academic sector needs spatial data for research and teaching. Other users include non-governmental organizations, international bodies and journalists. Use cases for NSDI data are wide: national and territorial planning, regional and urban development, emergency management for floods, fires and earthquakes, large infrastructure projects, environmental and cultural heritage protection and forestry and rural planning.
The geoportal is a main point of data access and information receiving for system users. It makes it possible to use systematized, synchronized, standardized and interoperable spatial data, metadata, and electronic services received from various sources. Information is designed to be easy to search and access for many users and software.

Geoportal was developed entirely through NAPR in-house IT team and is compatible in nature with Geoportals of other INSPIRE jurisdiction countries. The brief description of the architecture setup will be analyzed in the following chapter.

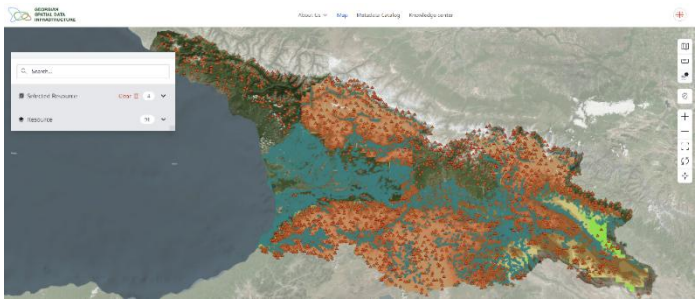
## 4. GEOPORTAL

On July 17, 2025, the official launch and presentation ceremony of the National Geoportal took place. The Minister of Justice presented the platform, which integrates spatial data from public institutions and, in the future, will also include private sector datasets such as maps, orthophotos, land parcels, infrastructure and cultural heritage sites. The event was attended by representatives of ministries, public agencies, and guests including the Minister of IDPs, Labor, Health and Social Affairs, and others.

The National Geoportal is accessible at www.nsdi.gov.ge. The National Metadata Catalogue is available at www.nsdi.gov.ge/ka/catalog, and the metadata editor/validator at www.catalog.nsdi.gov.ge .

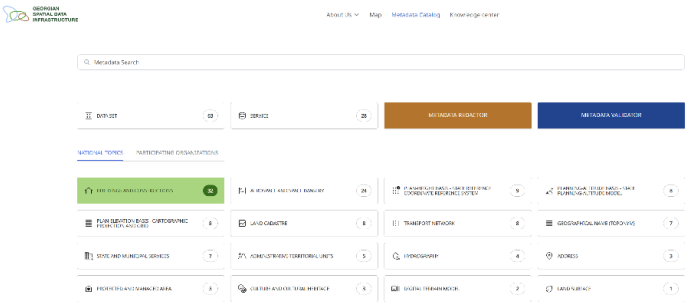
10 registered entities published a total of 90 spatial data resources and their corresponding metadata, with active involvement from both NSDI subject representatives and structural units of the Public Registry. Spatial data and metadata from the Digital Governance Agency were successfully published on the Geoportal. Communication with other public institutions, including the Notaries' Chamber of Georgia, National Archives, State Services Development Agency, and the Ministry of Internally Displaced Persons, Labor, Health, and Social Affairs, was conducted both in person and online to facilitate the publication of their spatial data resources.

The General Section of the National Geoportal serves as the primary gateway to spatial data infrastructure in Georgia. It offers an overview of the portal's purpose, benefits and functionalities, and introduces users to national spatial data initiatives. This section is designed to guide users, provide updates on recent developments and serve as a central hub for navigating the portal's features.



The Map Viewer provides interactive access to a wide range of geospatial datasets through an interactive interface. Users can explore, overlay and analyze spatial information from different sources in real time. The tool supports basic GIS functionalities such as zoom, search, layer management, and attribute inspection.

The map module design of the Geoportal was also redesigned to provide clearer visualization and easier navigation. A standardized symbology library was developed for spatial data published on the Geoportal, ensuring consistent representation across datasets.



The Metadata Catalog is a centralized registry that documents spatial datasets available through the National Geoportal. Each entry includes standardized metadata, enabling users to understand the source, quality, and usability of the data. The catalogue also provides download links and WMS services for seamless integration into external applications, promoting data transparency and interoperability.

Knowledge Centre offers support and guidance for users of the Geoportal. It will include user manuals, FAQs, video tutorials, and technical documentation to assist individuals and organizations in accessing and using geospatial data effectively. Additionally, it serves as a contact point for inquiries and feedback, fostering engagement with the broader spatial data community.

### 4.1. Architectural Setup

The geoportal follows a three-layer architecture. The Data Layer holds spatial datasets, their metadata and service level metadata.

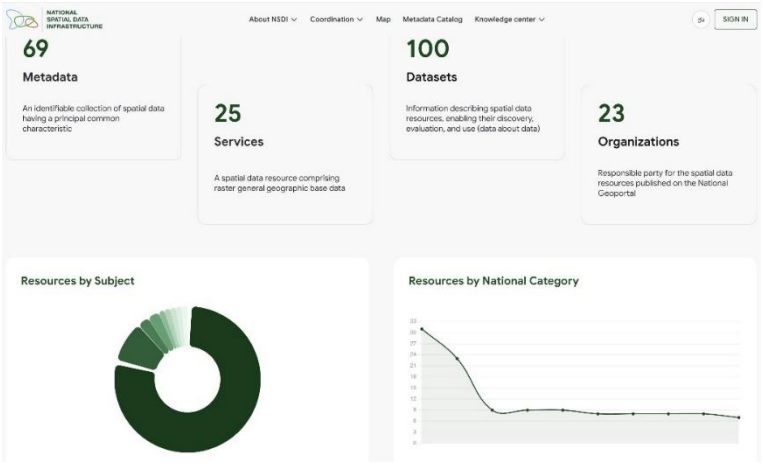
The Service Layer exposes standard network services, including discovery, view, download and transformation, using WMS, WMTS, WFS and CSW protocols.

The Application Layer is where users interact with the data through the geoportal web interface, APIs, or desktop GIS software such as QGIS and ArcGIS.

A dataset published once by a subject can be discovered through the metadata catalogue, previewed on the map viewer, downloaded as a shapefile or another available format and used directly as a web service inside a GIS application. This eliminates the need for data providers to handle individual requests by email, letter or official request.
In accordance with the NSDI law, there are nineteen basic spatial data types, including cadastre, addresses, transport networks, hydrography, elevation and land cover, plus fifteen thematic domains ranging from health and energy to meteorology and species distribution. These categories mirror the INSPIRE themes from the EU directive.

### 4.2.Infrastructure and Deployment

Geoportal supports fifteen functional requirements. Users can view maps with pan, zoom, and identify tools. They can search, upload and download spatial data by resource name, keyword, category, location or institution. The metadata catalogue supports thematic browsing and filters data by attributes. Data is available for download in standard formats including GeoJSON, KML and Shapefile.
The system operates in Georgian and English and is mobile friendly. Each dataset carries a defined license type and conditions of use. Access to restricted data requires appropriate role-based permissions. Users can preview both vector and raster layers without downloading them and can export maps in PDF or image format. Registered users receive notifications about data updates or newly published datasets.
As of May 2026, the National Metadata Catalogue at catalog.nsdi.gov.ge contains 125 published records: 100 datasets and 25 services. The catalogue provides links to two key tools: the Metadata Redactor, which is the editing interface for authorised users and the Metadata Validator. This is not a big number but the Geoportal will be gradually populated with sufficient data.




The e-services provided through the geoportal are designed to increase efficiency of information sharing between state institutions, the business sector, and any interested user. A user obtains required information remotely, through a few simple steps. The Web Feature Service (WFS) allows users to copy or download spatial data based on filtering criteria and provides direct data access without requiring additional software. The Catalogue Service for the Web (CSW) enables complex search of spatial datasets and services based on metadata. These services reduce costs, eliminate the need for duplicate data maintenance and make spatial data accessible in formats that can be integrated into existing workflows.

## 5. LICENSING AND ACCESS CONDITIONS

Before the introduction of the NSDI law, sharing geospatial data in Georgia was a manual, in person, request driven process. An organization or a person wanting data from another agency would submit a formal request. The provider would review it, decide whether to grant access and under what conditions. This could take days. Some agencies have written procedures that are easily accessible for everyone, some don't. Standard licenses were rare. Access was typically granted more readily to public authorities and for non-commercial purposes.

Currently deliberated setup requires, NSDI subjects to apply one of seven Creative Commons licenses: CC BY 4.0, CC BY-SA 4.0, CC BY-NC 4.0, CC BY-NC-SA 4.0, CC BY-ND 4.0, CC BY-NC-ND 4.0, or CC0 (public domain). The metadata editor includes a tree that guides users through the selection: attribution required, commercial use allowed, derivatives permitted, etc. The selected license is recorded in the metadata and displayed to anyone who discovers or downloads the dataset.

Discovery and view services must be free. Download services may carry fees, but charges cannot exceed what Georgian law already sets for the same data. For sharing between public authorities for public tasks, access must be free. Public access may be restricted only on narrow grounds: national security, personal data, state secrets, or threats to the administration of justice. Re use conditions must be non-discriminatory and cannot grant exclusive arrangements to any single party.

This approach aligns with the EU legal framework. The INSPIRE Directive requires data sharing between public authorities and public access through standard network services. The Open Data Directive establishes that public data should be reusable for commercial and non-commercial purposes. The 2023 High-Value Dataset Implementing Regulation requires publication of certain geospatial datasets under CC0 or CC BY 4.0, covering 25 of the 34 INSPIRE themes. Germany, the Netherlands, Lithuania, Spain, Finland, and Luxembourg have all moved in this direction.

The INSPIRE Metadata Implementing Rules provide guidance and following these rules helps ensure harmonized information. The use of harmonized licenses by all subjects enables the provision of structured information, including links to license texts and the use of controlled vocabularies or code lists. Legal and technical approaches to simplification complement each other.

## 6. FUNDING MODEL FOR NSDI

Most SDIs run primarily on government budgets. Georgia is no exception, NSDI currently relies on a mixture of Government and Donor funding (World Bank financing through the Georgia Resilient Agriculture Irrigation and Land Project). The main ongoing costs are IT infrastructure maintenance, metadata production by subjects and coordination work by NAPR. Internal review of the NSDI subjects found that only a handful of Georgian data providers generate revenue from selling geospatial data and those amounts are marginal.

Pricing models identified in the same review range from profit maximization to full open data, with cost recovery, marginal cost pricing and freemium models.

Stakeholder consultations in September 2025 found that most agencies already share data freely within the public sector, though without standard licenses. The preferred model among most participants was open data for non-commercial purposes, with strong interest in tracking who downloads the data. A few providers had formal pricing set by decree and sharing with private companies was often restricted to specific geographic areas.

Moving forward, it is the position of these authors that transitioning to Open Data is the best alternative. Evidence from multiple countries supports this assertion. In the Netherlands, company use of topographic data increased fivefold after opening, with companies investing at least €9 million in new products (Welle Donker, van Loenen & Bregt, 2016; Welle Donker & van Loenen, 2018). Denmark's address data attracted 100 times more re-users when made free (McMurren, Verhulst & Young, 2016).

Lost revenue from opening data typically amounts to 2 to 6% of total organizational income (Welle Donker, van Loenen & Bregt, 2017). Denmark saved an estimated €5 million over five years by eliminating licensing overhead for address data (Lind, 2010; McMurren, Verhulst & Young, 2016). Free geodata generated €133 million in efficiency gains in Denmark in a single year, with private companies capturing 72% of that value and utility companies 23%. Production effects, meaning new products and services that would not have existed without open data, added another €334 million (PwC, 2017). Long-term effects of migrating to open data include significant job creation, higher tax revenue, and broader welfare gains from better public services and decision-making.

Agencies that opened their data often found new roles for themselves: supporting users, developing tailored products and collaborating with companies to build services on top of the underlying datasets. The loss of fee income was frequently offset not only by efficiency gains but by a shift in what the organization actually does.

For Georgia, where most data providers earn modest revenue from data sales, the financial shock of moving to open licensing would be relatively small, while the potential for increased use and new applications is substantial.

## 7. CONCLUSION

In approximately two years since the NSDI law's adoption, Georgia has established a functioning geoportal with published metadata records, a working catalogue, metadata editor with built-in validation and license selection and standard network services for discovery, viewing, and downloading. The technical stack is modern, open source, standards compliant, and designed for scalability.

The catalogue statistics reflect both progress and remaining work. Buildings and constructions, aerospace imagery and cadastral data lead the thematic coverage. However, there is a significant space for improvement. It is just a beginning of the journey. The licensing framework, grounded in Creative Commons and aligned with INSPIRE, positions Georgia well for integration with European data sharing ecosystems.

The NSDI is designed to enable simple and accessible discovery and use of geospatial information for informed decision making and sustainable development. Its four guiding principles, efficiency, accessibility, interoperability and coordination, are sound. NAPR needs

to continue towards the full flag execution process: onboarding the organizations that have not yet published, training their staff, enforcing metadata quality, resolving fee structures and building the sustainable infrastructure.
Georgia has moved faster than many anticipated, however sustaining that pace will not depend on technological solutions. Building institutional resilience, the human capital and political commitment will hold keys to NSDI realizing its full potential for the Georgian society.

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## BIOGRAPHICAL NOTES

Ms. Elene Grigolia – is an experienced, PMP certified project manager with an in-depth knowledge of the land sector working in public service delivery for land administration and innovation technology in the National Agency of Public Registry (NAPR), Ministry of Justice, Georgia. Among her professional achievements, Elene as a Component Lead, successfully completed a large scale $US50 million World Bank land market reform program in Georgia. Within this program Elene was responsible for overseeing and communicating results of the ICT assessment to key stakeholders, ensuring uptake and smooth implementation of the new systems as a basis for national systematic land registration rollout. Elene has a proven track

record of working with government stakeholders and the private sector to collect data, analyze results. Currently Elene serves as a Project Manager at the World Bank funded Georgia Resilient Agriculture Irrigation Land (GRAIL) project administered by the National Agency of Public Registry of Georgia. GRAIL aims to enhance land administration service delivery and building digital governance infrastructure by focusing on enhancing NAPR's IT Systems, Electronic Services and building National Spatial Data Infrastructure.

Mr. Teimuraz Gabriadze is a Senior Project Officer at the World Bank funded Georgia Resilient Agriculture Irrigation Land (GRAIL) project. GRAIL aims to enhance land administration service delivery and building digital governance infrastructure by focusing on enhancing NAPR's IT Systems, Electronic Services and building National Spatial Data Infrastructure. Prior to GRAIL, Teimuraz was a chief lawyer at the World Bank financed Irrigation and Land Marker Development Project implemented by NAPR. Teimuraz participated in the implementation of the pilot project for systematic land registration and design and implementation of the subsequent scale up. Teimuraz was responsible for legal support of the SLR project. As part of his duties Teimuraz supported all aspects of the SLR project including but not limited to IT modernization and Procurement. Mr. Gabriadze is also tasked with international relations and communication with the World Bank team.

**CONTACTS**

**Ms. Elene Grigolia**

**National Agency of Public Registry of Georgia**

22 Vakhtang Gorgasali Street, Tbilisi, Georgia

Tel. +995 599 52 80 85

Email: egrigolia@napr.gov.ge

Web site: www.napr.gov.ge

**Mr. Teimuraz Gabriadze**

**National Agency of Public Registry of Georgia**

22 Vakhtang Gorgasali Street, Tbilisi, Georgia

Email: temuri_gabriadze@yahoo.com

Web site: www.napr.gov.ge