



Agencia Relatii Funciare si
Cadastru a Republicii Moldova

INTEGRATED GEOSPATIAL INFORMATION FRAMEWORK



MOLDOVA

Action Plan



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ABBREVIATIONS

CORS	Continually Operating Reference System
DT	Diagnostic Tool
GIS	Geographical Information System
GNSS	Global Navigation Satellite System
IGIF	Integrated Geospatial Information Framework
ISO	International Standards Organization
NSDI	National Spatial Data Infrastructure
PSA	Public Services Agency (Agency for Public Services)
SDG	Sustainable Development Goal(s)
SDI	Spatial Data Infrastructure
SK	Statens kartverk, Kartverket, Norwegian Mapping Authority
UN-GGIM	United Nations Global Geoinformation Information Management
WB	World Bank

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ALRC wish to acknowledge its grateful thanks to the Norwegian Ministry of Foreign Affairs for the continued support provided to the Republic of Moldova.

PREFACE

The world is experiencing a fourth industrial revolution built upon the internet and a comprehensive data infrastructure of fundamental datasets¹. The term infrastructure is used here in the same sense as the road network is part of the fundamental infrastructure required to support transportation.

To help achieve this transition, many countries are building national data infrastructures. For instance, the Netherlands has been at the forefront of recognizing that integrating authoritative key data registers, such as buildings, addresses and ownership, into a coherent data infrastructure will, not only make Government more cost-effective, but will also make the interaction for citizens and businesses with Government quicker and more efficient² and allow the private sector to derive benefits from new services.

One of the primary components of a data infrastructure is the location of a nation's assets, including land, natural resources, and the built environment to allow these assets to be managed more effectively in the context of development planning and climate change mitigation, for example. This is because "everything happens somewhere" and without knowledge of location (geospatial position³), decision making on many matters of national importance is significantly impaired.

The term Spatial Data Infrastructure (SDI) has historically focused on the collection of data and the implementation of technologies. The IGIF provides guidance on how to extend the scope of SDI to cover the governance, policy, financial, capacity and engagement processes necessary to collect, maintain, integrate, and share geospatial information, through all levels of government and society.

In August 2020, the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) adopted the Integrated Geospatial Information Framework (IGIF), which provides the strategic guidance that enables sub-national or national-specific Action Plans to be prepared and implemented to strengthen integrated information management.

The IGIF aims to assist countries (including city and regional governments) to move towards e-economies, e-services, and e-commerce. Delivering socio-economic value by improving services to citizens, enhancing evidence-based government decision making processes, creating new job opportunities, facilitating private sector economic growth, and taking practical actions to achieve a digital transformation. Through these means, IGIF will help to bridge the geospatial digital divide between developed and developing countries and to support the 2030 Agenda for Sustainable Development.

IGIF Structure

The IGIF comprises of three (3) parts as separate, but connected, documents:

- **Part 1:** Overarching Strategic Framework presents a forward-looking Framework built on national needs and circumstances, focusing on policy, perspectives, and elements of geospatial information. It sets the context of 'why' geospatial information management is a critical element of national social, economic, and environmental development.
- **Part 2:** Implementation Guide is the detailed document that provides the 'what', the specific guidance and actions to be taken in implementing the Framework. The aim is to provide guidance for governments to establish 'nationally' integrated geospatial information frameworks in such a way that transformational, albeit staged, change is enabled, visible and sustainable.

¹ United Nations GGIM Fundamental Geospatial Data Themes: https://ggim.un.org/documents/E-C20-2018-7-Add_1-Global-fundamental-geospatial-data-themes.pdf

² <https://business.gov.nl/regulation/addresses-and-buildings-key-geo-register/>

³ These terms are used in different geographies and contexts and are regarded here as interchangeable.

- **Part 3:** Country-level Action Plans will provide templates and guides to operationalize the Framework in a national and sub-national context. Providing the ‘how, when and who’ approach, this document will assist countries to prepare and implement their own country-level Action Plans taking into consideration national circumstances and priorities.

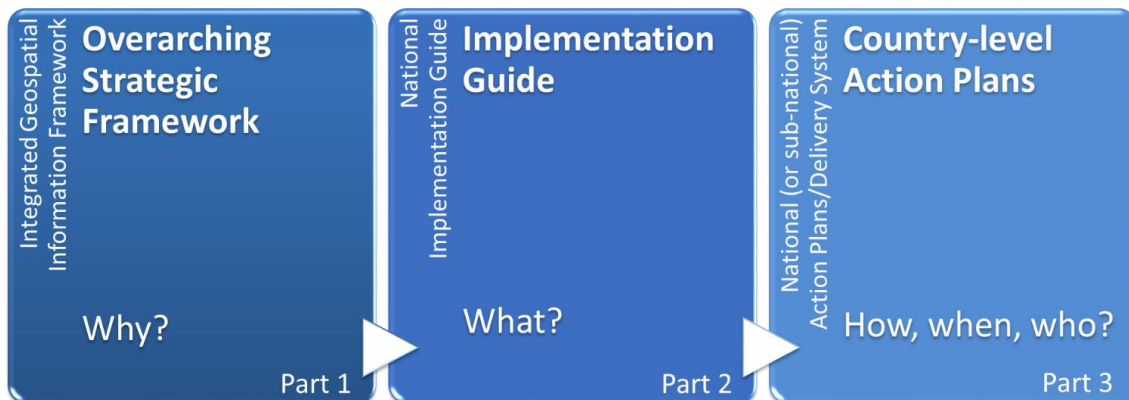


Figure 1: The 3-component documents of the Integrated Geospatial Information Framework

World Bank IGIF Implementation Methodology

The World Bank Group has established an IGIF Implementation Methodology and corresponding analytical toolkit to support the use of the IGIF and incrementally create SDIs customized to specific countries and priorities. The graphic below illustrates the sequence and relationship of these analytical tools used to arrive at the implementation of the SDI. The symbology shows the analytical tools (in orange), key inputs (in blue), the IGIF in purple, outcomes (in green) and uses arrows to different types of information flows.

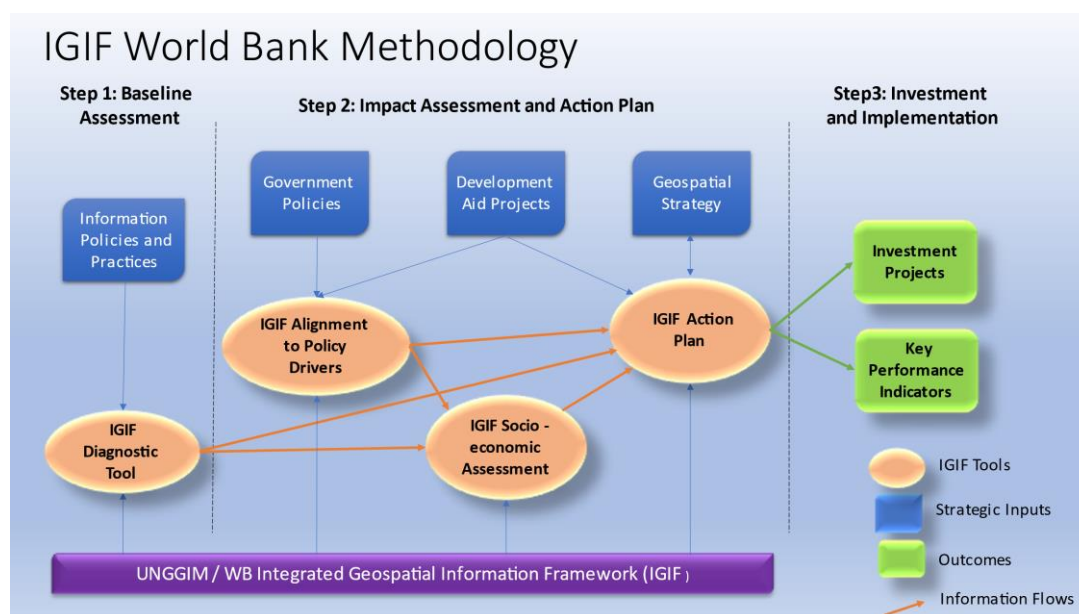


Figure 2: World Bank IGIF Implementation Methodology

In summary, this methodology has been applied as follows:

Step 1: Baseline Assessment

A single integrated tool is used for this purpose:

Analytical Tool 1 – IGIF Baseline Diagnostic Tool (DT): this provides an assessment of the “as is” position of geospatial information management in the country, structured around

the nine IGIF pathways, including governance, policy, financial, human capacity, and technical perspectives. The output forms a baseline for the next steps.

Step 2: Impact Assessment and Action Plan

Three tools are used to build a prioritized, cost-justified roadmap for strengthening integrated geospatial information management:

Analytical Tool 2.1 – IGIF Alignment to Government Policy Drivers: this tool is used to align the Government’s strategic objectives and international commitments to specific spatial use cases (applications) and then prioritizes them based on how well they support and accelerate achieving these strategic objectives.

Analytical Tool 2.2 – IGIF Socio-Economic Impact Assessment: this tool delivers an assessment of the socio-economic business case for investment in an SDI from both qualitative and quantitative perspectives. It is informed by the outputs from the previous two tools outlined above.

Analytical Tool 2.3 – IGIF Action Plan: this tool builds on the previous deliverables to create or update a high-level geospatial strategy and a corresponding costed plan roadmap for SDI enhancements, presented as a series of interdependent policy interventions and implementation projects.

Step 3: Investment and Implementation

Once the Action Plan has been approved in terms of scope, investment plan and priorities, then work will commence to identify sources of government and international funding. Individual actions may also need to be specified in greater detail to support implementation planning and the definition of Key Performance Indicators (KPIs) to monitor and evaluate implementation.

These steps must be delivered within a recognized project management methodology that provides proper governance and incorporates transparency and accountability for all tasks and outcomes.

STRUCTURE AND CONSISTENCY STATEMENT

Project Appraisal Structure

The structure of an action plan as required by article 12 of GD386⁴ for project appraisal is described as follows:

The action plan, as part of the program, has the following structure:

- 1) specific objectives (taken from the descriptive part of the program).
- 2) actions (measures to be implemented in the short and medium term to achieve specific objectives).
- 3) monitoring indicators (indicators for each planned action, with reference values [(current) and targeted [planned]).
- 4) implementation costs (costs required to implement each action and source of funding).
- 5) deadline (period of completion of each action, including deadline).
- 6) responsible institution (public authority/institution responsible for carrying out the planned actions).

Cross referencing to IGIF-based Country Action Plan

The Norwegian-funded Country Action Plan, which is structured to follow the United Nations and World Bank Integrated Geospatial Information Framework⁵, covers the following components:

- 1) **Specific objectives** are set out in the project context (section 1). Further, in section 4, the alignment of the actions to policy drivers across 12 different sectors and over 40 specific use cases where NSDI can support achievement of policy objectives are identified.
- 2) The **actions** are set out in section 6, these cover governance, technology, and people-related strategic pathways.
- 3) **Monitoring indicators** (Key Performance Indicators) are also provided within section 6.
- 4) The **implementation costs** of each action and funding source are provided in the implementation plan (section 7). An accompanying spreadsheet also provides an estimate of the return on investment (RoI) over the program lifecycle.
- 5) The **start / deadline dates** for each action forms part of the implementation plan (section 7).
- 6) Each action is described in detail including the **responsibilities for implementation** in section 7. Inter-organisational actions are assigned to the governing council overseeing implementation of the NSDI Act.

Collaboration

The Country Action Plan has been produced in close collaboration with the EU Twinning project on Strengthening the NSDI and the Government of Moldova ALRC team. The action plan produced by the EU Twinning project has been included in the IGIF Country Action Plan, so that advice provided is both consistent and complementary.

⁴ Government Decision no. 386 of 17-06-2020 on planning, drafting, approval, implementation, monitoring and evaluation public policy documents: https://www.legis.md/cautare/getResults?doc_id=121921&lang=ro

⁵ IGIF Overview: <https://ggim.un.org/IGIF/>

DOCUMENT STRUCTURE

The report is structured as follows:

- **Chapter 1: Context** – provides a brief introduction to the origin of the report, and the current status of its geospatial information management in Moldova.
- **Chapter 2: Country overview** – looks at the geography, administrative structures and economic factors that underpin the recommended set of actions (interventions).
- **Chapter 3: Geospatial Information Management in Moldova** – provides a baseline (“as is”) assessment of the current state, summarizes current initiatives, and examines some of the barriers to optimal implementation of the NSDI.
- **Chapter 4: Strategic Alignment to Policy Drivers** – describes national policies initiatives and international commitments that might be facilitated by developing the NSDI.
- **Chapter 5: Vision** – lays out a set of set of strategic objectives, guiding principles and goals.
- **Chapter 6: Action Plan** – is the main part of the document, outlining a set of actions based on the nine strategic pathways used to structure the IGIF, to achieve progress towards building a sustainable National SDI for Moldova.
- **Chapter 7: Implementation Plan** – outlines a costed plan, which it is envisaged will form the basis for delivering the actions.
- **Chapter 8: Business Plan** – provides a summary of the accompanying Socio-Economic Impact Assessment, setting out the justification for the investment required to implement the action plan.
- **Chapter 9: Next Steps** – covers what has been learnt from this work and indicates what needs to happen next.
- **Appendices and Annexes** – are used for additional reference material.

CONTENTS

ABBREVIATIONS	2
ACKNOWLEDGEMENTS	3
PREFACE	4
STRUCTURE AND CONSISTENCY STATEMENT	7
DOCUMENT STRUCTURE.....	8
CONTENTS.....	9
EXECUTIVE SUMMARY	10
1. CONTEXT	21
2. MOLDOVA	23
3. GEOSPATIAL INFORMATION MANAGEMENT	26
3.1. Overview	26
3.2. Baseline Assessment.....	26
3.3. Barriers to NSDI Strengthening	32
4. STRATEGIC ALIGNMENT TO POLICY DRIVERS	34
4.1. Introduction	34
4.2. National Policy and International Policy Commitments	35
4.3. Geospatial Use Cases	43
4.4. Key Stakeholders.....	45
5. STRATEGY.....	46
5.1. Introduction	46
5.2. Strategic Goals and Objectives	46
5.3. Enabling Technology	47
5.4. Guiding Principles	48
5.5. Benefits	49
6. ACTION PLAN	50
6.1. Governance and Institutions.....	50
6.2. Policy and Legal.....	53
6.3. Financial	56
6.4. Data.....	58
6.5. Innovation	64
6.6. Standards	67
6.7. Partnerships	70
6.8. Capacity and Education.....	72
6.9. Communications and Engagement	74
7. IMPLEMENTATION	77
7.1. Investment Plan	77
7.2. Risk Management	88
8. BUSINESS CASE.....	89
8.1. Introduction	89
8.2. Strategic Case.....	89
8.3. Economic Case	90
9. NEXT STEPS	94
APPENDIX A: LIST OF STAKEHOLDERS.....	95
APPENDIX B: USE CASE INVENTORY.....	104

EXECUTIVE SUMMARY

1. Context

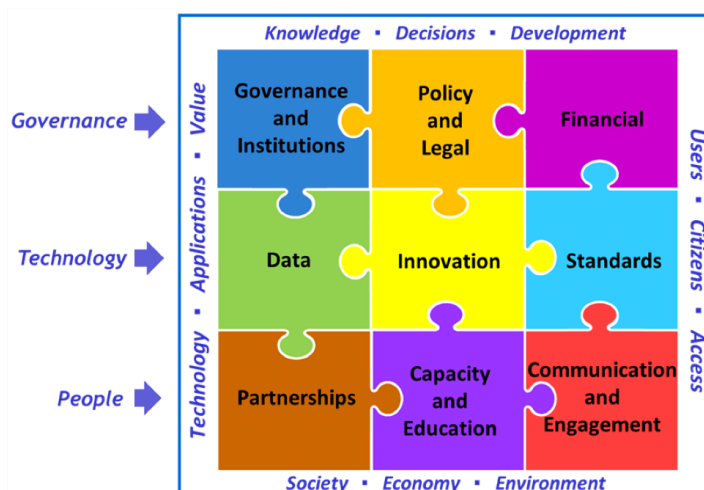
This report has been prepared at the request of Kartverket (SK), the Norwegian Mapping Authority, by specialist Geospatial consultants from ConsultingWhere⁶.

Since 2006, SK has been working with the government of Moldova through its cooperation partner the Agency for Land Relations and Cadastre (ALRC). ALRC is the coordinating authority for the National SDI and is responsible for implementing policy in this domain. Through engagement with ALRC, the objective is to provide support to Moldova with the implementation of its Integrated Geospatial Information Framework (IGIF) and provide support for the continued development of the National SDI.

2. Integrated Geospatial Information Framework (IGIF)

The Action Plan is created in accordance with the UN-GGIM Integrated Geospatial Information Framework, its principles, and methodologies. The Framework has been developed by UN-GGIM in collaboration with the World Bank. It was endorsed by the UN-GGIM Committee of Experts in August 2018. The Framework has been developed to support the development of national infrastructures for geospatial information management in developing countries. The framework aims to assist countries to move towards e-economies, e-service, e-commerce, and other services to improve services to citizens in support of the implementation of national strategic priorities together with the 2030 agenda for sustainable development.

The IGIF is anchored by nine strategic pathways within three main areas of influence: governance; technology; and people. These nine strategic pathways seek to maximize the innovative and integral nature of geospatial information by making it available and accessible to governments, communities, businesses, academia, and civil societies. This provision serves to innovate, co-create, and develop new products, services, and applications that deliver new knowledge for evidence-based policy and decision-making.



3. Geospatial Information in Moldova

The development of the National SDI has progressed over recent years through support from various donors including the United Nations, World Bank, European Union, and the Norwegian Mapping Authority (Kartverket). A significant milestone for this was the publication of Law 254 of 2016⁷ on national spatial data infrastructures. This Law, together with various amendments, Government Decisions and Government Orders, provides the general rules, together with the necessary political endorsement, regarding the establishment of the National SDI. The scope of the Law includes all spatial data sets as specified in the annexes to the Law, data content, data availability, data sharing, metadata, interoperability of the data, data services, data access, data use, together with the relevant responsibilities of the public entities and third parties. The spatial data sets identified in Annex 1, 2,

⁶ ConsultingWhere website: www.consultingwhere.com

⁷ https://www.legis.md/cautare/getResults?doc_id=105790&lang=ro

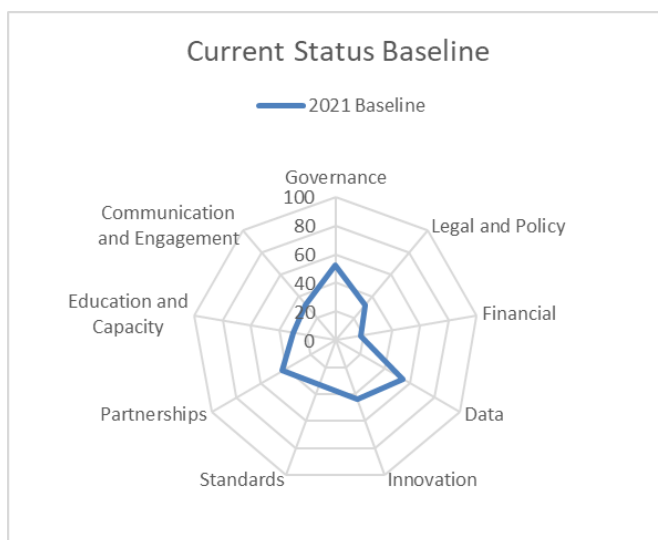
and 3 of the Law are based on the EU Directive Inspire⁸ and represents a broader range of data themes than the fundamental datasets covered by IGIF. For details of this and further background on SDI in Moldova see Moldova IGIF Baseline Diagnostic Report 20210422_v0.4.1⁹ (available from ALRC).

In parallel with the activities outlined in this report a similar activity by a team representing EU ENI 2020 (referred to as Twinning project MD 16 ENI OT 01 19) has been undertaking a series of missions with ALRC with the objective of identifying improvements to Spatial Data Services in Moldova based on EU standards. The Twinning Project is a complementary project to the SK IGIF project.

4. Baseline Assessment

Moldova completed a baseline assessment of current geospatial information management practices during February – April 2021. The findings, organized in terms of the IGIF Strategic Pathways, reflects the outcome from this baseline assessment. A score of 100 is the maximum achievable, and awarded only if the NSDI, in relation to the strategic pathway being assessed, is fully developed and sustainable.

The Baseline Assessment scores, and a summary of the current situation for each of the strategic pathways, is as follows:



- **Governance and Institutions (Score = 53):** Moldova has high level support for the implementation of a National SDI with clear institutional arrangements defined in Law (law no 254 from 2016 on National Spatial Data Infrastructure¹⁰ governs much of the activity associated with the implementation of IGIF). There is also a framework for monitoring the implementation of the National SDI and this is covered by Government Order no 23 of 2020. However, it is recommended that the role of the SDI Council be reviewed (see 6.1.3).
- **Policy and Legal (Score = 32):** Legislation for a National SDI in Moldova is good. The country benefits from having Law 254 from 2016 on national spatial data infrastructures which provides the framework for the implementation of the SDI. This Law, together with various amendments included in 2018, sets the general rules about the establishment of the National SDI and establishes the legal and policy framework for the implementation of the SDI. However, there is a need to continue to actively promote the legal and policy framework which could be achieved through a suitable outreach plan (see 6.2.3).
- **Financial (Score = 18):** Moldova has been successful at accessing external funding. There has been, and continues to be, excellent collaboration with various international donors which have provided funding for projects which support the implementation of the National SDI. However, outside of the various donors, there appears to be a lack of a cohesive and consistent understanding of how the implementation of the National SDI will continue to be financed. There is no single authority with financial responsibility and accountability for ensuring investment in the National SDI is identified, is appropriate, is achieved, and is sustainable (see 6.3).

⁸ <https://inspire.ec.europa.eu/Themes/Data-Specifications/2892>

⁹ Reference 'Moldova IGIF Baseline Diagnostic Report_20210422_v0.4.1'

¹⁰ https://www.legis.md/cautare/getResults?doc_id=105790&lang=ro

- **Data (Score = 54):** The primary geospatial and statistical data holdings are well organized and mainly conform to the UN-GGIM recommended fundamental themes. Moldova has established a good geodetic infrastructure, there is a common national geodetic datum reference, projection and co-ordinate system which is accessible and used by most stakeholders. A data framework has been established with the management of fundamental datasets in the M Cloud as a secure storage and retrieval environment. However, few of the stakeholder organizations have implemented an appropriate Data Quality Management (DQM) plan and it is recommended that this is addressed (see 6.4).
- **Innovation (Score = 44):** There are examples where innovation is being used in support of geospatial activities, but this tends to be done on an individual basis by individual stakeholders, or by the private sector. Moldova has a very well-developed ICT infrastructure which will facilitate the implementation of the National SDI, the geoportals are well established but there was no evidence of any formal investment for geospatial innovation projects such as innovation hubs/centre of excellence responsible for actively managing and communicating information. Despite the evidence of some strong academia there is no 'centre of excellence' which would provide a focus for geospatial research (see 6.5).
- **Standards (Score = 33):** The implementation of standards in Moldova is based on the Law 254 from 2016 and is strongly aligned with the EU INSPIRE Directive. National data standards and technical specifications have been defined for the geospatial domain. Initiatives have been taken to establish a community of practice to share skills, knowledge, and experiences about the implementation of standards. Additionally, Moldova is nationally represented on international standards development organizations, such as ISO and CEN.

Government Decision on interoperability 683 from 2018 establishes a list of standards that need to be applied for relevant geospatial data themes and related services¹¹ and, while most of the responsible public data providers are aware about standards, the implementation of this appears to be very ad-hoc. There was no evidence of the development of a needs assessment, no active standardization awareness program, and no proper system of compliance in use to ensure that organizations are correctly implementing nationally or internationally endorsed standards (see 6.6.3).

- **Partnerships (Score = 43):** There is some cooperation and collaboration between some of the public sector stakeholders. Collaborations between public sector institutions and academia have also been successfully established. International collaborations on geospatial information management are strong and are active and on-going. However, more needs to be done to raise awareness, promote, encourage, and support public private partnerships (PPP), looking for opportunities for establishing PPP joint ventures with the objective of developing and delivering new or improved geospatial products and services (see 6.7.3).
- **Capacity and Education (Score = 30):** The benefits and value of geospatial information has been raised across key decision makers, institutions in government, and across the education sector. The Universities provide courses designed to develop the geospatial information management competences and skills required by the geospatial information sector workforce, and in-house technical training is available. However, there is a need to provide opportunities for continual professional development (CPD) and other lifelong learning initiatives. The study also recommends the development of a national geospatial competencies inventory, to complete an assessment on priority areas for capacity development, together with a proposal to embed geospatial literacy in schools (see 6.8.3).
- **Communication and Engagement (Score = 32):** Stakeholder engagement is ongoing but is ad-hoc, not very active, does not cover all the relevant stakeholder groups. Such communication and

¹¹ https://www.legis.md/cautare/getResults?doc_id=108815&lang=ro

engagement as exists, needs to be improved. The consequence of this all is that stakeholders are not fully informed of the significant progress and efforts being made with the SDI. Stakeholder engagement and communication needs to be consistent, regular, and reliable and would benefit from a more formal approach as part of an Outreach plan (stakeholder engagement strategy).

5. Strategic Alignment to Public Policy Drivers

The overall target outcome for the SDI is to lead to the efficient, equitable and optimal utilization and management of geospatial information applied across all sectors of the economy. To facilitate this alignment, the study has analyzed a wide range of Government policies and commitments. Based on this analysis, the following sectors are where geospatial information generally, and the SDI particularly, can make the most significant and positive impact:

- (a) **Economic and Urban Planning** – including support to the Moldova 2030 development strategy, improved urban planning, and supporting improvements to the analysis of national statistics.
- (b) **Land Management and Administration** – completion of the Land Registration and Property Valuation project, land reform to reduce the number of land related disputes and adopting improvements in property valuation and assessment to provide more predictable revenues from land and property taxation.
- (c) **e-Government** – including the integration of national registers, online digital services, and implementation of the National SDI as part of a National Information Infrastructure (NII).
- (d) **Transport** – including integrated transport planning, street works management, and transport road safety and maintenance.
- (e) **Disaster Risk Management and Emergency Services** – disaster management to aid preparation, response and recovery and improvements to emergency response by the emergency services.
- (f) **Agriculture Forestry and Fishing** – including opportunities for increased crop production/sustainable agriculture through precision farming, agricultural land management, forest management and sustainable forest development.
- (g) **Health and Social Care** – including improved access to primary healthcare and the ability to model access to primary healthcare in order to reduce healthcare inequalities and the development of patient ‘pathways’.
- (h) **Natural Resources** – the development of a national geological data model and 3D geological data will support investigations into new groundwater abstractions (important given the risk of drought in Moldova) and support improved flood management schemes.
- (i) **Water and Hydrology** – a key objective is to fulfill the requirements of the European Water Framework Directive (WFD), to support improvements in the management of water assets, and tracking water loss and leak management.
- (j) **Energy** – site selection for renewable energy initiatives to help reduce the dependence on energy imports.
- (k) **Environment and Tourism** – more cost-effective environmental impact assessments together with the monitoring and analysis of air pollution.
- (l) **Local Government** – improved decision making together with the opportunity for enhanced development governance, management, planning, and the transparent provision of citizen services.
- (m) **Commercial** – providing for more informed decision making for online transactions in the banking, finance, and retail sectors.

- (n) **Multi-sector** – adopting policies on open data, national address registers, imagery, and other collaborative data acquisition policies.

This list illustrates the broad range of sectors that can benefit from an effective National SDI. A companion report, *Geospatial Alignment to Policy Drivers*, contains analysis of key government policy at the time of the study (June 2021) and an inventory of use cases across these sectors.

6. NSDI Vision

The aim of the National SDI is to deliver optimal use of geospatial information to support more effective means of measuring, analyzing, monitoring, and achieving inclusive and sustainable social, economic, and environmental development.

7. Goals and Objectives

As an outcome of the stakeholder engagement, the research completed as part of the IGIF baseline assessment, and the review of the geospatial alignment to national policy drivers, a number of strategic goals and objectives have been identified. Achieving these goals and objectives will enable Moldova to realize its vision for the implementation of a National SDI.

The goals outline what needs to be accomplished to achieve the NSDI vision and the objectives reflect how the goals will be accomplished.

Goal 1 Good Governance and Leadership: a legal and policy framework and investment plan that coordinates and integrates geospatial information management across both the public and private sectors. The objective is to further implement the existing legal and policy framework relevant to the SDI to develop and accelerate cross-sector coordination, industry partnerships, and stakeholder collaboration

Goal 2 Quality Information: timely, reliable, and fit-for-purpose integrated geospatial information that is the trusted source of information for government, business, and the community. The objective is to continue to enhance the quality of geospatial information and make this available to all stakeholders and users through continued improvements in the collection and sharing of geospatial information.

Goal 3 Education and Capacity Development: geospatial information is used widely to improve government products and services and stimulate new business opportunities for the benefit of all citizens. The objective is to strengthen human capacity (skills, knowledge, experience), to promote research and development and innovation programs, to make the opportunities afforded by the National SDI more effective and sustainable.

Goal 4 Partnering: exploiting the expertise, skills, and knowledge across all sectors of society and applying this expertise for the general benefit of all. The objective is to promote a greater awareness and benefits of partnering, the types of collaboration/partnering available, and to develop the strategy for partnering to investigate the benefits to be gained through public private partnerships for the delivery of new or improved and innovative geospatial products and services.

Goal 5 Stakeholder Communication and Engagement: informing, advising, and seeking feedback from all the organizations contributing to and facilitating the implementation of the National SDI. The objective is to keep stakeholders informed and engaged in order to maintain the ongoing commitment to the implementation of the National SDI.

8. Benefits and Outcomes

Positive impacts are expected in many parts of the economy, including:

- **Improved public sector efficiency** – of institutions responsible for land administration, property taxation, agriculture, rural and urban development, emergency services, and transport
- **Citizen benefits** – through increased efficiency in road navigation, emergency services dispatch and improved interactions with the public sector, particularly in respect to land transactions and property taxation and the integration of national registers
- **Improvements in agricultural output** – by facilitating agricultural development and improvements in farming processes, and the implementation of precision farming methods
- **Developments in public health** – through improved monitoring of air pollution (a particular source of adverse health effects in children); air pollution is a major environmental health threat and can impose significant costs on the economy
- **Adapting to climate change** – through improved awareness of air pollution, improvements in the assessment of flood risk, and greater resilience to disasters

Each of these areas is developed in more detail in the body of the report.

9. Action Plan

The Action Plan is designed for implementation of the NSDI over a 5-year timeframe and operation for a least a further 7 years. The Action Plan contains a series of inter-dependent actions with outlines of associated costs and timeframes that together form an integrated roadmap. It encompasses, and is consistent with, the EU Twinning project Action Plan¹². Individual actions are described in chapter 6 of the report under each strategic pathway and are summarized below. Where appropriate, references to related items in the EU Action Plan are included.

Strategic Pathway 1: Governance and Institutions

- Action 1.1 – Form an SDI coordination and project management team to support ALRC's role to be the coordination body of the NSDI and associated administrative, secretarial, and managerial tasks.
- Action 1.2 – Re-energize the geospatial leadership team with a very clear mandate to drive the implementation of the IGIF Action Plan; this action incorporates EU Twinning Project objectives 2.1.1 and 2.1.2.
- Action 1.3 – Preparation of a National SDI strategy/geospatial strategy linked to the National SDI operating model.
- Action 1.4 – Reconsider the composition of the NSDI Council to Institutionalize the private sector in the governance structure.

Strategic Pathway 2: Policy and Legal

- Action 2.1 – Adjusting the regulatory framework for the establishment, development, and maintenance of the NSDI to the current requirements and principles of INSPIRE; incorporates EU Twinning Project objective 1.1.
- Action 2.2 – Developing the draft Government decision on the methodology for forming tariffs (costs) for spatial data network services; incorporates EU Twinning Project objective 1.2.1 and 1.2.2.

¹² EU ENI 2020 Twinning Project: MD 16 ENI OT 01 19 Action Plan of NSDI State Programme 2022-2024 Doc no TWMD-1-122-04

- Action 2.3 – Establish regulations regarding the licensing of spatial data; incorporates EU Twinning Project objective 4.2.
- Action 2.4 – Strengthen Data Sharing Agreements; Incorporates EU Twinning Project objective 2.3.
- Action 2.5 – Create and operationalize a centralized public sector procurement policy for geospatial services and data.

Strategic Pathway 3: Financial

- Action 3.1 – Develop a Sustainable Business Model for SDI to cover budgets, funding options, and to align this with government policies; incorporates EU Twinning Project objectives 4.1.1 and 4.1.2.
- Action 3.2 – Commission a sustainability strategy to outline plans for ongoing support of existing products and services currently covered by donor agencies.
- Action 3.3 – Measure and document benefits realization through the definition of the KPI's to be used in the implementation of the SDI and how these will be measured.

Strategic Pathway 4: Data

- Action 4.1 – Complete the current cycle of National Orthophoto Mapping and institute a regime of continuous revision.
- Action 4.2 – Implement a process of change detection using satellite imagery and consider the use of services available from commercial suppliers.
- Action 4.3 – Develop a maintenance process for the topographic basemaps (line maps) derived from aerial imagery previously provided under the Kartverket engagement.
- Action 4.4 – Maintain the National Register of Addresses to include a process for harvesting data from the local public authorities.
- Action 4.5 – Complete the National Cadastre Land Registration project and operationalize its on-going maintenance.
- Action 4.6 – Develop and implement the process for data sharing between the road agency and the SDI.
- Action 4.7 – Develop and implement a digital twin for urban centers; city centers have been partly created in Chisinau and Orghei but should be further developed.
- Action 4.8 – Maximize the use of GNSS; a good geodetic reference network has been developed, promote the further usage of this through the investigation of current licensing model and opportunities for 'free to use'.
- Action 4.9 – Complete the Land Use/Land Cover Map of Moldova and join the CORINE network to monitor land degradation.
- Action 4.10 – Integrate the Water and Sewage Databases with the SDI.
- Action 4.11 – Establish and operate a Centre of Excellence for Satellite Imagery.
- Action 4.12 – Implement best international practice using Global Statistical Geospatial Framework (IGIF for Statistics).
- Action 4.13 – Integration with Emergency Services.
- Action 4.14 – Enhancements to the Geoportal to help ensure the network service and including maintenance of discovery and view services, creation of download services, and

publication of spatial data CLC 2000, 2018 (Corine Land Cover); incorporates EU Twinning Project objective 3.3.

- Action 4.15 – Updating Metadata Catalogue on NSDI Geoportal, increasing the number of metadata record for harmonized spatial data sets and network services on the Geoportal; incorporates EU Twinning Project objectives 3.4 and 3.5.
- Action 4.16 – Analogue to digital conversion and georeferencing of specific missing or out of date fundamental spatial data; incorporates EU Twinning Project objective 3.1.

Strategic Pathway 5: Innovation

- Action 5.1 – Annual Technology Tracking Review, maintaining an awareness of new developments and how these could be leveraged in Moldova.
- Action 5.2 – Implement a coordinated approach to (geospatial) innovation through the creation of innovation hubs or a center of excellence to provide a focus for geospatial research.
- Action 5.3 – Invest in the incubation of geospatial start-ups, embedded in the digital transformation program.

Strategic Pathway 6: Standards

- Action 6.1 – Establish a working group on standards with responsibility for preparing a needs assessment, a national standards strategy, an active standards awareness program, and a strategy for rolling out data standards and associated technical specifications.
- Action 6.2 – Develop data specifications for spatial data sets and products and transposition of technical specifications for spatial data sets which are part of annexes 1, 2 and 3 of the Law 254/2016; incorporates EU Twinning Project objective 3.2.
- Action 6.3 – Adopt and implement international standards, as a default approach.
- Action 6.4.1 – Establish, maintain, and monitor compliance with common data quality standards based on relevant international standards (reference ISO and OGC-standards).
- Action 6.4.2 – Prepare and implement a Data Quality Management (DQM) plan that assures information is fit-for-purpose.
- Action 6.5 – Improve interoperability through development of APIs and monitor compliance.

Strategic Pathway 7: Partnerships

- Action 7.1 – Strengthen the Partnerships between Public Sector Stakeholders; incorporates EU Twinning Project objectives 2.2 and 6.3.
- Action 7.2 – Establish Partnerships with Private Sector Stakeholders.
- Action 7.3 – Continue to engage with UN GGIM but review the opportunities for engagement to be shared across multiple agencies.

Strategic Pathway 8: Capacity and Education

- Action 8.1 – Re-energize the working group on Capacity and Education and form a relationship with the Ministry of Education; undertake a capability and capacity assessment (a gap analysis of skills and resources) and link this to Government strategies for staff retention.
- Action 8.2 – Expand the available university courses and develop a multi-disciplinary approach to the teaching of geospatial; incorporates EU Twinning Project objective 6.2.3.
- Action 8.3 – Engage with primary and secondary schools and explore opportunities for introducing geospatial literacy into some core courses.

- Action 8.4 – Encourage the principles of continued professional development (CPD) and promote the benefits of lifelong learning; incorporates EU Twinning Project objectives 6.1.1, 6.1.2, 6.2.1, and 6.2.2.

Strategic Pathway 9: Communication and Engagement

- Action 9.1 – Develop and implement a stakeholder communication and engagement Plan; incorporates EU Twinning Project objective 5.1.
- Action 9.2 – Create a National SDI Outreach team with the goal of developing, agreeing, and implementing a communication and engagement strategy to inform, influence, and promote the SDI service and establish performance measures to measure the effectiveness of this.
- Action 9.3 – Undertake an annual market survey of User satisfaction (this will support the monitoring and evaluation requirement).
- Action 9.4 – Create a ‘value proposition’ for the SDI, prepare supporting collateral, and socialize to support the advocacy of the strategic plan to politicians.
- Action 9.5 – Develop a monitoring and evaluating framework to assess the effectiveness of engagement and communication about the development of the National SDI.

10. Implementation Plan

The costs of implementing these Actions are estimated in detail in the Socio-economic impact Assessment report which is submitted alongside this document. The investment plan to be implemented over a period of 5 years is summarized in the table below.

Period	Investment Value (MDL Thousands)	Cumulative Investment Value (MDL Thousands)	Investment Value (USD Thousands)	Cumulative Investment Value (USD Thousands)
Year 0+1	22,710	22,710	1,282	1,282
Year 2	20,323	43,033	1,147	2,429
Year 3	22,664	65,696	1,279	3,708
Year 4	17,348	83,044	979	4,687
Year 5	12,015	95,059	678	5,365
Total	95,059		5,365	

The plan is based on a relatively steady level of investment over a 5-year period from approval. It assumes that investment will drop off during Year 5 as the investment period is completed. The total investment of MDL 95.1 million (USD 5.4 million) is commensurate with what is being planned for other developing countries. It is worth observing that required investment would be much higher had it not been for the input of major donors over the previous 10 years.

A draft implementation plan, with estimated costings for each activity, is set out in Chapter 7. This can be used as the starting point for a project management plan for implementation of the actions.

11. Business Case

The strategic case for investment is derived from the geospatial policy alignment, socio-economic impact assessment and action plan. Key national priorities that are expected to be supported by the Action Plan are direct economic impacts, as well as societal and environmental benefits. In this section we draw out a small subset of those identified:

Economic benefits

i) To Government:

- **Increase business tax revenue collection** by identifying unrecorded properties from a single national street addressing system
- **Support to the National Development Strategy** with online access to more current and complete geospatial information
- **In the longer-term to reform land use fees and taxes collection based on completing the land cadastre and register**

ii) **To Business:**

- **Increased crop yields** by use of precision agriculture techniques to link satellite imagery to fertilizer distribution
- **Better asset management for utilities** as the NSDI program will enhance the availability of current geospatial data enabling digitalization of paper records to be more accurate and converted more quickly
- **Quicker and less costly land and construction survey work** from increased use of the CORS geodetic network
- **The real estate sector enabled to use web technology** to provide new and better commercial and residential property services to citizens using location data

iii) **To Citizens:**

- **Improved emergency response** by equipping more vehicles with geospatially enabled software
- **Greater efficiency of transactions between citizens and businesses**, especially by having a single national address database augmented with geographical position

Societal benefits

Key impacts that are not easily expressed in economic terms, include:

- **Completion of land registration and cadastral registers providing a more transparent, consistent, and up to date database** to underpin growth of the land market by increasing the level of mortgages secured on land rights
- **Improved disaster response**, making mobilization faster so reducing loss of life and costs of damage to forests, crops, and property
- **Improved Sustainable Development Goal (SDG) reporting** through enhanced geo-statistics

Cost-Benefit Impact Assessment

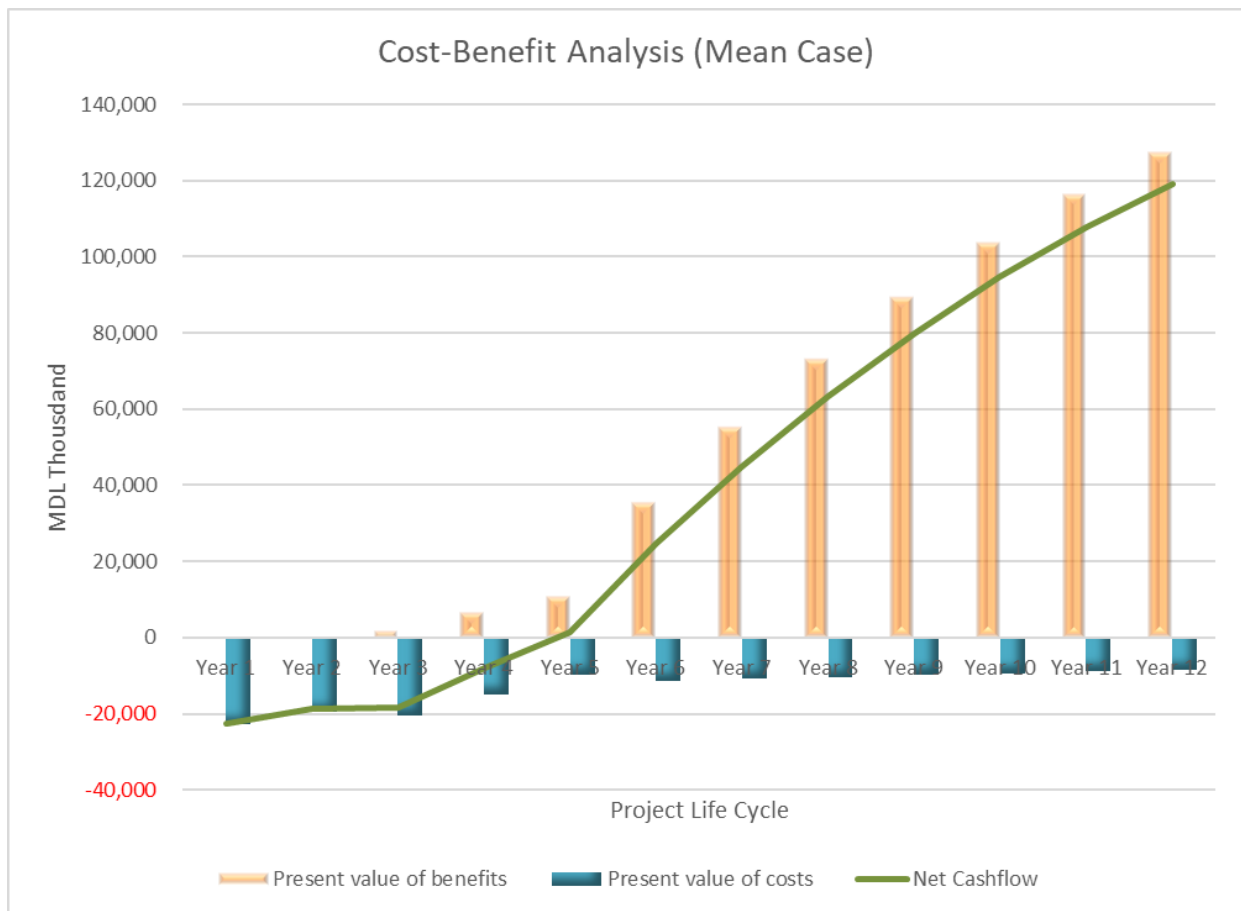
The financial values for the investment plan and on-going recurrent expenditure have been entered into a discounted cash flow spreadsheet to calculate the likely RoI using a standard Cost-Benefit Analysis approach.

The results for the mean case, can be summarized as follows:

Description	MDL (Thousands)	USD (Thousands)
Sum of discounted benefits	624,630	35,255
Sum of discounted costs	156,578	8,838
Benefit to Cost Ratio	3.99	
Cumulative Net Present Value	468,052	26,418

It is important to stress that this assessment is based upon quantification of around 20% of the identified use cases. If data and time were not constrained, and more case studies had been quantified, it is our expert opinion that the calculated RoI would be significantly higher.

The cash flow forecast is indicated in the chart below.



Business Case Sensitivity:

Lower bound (pessimistic case):

Benefit to Cost Ratio: 3.17 (reduction from 3.99 for mean case)

Cumulative Net Present Value: MDL 340 million (reduced from mean case MDL 468 million)

Upper bound (Optimistic case):

Benefit to Cost Ratio: 4.82 (increase from 3.99 for mean case)

Cumulative Net Present Value: MDL 598 million (increase from mean case MDL 468 million)

From the sensitivity analysis, we conclude that the policy advice that this is viable investment would not change even in the lower bound case.

A full analysis of the economic case for investment is provided in the accompanying Moldova Socio-economic Impact Assessment report.

12. Conclusions

It should be noted that any Action Plan is a living document. It will be refined and revised as additional information becomes available, as a consequence of more detailed planning, and will continue throughout the implementation period.

1. CONTEXT

1.1. Purpose

This report was prepared at the request of Kartverket (SK), the Norwegian Mapping Authority, as part of the Technical Assistance provided to the Government of Moldova for Geospatial Information Management.

1.2. Audience

The report is written to aid decision makers in the public and private sectors to better understand the impact the strengthening management of fundamental geospatial information can have upon enhancing the efficiency of government, the economic prosperity of the country and the welfare of its people. A secondary audience for this report is the stakeholders who supported this study through their contributions to the Baseline Assessment, the review of the current Geospatial Alignment to Policy Drivers, the preparation of a Socio-economic Impact Assessment, and by contributing to various workshops, all of which provided validation of the reporting of the current state.

A schedule of stakeholders who contributed to the study is included in Appendix A.

1.3. Why is this report needed?

As described in the foreword, the Integrated Geospatial Information Framework (IGIF) is a United Nations (UN) endorsed Framework developed to support the development of national infrastructures for geospatial information management in developing countries. The framework aims to assist countries to move towards e-economies, e-service, e-commerce, and other services to improve services to citizens in support of the implementation of national strategic priorities together with the 2030 agenda for sustainable development.

Since 2006, the Norwegian Mapping Authority has been working with the government of Moldova through its cooperation partner the Agency for Land Relations and Cadastre (ALRC). ALRC is the coordinating authority for the National SDI and is responsible for implementing policy. This current engagement has been initiated by Kartverket to assist in defining a long-term strategy for sustaining development of its National SDI.

1.4. Background on NSDI Activity

The development of the National SDI has progressed over recent years through support from various donors including the United Nations, World Bank, European Union, and the Norwegian Mapping Authority as outlined in the previous paragraph. A significant milestone for this was the publication of Law 254 of 2016¹³ on national spatial data infrastructures. This Law, together with various amendments, Government Decisions and Government Orders, provides the general rules, together with the necessary political endorsement, regarding the establishment of the National SDI. The scope of the Law includes all spatial data sets as specified in the annexes to the Law, data content, data availability, data sharing, metadata, interoperability of the data, data services, data access, data use, together with the relevant responsibilities of the public entities and third parties. The spatial data sets identified in Annex 1, 2, and 3 of the Law are based on the EU Directive Inspire¹⁴ and represents a broader range of data themes than the fundamental datasets covered by IGIF. For further background see Moldova IGIF Baseline Diagnostic Report v1.0¹⁵.

¹³ https://www.legis.md/cautare/getResults?doc_id=105790&lang=ro

¹⁴ <https://inspire.ec.europa.eu/Themes/Data-Specifications/2892>

¹⁵ Reference 'Moldova IGIF Baseline Diagnostic Report_20210422_v0.4.1'

In terms of support towards the implementation of a National SDI, Moldova has benefited from strong relationships with several strategic partners including assistance from the World Bank, which has supported integration with the EU INSPIRE Geoportal, capacity building, and the development of standards. Assistance from the Norwegian Government, through the Norwegian Mapping Authority, which has had a strong relationship with ALRC since 2006 and has provided support for the implementation of various geospatial projects including ortho-imagery, digital terrain modelling, the development of a GNSS Positioning Service (MoldPOS), the development of a property information system (MoldLIS), and topographic base mapping projects, as well as this current direct support to the implementation of the National SDI. For details on this and other donor activities associated with this see Ovdii & Busch, 2020¹⁶.

In parallel with the Kartverket activities outlined in this report a similar activity by a team representing EU ENI 2020 (referred to as Twinning project MD 16 ENI OT 01 19) has been undertaking a series of missions with ALRC with the objective of identifying improvements to Spatial Data Services in Moldova based on EU standards. The general scope of this Twinning project includes an assessment of the current state of NSDI implementation together with the development of an action plan for future development of the SDI. This Twinning study is focused on ALRC while the IGIF assessment has been applied to a wide range of stakeholders at national level. The Twinning Project is a complementary project to the SK IGIF project.

1.5. Key Organizations / Stakeholders

A schedule of stakeholders who have contributed to this SDI study through their participation in workshops, questionnaires, and/or interviews are included in Appendix A.

¹⁶ Ovdii M, Busch E, Implementation of the Integrated Geospatial Information Framework in Moldova; 2020 World Bank Conference on Land and Poverty, The World Bank, Washington, 2020;

2. MOLDOVA

In this section, the report seeks to provide some background to allow external readers to understand the context into which the National Spatial Data Infrastructure (NSDI) is being introduced.

2.1. Geography

Moldova is a land-locked country in Eastern Europe situated between Romania (to the west) and Ukraine (to the east). The country has a total area of approximately 33840 square km¹⁷ (including Transnistria) with a usual resident population in January 2021 of 2.6 million (excluding districts from the left side of the river Nistru and municipality Bender)¹⁸. The urban population is less than half of the total population, but the literacy rate is very high.



Figure 2.1: Political Map of Moldova

2.2. History

Moldova became independent from the Soviet Union in 1991 and, since 2009, the Country has been governed by a series of pro-European ruling coalitions.

2.3. Climate

The climate of Moldova is termed as moderately 'continental'. The term 'continental' being characterized by relatively mild winters, with little snow, long warm summers, and low humidity. The

¹⁷https://statbank.statistica.md/PxWeb/pxweb/en/10%20Mediul%20inconjurator/10%20Mediul%20inconjurator_MED050/MED050100.px/

¹⁸https://statbank.statistica.md/PxWeb/pxweb/en/20%20Populatia%20si%20procesele%20demografice/20%20Populatia%20si%20procesele%20demografice_POPrec_POP010/POP010100rcl.px/table/tableViewLayout1

average annual temperatures vary between 6°C in the North to 12°C in the South with a temperature range of 0°C in winter to 25°C in summer¹⁹.

2.4. Government

The government is a parliamentary republic, and the Executive comprises a Head of State (President), a Head of Government, and a Cabinet. The political system is mixed parliamentary-presidential, with the parliament (one hundred and one representatives) and president both directly elected for a four-year period.

The most recent elections, held in July 2021, resulted in a victory for Moldova's Action and Solidarity party (perhaps better known by its Romanian acronym of PAS)²⁰. PAS is a pro-European party and will likely promote the drive for a much closer relationship with the European Union, a goal which has been identified as a key element in the development of the National SDI.

2.5. Administration

The government is a parliamentary republic, and the Executive comprises a Head of State (President), a Head of Government (Prime Minister), and a Cabinet. The territory of the Republic of Moldova is organized administratively in administrative-territorial units: districts, cities and villages. The statute of village (commune), sector, city (municipality) is elaborated based on the framework statute, approved by the Parliament of the Republic of Moldova and it is approved by the local Council. The administrative territorial organization of Moldova is made on 2 levels: villages (communes), sectors and cities (municipalities) constitute the first level, districts, Chisinau municipality, Balti municipality constitute the second level²¹.

2.6. Chişinău

Chişinău is the capital of Moldova and is the major industrial centre of the country, important for engineering and other light manufacturing activities. Wine making, flour milling, and tobacco processing are among the city's agriculture-related industries. There are also clothing and footwear factories. The city is the cultural centre of Moldova, with an academy of sciences, universities, and other institutions of higher education, and several scientific research establishments. Chişinău has a population of approximately 500,000 (est. 2021)²².

2.7. Economy

Moldova is classified as a lower middle-income country by the World Bank²³. In terms of the World Bank's Human Development index²⁴ Moldova ranks 90th in the world, a little lower than its neighbors Romania (49th) and Ukraine (74th).

The economy of Moldova relies heavily on the agricultural sector but has some natural resources including lignite, phosphorites, gypsum, and limestone. With few natural energy resources, Moldova imports almost all its energy supplies from Russia and Ukraine and has an objective of connecting with the European power grid by 2022. Stronger integration with Europe is a stated goal of the government and this has resulted in some market-oriented progress. Moldova has experienced better than

¹⁹ <https://climateknowledgeportal.worldbank.org/country/moldova/>

²⁰ <https://emerging-europe.com/news/>

²¹ <https://moldova.md/en/content/administrative-territorial-organization-moldova>

²² <https://www.cia.gov/the-world-factbook/countries/moldova/>

²³ <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>

²⁴ <http://hdr.undp.org/sites/default/files/hdr2020.pdf>

expected economic growth since 2017, largely driven by increased consumption, increased revenue from agricultural exports, and improved tax collection²⁵.

As with most other developing nations Moldova has been affected adversely by the COVID pandemic. Moldova is particularly vulnerable to a large drop in the inflows of foreign currency, which could compound the direct effects of the lockdown on economic activity. It will become more challenging to finance Moldova’s large current account deficit in the current context. A decline in remittances, which is expected to reach around 24-27%, will be a further blow to the economy²⁶.

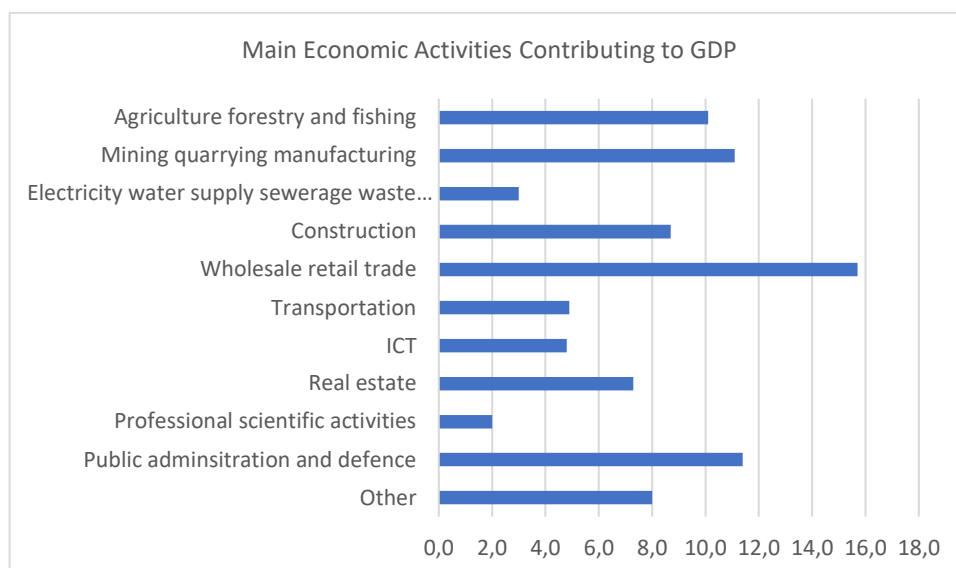


Figure 2.2: Main economic activities in GDP terms²⁷

During 2014 Moldova signed an Association Agreement (AA) and a Free Trade Agreement (DCFTA²⁸) with the European Union (EU) connecting Moldovan products to this market. The EU AA/DCFTA has contributed to significant growth in Moldova’s exports to the EU and in recent years the EU purchased over 65% of Moldova’s exports²⁹.

One outcome of the DCFTA was the redrafting of the Country’s customs legislation and procedures in line with EU standards and to align with the EU’s Union Customs Code. This has reduced business costs, boosted competitiveness, and has raised Moldova’s ranking in the World Bank’s Ease of Doing Business index. Although the ranking has dropped marginally over the past 18 months (47 to 48) the DCFTA has resulted in a significant improvement to the ‘doing business’ indicators and reflects a regulatory environment that has become conducive to business operation, together with stronger protections of property rights³⁰.

EU integration prospects have been driving the governments’ policy reform agenda since 2009. These developing links with the EU have been a significant contributing factor in the progress of the various policies supporting the development of the geospatial landscape in Moldova and has been one of the drivers behind the development of its National SDI.

²⁵ <https://www.cia.gov/the-world-factbook/countries/moldova/#economy>

²⁶ Oxford Economics <https://www.oxfordeconomics.com/recent-releases/Republic-of-Moldova-Bracing-for-domestic-and-external-Covid-19-shocks>

²⁷ Anuarul Statistic al Republicii Moldova, 2020
<https://statistica.gov.md/pageview.php?l=en&id=2193&idc=263>

²⁸ Deep and Comprehensive Free Trade Agreement

²⁹ http://eubam.org/wp-content/uploads/2017/10/Pisar_1-2.pdf

³⁰ <https://tradingeconomics.com/moldova/ease-of-doing-business#:~:text=Ease%20of%20Doing%20Business%20in%20Moldova%20is%20expected%20to%20reach,according%20to%20our%20econometric%20models.>

3. GEOSPATIAL INFORMATION MANAGEMENT

3.1. Overview

The use and application of geospatial information is not a recent activity to Moldova. A driver for much of this was the need for land reform following independence. To facilitate this a government entity, the Agency for Land Relations and Cadastre (ALRC), was established in 1994. The primary role of ALRC is the development and promotion of state policy and strategy in the field of land administration with responsibilities including, land registration, cadastre, geodesy, topographic mapping, thematic mapping, aerial photography, imagery, and the implementation of the National SDI³¹.

In 1997 - 2006, much progress was reported with the land privatization process with support from the WB and other donors. The stated development goal of this support was to achieve economic growth enabled by the functioning land market. The assistance provided by various donors has contributed to improvement of public services by providing open access to geospatial data on the Internet.

In terms of support towards the implementation of a National SDI, Moldova has benefited from strong relationships with a number of strategic partners including assistance from the World Bank, which has supported integration with the EU INSPIRE Geoportal and the development of INSPIRE data themes. Assistance from the Norwegian Government, through the Norwegian Mapping Authority (SK) which has had a strong relationship with ALRC since 2006, has provided support for the implementation of various geospatial projects including ortho-imagery, digital terrain modelling, the development of a GNSS Positioning Service (MoldPOS), the development of a property information system (MoldLIS), and topographic base mapping projects, as well as this current direct support to the implementation of the National SDI.

A significant milestone for Moldova was the publication of Law 254 of 2016³² on national spatial data infrastructures. The scope of the Law includes all spatial data sets as specified in the annexes to the Law, data content, data availability, data sharing, metadata, interoperability of the data, data services, data access, data use, together with the relevant responsibilities of the public entities and third parties. The spatial data sets identified in Annex 1, 2, and 3 of the Law are based on the EU Directive INSPIRE³³ and represents a broader range of data themes than the fundamental datasets covered by IGIF.

3.2. Baseline Assessment

Moldova completed a baseline assessment of current geospatial information management practices during the early part of 2021³⁴. The baseline assessment reflects the degree to which Moldova has developed in terms of each IGIF Strategic Pathway (SP). This baseline assessment has been mapped to the World Bank IGIF Diagnostic Tool, which applies scores so that progress can be measured from the current starting point. The scores have been averaged to provide an overall score for the Moldova geospatial infrastructure.

The score for the Governance and Institutions Strategic Pathway for example, is the average score from eleven questions on the indicator subject. For each of the questions, the score increases the more that an indicator is “complete”. For example, if there is no NSDI Coordinating Unit the score is zero; if one has been planned only, and has not been taken further the score is 25; if one has been planned and the plans have been developed into formal Terms of Reference then the score is 50; if the Unit has Terms of Reference and people allocated to positions the score is 75, and if the Coordinating Unit exists and is active the score is 100. It is important to appreciate that the scores are

³¹ <http://www.arfc.gov.md/>

³² https://www.legis.md/cautare/getResults?doc_id=105790&lang=ro

³³ <https://inspire.ec.europa.eu/Themes/Data-Specifications/2892>

³⁴ An earlier Baseline Assessment had been completed by ALRC during 2019

'fuzzy', they provide an 'indication' of the current state. Precision of the scores is not so important – scores could be argued up or down in many cases, but an overall picture emerges, and this provides a benchmark against which further progress can be measured.

The stakeholders who participated in this study had been introduced to the purpose, function, and use of the DT through interactive workshops during February 2021 which were hosted by ALRC. The workshop introduced IGIF, the Strategic Pathways, and the Diagnostic Template including its purpose, structure, and content. The consultants from ALRC also assisted stakeholders with completion of the DT where this was required. During March and April 2021, the DT was completed by representatives from 19 separate stakeholder organizations. Completion of the DT was followed by evaluations of the completed DTs by the study team which, in turn, was followed by discussions and consultations with the various stakeholders. The objective of these consultations was to provide information to gain greater insight and understanding into the scores allocated to the selected 'indicators' by the various stakeholders. The Baseline prepared by ALRC was used as a gauge, ALRC participants are considered to be very well informed in terms of SDI and the study used the ALRC results as a guide however no moderation was applied to the stakeholder assessments.

There were two outcomes from this analysis:

- a. The development of a Baseline position for the status of SDI in Moldova; the Baseline represents a consolidated position considering the feedback from all participating stakeholders.
- b. A comparison against the 2019 Assessment

	ALRC	Consolidated Results
Governance	68	53
Legal and Policy	42	32
Financial	33	18
Data	60	54
Innovation	46	44
Standards	43	33
Partnerships	49	43
Education and Capacity	32	30
Communication and Engagement	35	32
Score	46	38

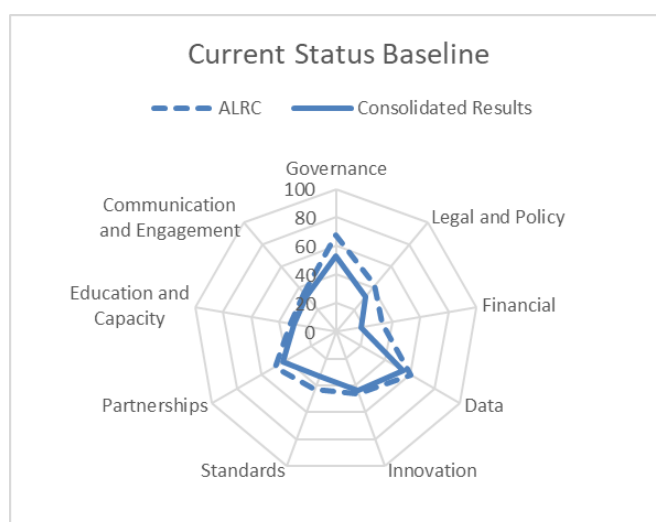


Figure 3.1 Current Status Baseline

The results and overall pattern between the ALRC Baseline and Consolidated Results from the stakeholders are quite similar. However, there was some variance for Governance, Legal & Policy, Financial and some minor variance across some of the other Pathways. The variance was considered to be an issue of stakeholder communication and engagement; recommendations on addressing this issue (and others) were included in the Baseline Assessment report.

In summary, the results and pattern between the 2021 baseline results and the results from the 2019 study shows some consistency in the general pattern of the scores. However, the results show a reduced understanding or appreciation across Legal and Policy, Data, and Standards and a much-improved understanding for Innovation. Reasons for this are outlined in the following sections.

	Baseline 2021	Baseline 2019
Governance	53	53
Legal and Policy	32	43
Financial	18	14
Data	54	64
Innovation	44	20
Standards	33	46
Partnerships	43	35
Education and Capacity	30	26
Communication and Engagement	32	41
All Pathways	38	38

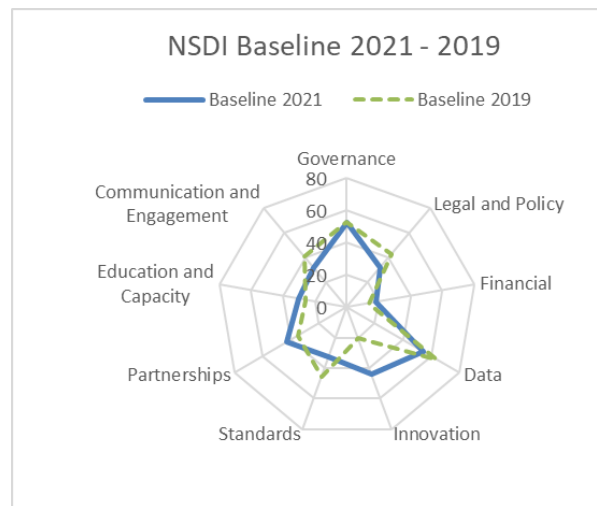


Figure 3.2 Baseline 2021 v 2019

Considering each Strategic Pathway the results for the stakeholder assessment show the following:

Governance and Institutions (Score = 53)

Current Situation

The current situation regarding this SP is the existence of clear institutional arrangements defined in Law. Governance (and Leadership) will underpin the NSDI operating model and will be essential to ensure that the principles of the operating model, when implemented, are maintained over time. Law no 254 from 2016 on National Spatial Data Infrastructure³⁵ governs much of the activity associated with the implementation of IGIF. While the Law does not specify or describe a governance framework, the implementation of this Law, together with the various Government Decisions associated with the Law, provides the necessary political endorsement for the development of a National SDI.

There is also a framework for monitoring the implementation of the National SDI and this is covered by Government Order no. 23 of 2020³⁶. This covers the data and metadata published on the various thematic geoportals with systematic updates every six months and published on the information page of the National SDI (www.inds.gov.md).

Identified Needs

The indicators of the baseline study suggest that while the concept of Governance is reasonably well understood what does appear to be lacking is the application of Leadership. While the role of ALRC as the coordinating body for SDI is widely recognized, based on the feedback from the stakeholders, the role of the SDI Council was invisible. This needs to be addressed.

In terms of leadership (and governance) as far as could be determined there are no published KPI's available to facilitate the effective monitoring of the implementation of the National SDI, there is a lack of a National SDI strategy/geospatial strategy that identifies the goals and objectives of the geospatial information initiative, and while the existence of the Law provides for a form of Governance framework, the nature of this framework was not always obvious to the various stakeholders suggests a deficiency in the communication and/or engagement with all stakeholders.

Policy and Legal (Score = 32)

³⁵ https://www.legis.md/cautare/getResults?doc_id=105790&lang=ro

³⁶ http://arfc.gov.md/files/Ordinul_monitorizare%2023_01_06_2020.pdf

Current Situation

The current situation regarding this Strategic Pathway is the existence of the Law 254 from 2016 on national spatial data infrastructures which provides the framework for the implementation of the SDI. This Law, together with various amendments included in 2018, sets the general rules about the establishment of the National SDI and establishes the legal and policy framework for the implementation of the SDI.

Identified Needs

Promote the legal and policy framework. In terms of this legal and policy framework the study yielded mixed results. There are several low scores from public entities indicating that representatives from some of the stakeholders either have (a) a lack of awareness of the Law or (b) a lack of understanding of the Law or (c) both. Communication and engagement would go some way to addressing this.

Use and Licensing of spatial data. In terms of key activities such as data sharing, data licensing, and data privacy and protection there was reference to the informal agreements which may be in place between public entities. For this to be effective agreements need to be formalized rather than left to individual interpretation. There were comments that these issues would be much more effective if all stakeholders managed their data and shared their data via the data portals, ie there is inconsistency in the approach to such data sharing.

Data licensing. There appear to be no published regulations regarding the licensing of spatial data³⁷. The conditions of use are described in the metadata on National Geoportal (geoportalinds.gov.md) or may be established in individual agreements, with the result that individual institutions can establish individual policies and conditions. This could result in duplication, misinterpretation, and misunderstanding.

Data use. Feedback received from the private sector representatives was a request for clarity and certainty in regard to the 'rules of the game' in terms of the use of spatial data. The private sector needs to understand how the data can be used, what are the limitations if any on the use of the data, and any costs associated with this use.

The development of suitable terms of reference for stakeholders. In terms of the responsibilities of stakeholders it was reported that, while there are some guidelines, the stakeholders have no defined terms of reference which specify the responsibilities of the individual stakeholders. A consequence of this is the risk of lack of consistency in stakeholder engagement.

Financial (Score = 18)

Current Situation

Moldova has been successful at accessing external funding. There has been, and continues to be, excellent collaboration with various international donors, such as the Norwegian Mapping Authority, European Commission, and World Bank, all of which have provided funding for projects which support the implementation of the National SDI.

Identified Needs

A business model for the SDI. Outside of the various donors, there appears to be a lack of a cohesive and consistent understanding of how the implementation of the National SDI will continue to be financed. At the time of the study (mid 2021) there was no business model supporting the National SDI³⁸. The concept of a central function for the financial management to support the implementation

³⁷ https://kartverket.sharepoint.com/:x:/r/sites/MoldovaGIF/Delte%20dokumenter/General/4-New%20Diagnostic%20Tools/Completed%20Diagnostic%20Templates/1_IGIF_DT_EN_ALRC_IP_JC_DR_v2.xlsx?d=w044a8f185708448b97cb22ac9eb8e572&csf=1&web=1&e=WgNNAe

³⁸ it is anticipated that this may be developed as an outcome of the various international projects which are currently in place.

of the National SDI is missing. There is no single authority with financial responsibility and accountability for ensuring investment in the National SDI is identified, is appropriate, is achieved, and is sustainable.

Additionally, while individual public entities have been identified as the responsible bodies for specified data themes, the funding needed to develop and maintain these themes needs to be secured annually from the government. Each entity has to seek funding from central government and provide appropriate justification. Where this funding is needed to support any National SDI/geospatial activities or projects there is the possibility of multiple projects having similar objectives with the risk of duplication of effort.

There is no evidence of any assessment or evaluation of potential revenue streams which may become available as a result of the implementation of the National SDI.

There is the need for a strategy to plan for a move away from the dependency on external donor funding.

Data (Score = 54)

Current Situation

The current situation is that the primary geospatial and statistical data holdings are well organized and mainly conform to the UN-GGIM recommended fundamental themes. Moldova has established a good geodetic infrastructure, there is a common national geodetic datum reference, projection and coordinate system (MOLDPOS/MOLDREF99), which is accessible and used by the majority of stakeholders. A data framework has been established to organize the country's fundamental geospatial and statistical data holdings, the identification of a set of fundamental datasets for each data theme with its own data profile, and the management of fundamental datasets in the M Cloud as a secure storage and retrieval environment.

Identified Needs

Data Quality. Very few organizations have implemented an appropriate Data Quality Management (DQM) plan with the consequence that data quality is poorly monitored.

Data sharing. In order to ensure the quality of spatial data services, Government Decision no. 737/2017 on rules for creating of network services for spatial data has been established. Although the guidelines for sharing/releasing geospatial information are provided in the context of the NSDI Law, only a few organizations have the knowledge, skills, and resources to apply them appropriately and hence may need support (financial, technical) for the implementation of these services.

Data exchange: At a national level data exchange has not been formalized, those agreements which are in use have mainly been based on individual or ad-hoc agreements with the consequence that interoperability issues are common.

Innovation (Score = 44)

Current Situation

The current situation is that there are examples where innovation is being used, and continues to be used, in support of geospatial activities, however this innovation tends to be done on an individual basis by individual stakeholders, or by the private sector, and does not represent a coordinated approach on behalf of the government. While there is no geospatial or SDI specific innovation group or innovation laboratory, Moldova does have the National Agency for Research and Development³⁹. This Agency provides support for research, innovation, and development generally and is available for specific sectors. Moldova has a very well-developed ICT infrastructure which will facilitate the implementation of the National SDI. The geoportals are well established but there is no evidence of a national strategy for geospatial digital transformation. However, there are examples by individual

³⁹ <https://ancd.gov.md>

stakeholders (public sector, private sector⁴⁰, and collaboration between public and private sector⁴¹) of innovative projects being developed. See the Baseline Assessment Report⁴² for some descriptions of these.

Identified Needs

Innovation hub/Centre of excellence. There was no evidence of any formal investment for geospatial innovation projects or innovation hubs actively managing and communicating information. The feedback from stakeholders was that funding for innovation should be a government initiative and not dependent on the initiatives from individual agencies or the private sector. The need for an appropriately funded innovation program is widely recognized as being desirable.

Geospatial innovation strategy. Moldova is also missing a geospatial innovation strategy, there was no evidence provided that related to any geospatial research programs. Despite the evidence of some strong Academia there is no 'centre of excellence' which would provide a focus for geospatial research.

Standards (Score = 33)

Current Situation

The current situation regarding Standards is based on the Law 254 from 2016 and is strongly aligned with the EU INSPIRE Directive. National data standards and technical specifications have been defined for the geospatial domain. Initiatives have been taken to establish a community of practice to share skills, knowledge, and experiences about the implementation of standards. Additionally, Moldova is nationally represented on international Standards Development Organizations, such as ISO and CEN.

Government Decision on interoperability 683 from 2018 establishes a list of standards that need to be applied for relevant geospatial data themes and related services⁴³ and, while most of the responsible public data providers are aware about standards they need to use, there is no strategy and the implementation of this appears to be very ad-hoc.

Identified Needs

Standards Strategy. As of the date of the study the adoption of best practice standards and compliance mechanisms for enabling data and technology interoperability was limited. There is no evidence of the development of a needs assessment, no active standardization awareness program, and no proper system of compliance in use to ensure that organizations are correctly implementing nationally or internationally endorsed standards.

Partnerships (Score = 43)

Current Situation

The current situation can be summarized as some cooperation and coordination collaborations have emerged between some of the public sector stakeholders, but Public-Private Partnerships (PPP), are still underdeveloped. Collaborations between public sector institutions and academia have also been successfully established. International collaborations on geospatial information management are strong and are active and on-going (see, e.g., cooperation agreements between the Norwegian Mapping Authority and ALRC, Twinning project of the European Commission and ALRC, and Erasmus+ projects with Technical University of Moldova and Tiraspol State University.

⁴⁰ See BeeProtect.md (available to the public from end of 2021)

⁴¹

<https://gismoldova.maps.arcgis.com/apps/opsdashboard/index.html#/d274da857ed345efa66e1fbc959b021b>

⁴² IGIF Moldova Baseline Diagnostic Report_20210422_v0.4.1 (available from ALRC)

⁴³ https://www.legis.md/cautare/getResults?doc_id=108815&lang=ro

Identified Needs

Public Private Partnerships. More needs to be done to raise awareness, promote, encourage, and support PPPs establishing joint ventures with the objective of developing and delivering new or improved geospatial products and services

Capacity and Education (Score = 30)

Current Situation

The current situation is that awareness about the benefits and value of geospatial information has been raised across key decision makers, institutions in government, and also across the education sector. While the Universities provide courses designed to develop the geospatial information management competences and skills required by the geospatial information sector workforce, and in-house technical training was evident, there was a lack of opportunities for continual professional development (CPD), lifelong learning, or internship development in geospatial information management available to the relevant workforce.

Identified Needs

Capability and capacity. There is a need to develop a national geospatial competencies inventory and complete an assessment on priority areas for capacity development, which together would contribute to the development of a capacity development and education strategy. This should be followed by the development of appropriate professional development ‘pathways’, the establishment of innovation programs that stimulate entrepreneurship, and a proposal to embed geospatial literacy in schools.

Communication and Engagement (Score = 32)

Current Situation

The current situation is that not many effective, efficient, and transparent engagement methods have been well applied to strengthen the stakeholders’ participation and contribution to the further implementation of the Moldova NSDI. Despite that, there is strong stakeholder awareness about the need to invest in consistent and regular communication and engagement.

Identified Needs

Communication and Engagement (Outreach) plan. There is a pressing need to establish a stakeholder engagement strategy. This could be achieved through a dedicated communications team but needn’t be dependent on this, given that there is a willingness to recognize this need⁴⁴. The objectives of this would include the development of a specific communication plan, assembling a database of case studies, strengthening the link between the National SDI and the UN Sustainable Development goals, and to monitor and evaluate the effectiveness of engagement and communication about the SDI development.

Stakeholder engagement. Stakeholder engagement is ongoing but is not very active and does not cover all the relevant stakeholder groups. The consequence of this all is that stakeholders are not fully informed about all the significant efforts recently made regarding the strategic pathways: Governance & Institution, Policy & Legal and Financial. Stakeholder engagement needs to be consistent, regular, and reliable and would benefit from a more formal approach as part of an Outreach Plan.

3.3. Barriers to NSDI Strengthening

Moldova is in the fortunate position that there are few real barriers to achieving a National SDI, and those that do exist can be overcome through the application of good governance together with the application of existing legislation, mandates, policies, and sustained financial resources. None of the

⁴⁴ ALRC, with the support of the WB, had initiated an Outreach program in 2021

following should prevent the implementation of a National SDI however, dealing with the few issues highlighted, would make the implementation of the SDI more predictable.

- **Governance and Leadership.** In terms of SDI, Moldova has the benefit of clear institutional arrangements defined in Law. The governance defined by these arrangements will underpin the SDI operating model and will be essential to ensure that the principles of the operating model, when implemented, are maintained over time. In terms of governance, the law identifies a coordinating authority, the authority responsible for implementing the National SDI policy, a role currently fulfilled by the Agency for Land and Cadastre (ALRC). The Law also identifies a Council for the NSDI. While the Law contains no direct reference to a Governance function per se the Council is identified as providing a consultative role about NSDI policy. While ALRC is the coordinating authority responsible for implementing policy the authority of ALRC to influence, control, or coerce the various stakeholders is limited. This needs to be addressed as, without such authority being clearly recognized, understood, and supported across all agencies, then there is a risk that ALRC may not be able to fulfill its brief. For consideration is the question of the authority of ALRC – is this fully understood across all stakeholders? Indeed, does ALRC have this authority? If not ALRC then who? This could be addressed through establishing a Leadership team with a clear mandate for the implementation of the National SDI.

There is also a need to consider the role of the SDI Council, if the Council is to have a role, then it needs to be more active and more visible.

- **Lack of consistent policies concerning access to and use of geospatial data.** There is a good Legal and Policy framework for the National SDI, however the application of these policies in terms of data use, data sharing, and data licensing needs to be consistent. The lack of a consistent approach to the licensing and use of the data may have a critical impact on the development of the SDI as organizations are not aware of information management policies, such as data ownership, usage, pricing, data exchange, data access and security, and licensing and copyright.
- **Inconsistencies in the availability and quality of geospatial data.** Data sharing will be compromised where there are concerns over data quality, data completeness, and data currency. Data quality issues are not easily resolved without a specific program of work directed at data quality improvement through the development and implementation of suitable data quality management plans.
- **The lack of a geospatial strategy.** The lack of a geospatial strategy risks a dilution of focus and effort which could compromise the implementation of the National SDI. An appropriate strategy would help consolidate the Institutional arrangements provided for in the NSDI Law and help connect the National SDI to other government policy priorities. This would provide structure and direction on where to focus effort and would support the transition from the current situation, which is very dependent on personal relationships, to a more coordinated and regulated arrangement which, in turn, would help support and contribute to the national action plan.
- **Lack of suitable or appropriate stakeholder communication and engagement strategy.** While this doesn't represent an unsurmountable barrier this is important as much of the progress being achieved is not being sufficiently well publicized. For the implementation of the National SDI to progress in a consistent manner there is a need for a communication and engagement strategy that keeps all stakeholders aware of what is happening, why it is happening, and how they might be expected to contribute to this. The need for improved communication and engagement was a common reference from the many stakeholders who contributed to the study.
- **Engagement with the private sector.** The private sector needs to know the 'rules of the game', to ensure there are no surprises. There needs to be clarity and certainty on how data provided for the National SDI can be used and what are the limits (if any) on this use. The rules need to be clear, need to be reasonable, and need to be consistent. This depends on the SDI Decision makers having a good understanding of the needs of the private sector and, until the private sector has this confidence, then this will remain a barrier.

4. STRATEGIC ALIGNMENT TO POLICY DRIVERS

4.1. Introduction

It is critical that the Action Plan is aligned to maximize support to implementing the key Government policies and meeting international commitments.

A separate deliverable, the geospatial policy alignment report⁴⁵, shows the analytical work undertaken to ensure the Action Plan is aligned to this objective. It does this by:

- i) Identifying a number of key policy areas where the National SDI can have a positive impact on implementation of policies or international commitments.
- ii) Prioritizing drivers for investment by identifying and prioritizing key thematic areas for the National SDI investment based on:
 - a) relevance to high-level implementation of the policy or international commitment;
 - b) achievability within the timeframe for implementation; and
 - c) alignment with sponsor's business entry point(s), such as efficient land administration and land registration, improvements in agricultural methods, or efficiencies in local government.
- iii) Describing spatial use cases that, from interactions with stakeholders and knowledge of the geospatial market, provide a considered assessment of the potential socio-economic impact.
- iv) Analyzing key stakeholders – outlining relevant functions and influence in terms of geospatial information policy.

In this section, only the key learnings from this analysis are summarized.

⁴⁵ IGIF Geospatial Alignment to Policy Drivers (GAPD) v0.4 23 June 2021 (available from ALRC)

4.2. National Policy and International Policy Commitments

4.2.1 National Commitments

The table that follows outlines the primary policies that are positively aided by geospatial information and technology.

Ref	Theme	Summary Description of Primary Policies	Importance of Geospatial Technologies
RD 1	Public Administration; Environment;	<p>Moldova National Development Strategy 2030</p> <p>The source document is available here...⁴⁶ (in Romanian). Approved by Parliament in December 2018, see also ⁴⁷</p> <p>The National Development Strategy 2030 is the main strategic planning document for Moldova and represents the strategic reference document for all policy documents at national, regional, and local level. The strategy identifies long-term development priorities focused on improving the quality of citizens' lives. The strategy identifies 4 development 'pillars'</p> <p>1 sustainable and inclusive economy with the aim of improving access to infrastructure, public utilities, water, safe sanitation, and increasing income from sustainable sources with specific references to the agricultural sector</p> <p>2 human and social capital to provide for quality education and an inclusive social protection system</p> <p>3 making public institutions more efficient and providing effective governance</p> <p>4 providing a safe and healthy environment</p>	<p>Geospatial information supports an integrated approach to decision-making for planning and development through the use of visualization techniques and the integration of geography and statistics.</p>
RD2	Health Education Infrastructure	<p>Council of Europe Action Plan for Moldova 2021-2024⁴⁸</p> <p>The Council of Europe Action Plan for the Republic of Moldova 2021-2024 is a strategic programming instrument that aims to bring Moldova's legislation, institutions, and practice further into line with European standards in the</p>	<p>Geospatial analysis can support the planning and development of health and education facilities, aligned with population densities and forecasts of population growth. Integrating cadastral data with land use and zoning data will provide more informed development planning (SDG's 3 and 4).</p>

⁴⁶https://cancelaria.gov.md/sites/default/files/cu_privire_la_aprobarea_proiectului_de_lege_pentru_aprobarea_strategiei_nationale_de_dezvoltare_moldova_2030.pdf

⁴⁷ See also summary document <https://cancelaria.gov.md/en/content/national-development-strategy-moldova-2030-parliament>

⁴⁸ https://search.coe.int/cm/Pages/result_details.aspx?ObjectID=0900001680a029ad

		<p>areas of human rights, the rule of law, and democracy. The Action Plan takes into account the National Development Strategy 2030.</p> <p>The Action Plan aims to support Moldova in its efforts to implement the UN Sustainable Development Goals (SDG's)⁴⁹, specifically Goals 3 – health; 4 – education; 5 – gender equality; 10 – reduced inequalities; 11 – sustainable cities and communities; and 16 – strong institutions</p>	Improved planning and design of urban areas and communities through the use of geospatial data (SDG 11)
RD3	Environment and Agriculture	<p>Environmental Strategy for the Years 2014-2023⁵⁰</p> <p>Environmental Strategy (Green Government)⁵¹</p> <p>Elaboration of the environmental strategy has been dictated by the political drive for European integration. Environmental protection is a national priority as it directly concerns the conditions and health of the population as well as capacities for sustainable development which implies maintaining the quality of the main components of the environment (air, water, soil, flora, and fauna). The strategy covers soil, air and water pollution, management of forests, improvements to agricultural practice, renewable energy (energy insecurity) and the impact on climate change. The strategy seeks to establish objectives for the protection of the environment, the implementation of which will lead to the sustainable development of the country.</p>	An effective National SDI (including the NSDI Law) will strongly facilitate the drive to achieve the set environmental strategic targets. Development and maintenance of some key data themes will support the implementation of this strategy including Functional Areas, Land Parcels, Elevation and Depth, Land Cover and Land Use, Geology and Soils, Water together with Mapping and Imagery.
RD4	Digital Economy	<p>Strategy for an Inclusive, Sustainable, and Digital Economy until 2030 (SEIDD 2030)⁵²</p> <p>The National Development Strategy 2030 indicates the priority areas for the long-term sustainable development and represents the strategic reference document for all other policy documents. SEIDD 2030 provides policy options, targets, and indicators with a greater level of detail for the following 3 strategic objectives (1) increasing revenues from sustainable sources; (2) increased citizen access to infrastructure, public utilities, and improved living</p>	An effective NSDI will support the areas targeted by the digital economy strategy including planning, urban development, rural transformation, transport and infrastructure, and energy efficiency through the use of mapping, imagery, address records, land ownership records, and other public registers

⁴⁹ <https://sdgs.un.org/goals>

⁵⁰ <http://green.gov.md/pageview.php?l=en&idc=41&t=/Regulatory-framework> (Romanian)

⁵¹ <http://green.gov.md/pageview.php?l=en&idc=41&t=/Regulatory-framework>

⁵² <https://mei.gov.md/en/content/national-development-strategy-moldova-2030>

		<p>conditions; and (3) improving working conditions and reducing informal employment.</p> <p>SEIDD 2030 will target the following areas of Government: economy, employment, innovation, regional development/urbanism, agriculture and rural development, energy efficiency, transport and infrastructure, consumer protection;</p>	
RD5	Digital Transformation	<p>Modernization of Government Services⁵³</p> <p>Rationalization of public services and simplification of the institutional framework; Re-engineering and optimization of workflows, e services to citizens; Digitization and automation of workflows (including inter-institutional data exchange); More delivery channels, integrated, citizen-centred service delivery;</p> <p>Develop geospatial services on geographic names, addresses, and administrative boundaries.</p> <p>Further development of the geoportal platforms across Government agencies to provide and share geospatial information.</p> <p>Accelerating Digital Transformation in the Public Sector⁵⁴</p> <p>This project aims to improve access to public services through digital transformation of government processes and business model(s) and promote innovation. Objectives include supporting changes in the organizational and innovation culture in the public and private sectors to help achieve the Sustainable Development Agenda and national targets; contribute towards streamlining innovation through engaging with the ongoing and prospective projects; and supporting the digitalization of Moldova that will contribute to improved governance by increasing the efficiency and effectiveness of government processes, increasing transparency and public access to governmental information; and improving the innovative delivery of public services.</p>	<p>At the national level, the integration of public registers will be integrated into a unified system and coordinated with other policy documents. Geospatial information provides a means of consistent integration.</p> <p>The digital transformation policy explicitly promotes innovation which lends itself to the innovative use of geospatial techniques. The relevant geospatial services can best be delivered through the use of a National SDI</p>

⁵³ <https://www.egov.md/en/content/modernization-government-services>

⁵⁴ <https://www.md.undp.org/content/moldova/en/home/projects/digital-moldova.html>

RD6	Rural Development and Natural Resource Management	<p>National Strategy for Agriculture and Rural Development (SNDAR) 2021-2030^{55 56}</p> <p>The IFAD strategic opportunities program (COSOP 2019-2024) has two strategic objectives (1) improve the capacity of agricultural producers through investments in rural infrastructure, and (2) promote rural transformation through improved access to financial services and markets.</p> <p>IFAD supports the National Development Strategy ‘Moldova 2030’ and investments are aligned with the UN’s SDG’s and specifically will contribute to SDG 1 – no poverty; SDG 2 – zero hunger; SDG 5 – gender equality; SDG 6 – clean water and sanitation; and SDG 13 – climate action.</p> <p>See also the strategic opportunities programme 2019 – 2024⁵⁷ for information on increasing tax base with improved farming methods and rural development</p>	Geospatial information supports the decision-making for agricultural, forestry and rural development purposes using analytics tools and visualization techniques. Moreover geospatial information also supports the integration of geography and statistics.
RD7	Water Supply and Sanitation	<p>Strategy for Water Supply and Sanitation 2014-2028⁵⁸</p> <p>See also RESOLUTION NO. 442 of 1 July 2020 – Amendments to Government Resolution No. 199/2014 on Approval of the Water Supply and Sanitation Strategy (2014-2028)</p> <p>The Action Plan for 2020-2024 for the Water Supply and Sanitation Strategy for 2014-2030 includes the following objectives (1) improve the management of public water supply and sanitation services; (2) plan and develop public water supply and sanitation systems to expand access of the population to high-quality services; and (3) harmonize the national water supply and sanitation legislation with the Community standards and international commitments.</p>	Geospatial data will support investigations into existing water supplies; water (and wastewater) management; planning and development of water supply with forecast of population growth and urban development
RD8	Energy	<p>Energy Strategy of the Republic of Moldova to 2030⁵⁹</p>	Use of geospatial data in planning, developing, and maintaining energy distribution and supply infrastructure and the development of

⁵⁵ <https://www.ifad.org/en/web/operations/w/country/moldova>

⁵⁶ <http://news.gov.md/en/news/2021/02/19/21001287>

⁵⁷ <https://webapps.ifad.org/members/eb/124/docs/EB-2018-124-R-22.pdf?attach=1>

⁵⁸ https://www.euwipluseast.eu/images/2020/11/PDF/MD_Gov-WSS-Strategy-AP_EN.pdf

⁵⁹ https://www.spcr.cz/files/Moldova_EnStrategy_draft_12_full_310512.pdf

		<p>The UN SDG 7 has as its main focus the sustainable production and use of energy. This is reflected in the National Development Strategy. The strategy identifies the goal of creating a competitive and efficient energy sector that will provide citizens and businesses with quality energy resources, respond to the dependency on imports of energy resources, and the impact of the energy sector on climate change. The Energy strategy of Moldova for up to 2030 is the main planning document. The Strategy has many goals including the aim to ensure the natural gas supply safety, by diversifying the supply routes and sources, of carrier types (conventional, non-conventional gas, LNG) and of storage facilities, together with strengthening Moldova’s role of natural gas transmission corridor. It also looks to strengthen Moldova’s role of power transmission corridor, by building new interconnectors, connected to the ENTSO-E.⁶⁰</p> <p>According to the Energy Strategy a national priority is to ensure an enhanced use of renewable sources. The Strategy also aims to improve energy efficiency through the introduction of the intelligent electricity networks and the development of environmentally friendly renewable energy sources.</p>	intelligent energy networks. Using topographic and climate data to help identify potential sources for renewable energy.
RD9	Environment	<p>Adapting the 2030 Agenda on Sustainable Development to the Context of the Republic of Moldova ⁶¹</p> <p>Provides an assessment of the alignment of sustainable development goals to national policies. A summary of the findings was that 11% of SDGs targets are aligned to the national policy papers, and do not require any adjustments; 57% of SDG’s are partially aligned to the national policy papers, only a few components of these targets are included, therefore, the relevant national strategies should be adjusted to better reflect the spirit and details of SDGs targets; 32% of SDG targets are not reflected in the national policy papers. Most of aligned targets relate to the “environment” sector, while most of misaligned ones relate to “governance and human rights” sector.</p> <p>For each SDG the paper provides a summary of priority policy areas, key responsible agencies, and relevant national policy documents. Of specific interest to the National SDI the paper identifies a number of goals including</p>	Improved rural, forestry and agricultural methods can contribute to more sustainable agriculture which would provide environmental benefits, for example through the use of precision farming methods using geospatial data. Alongside economic considerations, precision farming also promises substantial environmental benefits and is actively promoted by the EU.

⁶⁰ European Network of Transmission System Operators for Electricity (see <https://www.entsoe.eu/about/>)

⁶¹ https://statistica.gov.md/public/files/SDG/docs/Targets_ONU_EN.pdf

		Goal 2 – sustainable agriculture; Goal 3 – health; Goal 6 – management of water; Goal 7 – energy; Goal 9 – infrastructure; Goal 11 – ‘smart’ cities; Goal 15 – forest management	
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4.2.2 International Commitments

International commitments will place certain obligations on the two parties, and, in terms of Moldova, these obligations may then be incorporated into policy documents prepared by the Government. For example, in technical terms and with specific reference to the implementation of a National SDI, the IGIF framework developed by the United Nations is a key reference; in commercial and economic terms the agreements with the EU (AA and DCFTA see section 1.5) are key influencers of Government policy; and in environmental and sustainable development terms the UN’s Agenda for Sustainable Development heavily influences many of the key Government policies.

Ref	Policy Theme Title	Summary Description of Policy or Strategy	Importance of Geospatial Technologies
IC1	UN Global Geospatial Information Management ⁶²	<p>The Committee of Experts on Global Geospatial Information Management at its tenth session adopted the Implementation Guide of the Integrated Geospatial Information Framework (IGIF) as a means of strengthening national geospatial information management arrangements within and across Member States at the institutional level and supporting the implementation of the Sustainable Development Goals, especially in developing countries.</p> <p>In 2016, the Economic and Social Council (ECOSOC) adopted a draft resolution (E/2016/L.28) entitled "Strengthening institutional arrangements on geospatial information management". The resolution acknowledges that UN-GGIM is well placed to continue to contribute to the work of the United Nations, especially in the context of assisting Member States to implement the 2030 Agenda for Sustainable Development and the Paris Agreement on Climate Change.</p>	Geospatial data is essential to monitoring and reporting on many of the SDGs goals and targets. The Integrated Geospatial Information Framework (IGIF) provides a basis and guide for developing, integrating, strengthening, and maximizing geospatial information management and related resources.
IC2	Transforming our World: 2030 Agenda for Sustainable Development ⁶³	<p>This Agenda is described as a plan of action for the people, planet and prosperity. The agenda refers to 17 Sustainable Development Goals (and 169 targets). They seek to build on the Millennium Development Goals. They are integrated and seek to balance the three dimensions of sustainable development:</p> <ul style="list-style-type: none"> • Economic • Social • Environmental 	Many of the Sustainable Development Goals (SDG’s) will depend on the availability of suitable geospatial data.

⁶² <https://ggim.un.org/IGIF/>

⁶³ <https://sdgs.un.org/goals>

IC3	United Nations Framework Convention on Climate Change⁶⁴	The UN Framework Convention on Climate Change (UNFCCC) commonly referred to as the Paris Agreement, deals with greenhouse-gas-emissions mitigation, adaptation, and finance, and was signed in 2016. Under this agreement, each country must determine, plan, and regularly report on the contribution that it undertakes to mitigate global warming. To achieve this long-term temperature goal, countries aim to reach global peaking of greenhouse gas emissions as soon as possible to achieve a climate neutral world by mid-century.	A number of the IGIF fundamental data themes will contribute to monitoring climate change and the impact of urban and rural development on the environment. These will include Buildings and Settlements, Land Cover and Land Use, Population Distribution, Transport Networks, Water.
IC4	INSPIRE Directive 2007/2/EC⁶⁵	The INSPIRE (Infrastructure for Spatial Information in Europe) directive was approved by the European Council and Parliament in 2007. It aims to benefit European public authorities (and others) by making available geographic information, which is relevant, harmonized, and of high quality that supports policies and activities impacting the environment. INSPIRE also requires the adoption of 'Implementing Rules' which set out how the system will operate	The EU INSPIRE directive requires EU States to share 34 different spatial data themes through a network of 'services'.
IC5	Development of Pan-European Geospatial Datasets⁶⁶	The objectives of developing Pan-European Geospatial Datasets are to: provide a consolidated and consistent overview of European Commission needs, set out cross-cutting and domain specific requirements of the European Commission for: <ul style="list-style-type: none"> • EU wide geospatial information from Member States • Support Sustainable Development and other EU policies • To seek support from Member States to obtain more and better-quality data 	The priority Geospatial Datasets for the European Commission's needs were identified as: Buildings (BU), Cadastral Parcels (CP), Addresses (AD), Administrative Units (AU), Statistical Units (SU), Transport Networks (TN), Land Parcel Information System (LPIS) Postal Codes (PC) [and Utility and Governmental Services US]
IC6	EU-Moldova Association Agreement⁶⁷	The Association Agreement between the European Union Member States and Moldova was signed in June 2014 and has been in full effect since July 2016. Since the Agreement's provisional application since September 2014 Moldova has benefitted from a Deep and Comprehensive Free Trade Agreement (DCFTA) with the EU. This preferential trade system has allowed Moldova to benefit from reduced or eliminated tariffs for its goods, an increased services market, and better investment conditions. One of the key objectives of the Association is to promote economic integration between the two Parties by increasing Moldova's participation in EU policies, programs, and agencies.	This Agreement is supported by the Moldova 2030 Development Plan which includes promoting citizen access to infrastructure, public utilities, sustainable agriculture, and a healthy and safe environment, all of which is supported by a National SDI.

⁶⁴ <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>

⁶⁵ <https://inspire.ec.europa.eu/>

⁶⁶ https://eurogeographics.org/wp-content/uploads/2018/05/20100128_EuroGeographics-Data-Policy_V1.1.pdf

⁶⁷ https://ec.europa.eu/trade/policy/countries-and-regions/countries/moldova/index_en.htm

IC7	United Nations ‘The Future We Want’ ⁶⁸	The ‘Future We Want’ is the declaration on sustainable development and a green economy adopted at the UN Conference on Sustainable Development in Rio in 2012. The Declaration includes broad sustainability objectives within themes of Poverty Eradication, Food Security and Sustainable Agriculture, Energy, Sustainable Transport, Sustainable Cities, Health and Population and Promoting Full and Productive Employment. It calls for the adoption of agreed Sustainable Development Goals. It also requests a UN resolution strengthening and consolidating UNEP both financially and institutionally so that it can better disseminate environmental information and provide capacity building for countries. Elaboration of an Environmental Strategy has been dictated by the desire by Moldova for European integration, for national legislation alignment to the provisions of EU directives, and by promoting green economy as described in the ‘Green Government’ National Environmental Strategy.	The Green Government strategy will have a dependence on a number of geospatial data themes including Land cover, Agriculture and Aquaculture facilities, Land Use and Soils.
IC8	Norwegian Mapping Authority: Maps for Sustainable Development MDA 19/0001	The agreement describes the most recent collaboration between ALRC and the Norwegian Mapping Authority (Statens-Kartverk). Predicted outcomes include new nationwide digital mapping which will support improved governance, economic growth, the implementation of the UN SDG’s, improved land management and land use planning. This is one of many areas of collaboration between the two organizations, Norway has been supporting Moldova with various mapping and related projects since 2006.	The Mapping project is a key component to the development of the National SDI which is being implemented and will provide Moldova with a framework to meet the requirements of the EU INSPIRE Directive

⁶⁸ <https://sustainabledevelopment.un.org/content/documents/733FutureWeWant.pdf>

4.3. Geospatial Use Cases

From interviews with a variety of staff, representing more than 20 stakeholder organizations, including Government Ministries, Agencies, State Enterprises, and private sector companies, the team identified over 40 applications (use cases) where there are demonstrable benefits from the implementation of GIS technology requiring foundation geospatial data⁶⁹ that a National SDI would provide. These will have a positive impact on many sectors including:

Economic and Urban Planning:

- Support to the Moldova 2030 Development Strategy
- Improved urban planning and smart city projects through access to enhanced spatial data including 3D “digital twin” information models
- Support to the National Bureau of Statistics (NBS) to undertake more sophisticated statistical analysis through census planning, execution, and analysis

Land Management and Administration:

- Land registration and property valuation fewer land-related court cases
- Land reform to reduce the number of land related disputes with fewer land related court cases
- Increase in revenue from land use fees and land and property taxation

Surveying

- Enhanced Continuously Operating Reference Stations (CORS) network providing efficiencies in related surveying and engineering activities

e-Government

- Integration of national registers through the ability to use geospatial information to aid the synchronization of administrative registers such as land registration and cadastral registers, property register, address register
- Providing on-line digital services to citizens and business and improving the efficiency of transactions between citizens and businesses through the use of a national register of addresses

Transport

- More efficient transport planning through the use of integrated transport links (pedestrian, road, rail)
- Management of ‘Street Works’ by coordinating requests from utilities, engineering, and local government so as to minimize disruption to citizens, reducing traffic disruption, and providing opportunities for travel time efficiencies and fuel economies
- Feasibility studies and design activities for proposed new road and rail schemes
- Improved road safety, highway maintenance, and traffic enforcement including spatial analysis for accident ‘black spots’ helping more intelligent decision making on safety improvements

Disaster Risk Management and Emergency Services

- Improved disaster response and management using geospatial data to aid more efficient and informed preparation, response, and recovery tasks
- More efficient emergency response using integrated address, property, and building data together with address verification and validation services

⁶⁹ Foundation Data Themes: http://ggim.un.org/meetings/GGIM-committee/8th-Session/documents/E-C20-2018-7-Add_1-Global-fundamental-geospatial-data-themes.pdf

Agriculture, Forestry, and Fishing

- Increased crop production, more sustainable agriculture, and improved farming methods through the use of precision farming
- Agricultural land management (with potential for land consolidation) to provide for more equitable allocation of agricultural subsidies
- Improved forest management (planning and harvesting), rural development, and sustainable forest development
- Increasing crop yields by use of precision agriculture techniques to link satellite imagery to fertilizer distribution

Health and Social Care

- Improved access to primary healthcare through mapping the accessibility of primary healthcare facilities
- Facilitate the planning of health facility locations and capacity planning using patient address information
- Developing patient pathways and using geospatial data to provide for improvements to be made in epidemiology, helping to trace patterns in the spread of diseases and supporting control measures

Natural Resources

- Transition from analogue to digital mapping and use of 3D models for improved groundwater abstraction schemes (important given the risk of drought in Moldova), flood management schemes, and proving input to the regulation of waste disposal

Water and Hydrology

- Improved water and hydrology management to help meet the requirements of the European Water Framework Directive (WFD)
- Improved management of water and sewerage assets
- Tracking water loss and leak management to manage costs and monitoring water usage
- Increased revenue by a systematic identification of households/businesses and matching against a register of payments

Energy

- Reduced dependency on energy imports by identifying locations for renewable energy facilities

Environment and Tourism

- More cost-effective environmental impact assessment using geospatial information
- Visualization and analysis of levels of air pollution and tracking to sources

Local Government

- Developing local government decision making processes through enhanced development governance, management planning, provision of citizen services, and integrated development planning with neighboring administrative areas

Commercial

- More informed decision making for online banking and other financial transactions

Other/Cross-Cutting

- Completion and maintenance of the national register of addresses to enable efficiencies in government and improved ease of business

- Increase in the availability and use of satellite imagery, the National SDI will provide the opportunity to share data effectively across government agencies
- Modernization of public services through re-engineering and digitization of national registers, improved efficiency through data exchange between public service providers, and diversifying access channels to public services
- Reductions in the cost of data acquisition and removing the risk of data duplication through a 'collaborative' government data acquisition program including aerial photography, satellite imagery, topographic mapping; such a program can reduce the costs associated with the capture, storage, and management of geospatial information by procuring once and using many times by many agencies

4.4. Key Stakeholders

The study has involved discussions with a wide range of stakeholders. The accompanying geospatial policy alignment deliverable includes detailed assessment of all stakeholders who contributed and/or participated in the study. Each is described according to the following criteria:

- **Functions** – the entries are derived from their mission statements and other public statements; only those functions most directly relevant to the development of the NSDI are listed.
- **Centralized / Decentralized** – this characteristic will help in assessing the feasibility of certain strategic options, for instance, whether a distributed approach to data sharing will be impeded by low bandwidth or intermittent availability of suitable internet access.
- **Influence** – examining the current level of capabilities, commitment, existing data assets and user needs is used to assess the likely influence of the stakeholder in the future development of an NSDI.

A schedule of the stakeholders is included as Appendix A.

5. STRATEGY

5.1. Introduction

Having good public policy depends on high-quality information and informed public/private participation. Moldova has a wealth of geospatial data. The implementation of a National SDI is a recognition that methods are needed to reduce data collection, data duplication, and to promote the harmonization, dissemination, and use of geospatial data. The use and application of good information will help Moldova measure, monitor, and achieve, sustainable social, economic, and environmental development which aspirations will contribute to the vision outlined in the 2030 Agenda for Sustainable Development⁷⁰ and the EU-Moldova Association Agreement⁷¹.

5.2. Strategic Goals and Objectives

As an outcome of the stakeholder engagement and research completed as part of the IGIF baseline assessment, together with the review of the geospatial alignment to national policy drivers, several strategic goals and objectives have been identified. Achieving these goals and objectives will enable Moldova to realize its vision for the implementation of a National SDI.

Goal 1: Good Governance and Leadership

The objective is to further implement the existing legal and policy framework relevant to the SDI so as to develop and accelerate cross-sector coordination, industry partnerships, and stakeholder collaboration. This will be achieved through the establishment of a Leadership team with a clear mandate which identifies decision making responsibilities and powers of delegation and provide for meaningful monitoring, evaluation, and implementation of the National SDI.

Goal 2: Quality Information

The objective is to continue to enhance the quality of geospatial information and make this available to all stakeholders and users through continued improvements in the collection and sharing of geospatial information. This will be achieved through formal data governance processes, standards compliance, quality control and end-user stakeholder consultation together with the further development of the geoportals supporting the implementation of the National SDI and making good data available and accessible by all.

Goal 3: Education and Capacity Development

The objective is to strengthen human capacity (skills, knowledge, experience), to promote research and development and innovation programs, to make the opportunities afforded by the National SDI more effective and sustainable. This will be achieved by raising the awareness of the benefits of geospatial information, curriculum development with the education sector, and investing in, and promoting, continual technical and professional development.

Goal 4: Partnering

The objective is to promote a greater awareness and benefits of partnering, the types of collaboration/partnering available, and to develop the strategy for partnering to investigate the benefits to be gained through public private partnerships for the delivery of new or improved and innovative

⁷⁰ <https://cancelaria.gov.md/en/content/national-development-strategy-moldova-2030-parliament>

⁷¹ [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02014A0830\(01\)-20200123&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02014A0830(01)-20200123&from=EN)

geospatial products and services. This will be achieved through the development of stronger relationships between the public and private sectors together with improvements in the understanding from SDI Decision makers of the needs of the private sector.

Goal 5: Stakeholder Communication and Engagement

The objective is to keep stakeholders informed and engaged in order to maintain the ongoing commitment to the implementation of the National SDI. This will be achieved through the establishment of a stakeholder communication and engagement strategy; a suitable communication strategy (sometimes referred to as an outreach plan), will keep stakeholders informed and engaged.

5.3. Enabling Technology

Moldova is very well-positioned to take advantage of modern technologies to advance decision-making and government policy-setting using the power of geospatial information. Many of the government departments and agencies are familiar with geospatial information and are using this information daily. Moldova also has the benefit of a very good ICT infrastructure and enjoys an extremely high literacy rate, the most recent estimate being 99.4% of the population.

Impediments to the implementation of National SDI's have in the past often focused on lack of technology or expensive technology e.g., hardware, software, and data. In most cases, technology limitations have eased with increased competition in the market driving down unit costs. Similarly, access to high quality satellite imagery, the success of crowd-sourcing initiatives and smartphone-derived location-based services, has reduced the timescales and costs of geospatial data acquisition and the development of new products and services.

However, to achieve the full benefits of the opportunities available through the use of geospatial data and technologies, requires continuous development and innovation to modernize and support new ways of working, particularly across the public sector. The challenges include the need to:

- Improve the quality of geospatial information. Moldova has a good mapping and national reference system, the issue is that the organizational diversity in terms of data theme roadmap, data capture, and data acquisition is very high. This is evident by some of the data maintenance issues reported and examples of data (and hence cost) duplication.
- Improve data accessibility so it can be leveraged more fully to generate economic growth through businesses and new start-up taking advantage of the power of geospatial information. Although guidelines for sharing and releasing geospatial data are provided in the context of the NSDI Law, only a few organizations have the resources to apply them appropriately

The following enabling technologies will support the move beyond the collection of data and narrow usages to a thriving location-based services market.

- **Geoportal Technologies (Moldova map portal and geoportal):** Continued development of geoportal technologies, together with improved integration of the geospatial information supply chains, will provide further opportunities for the production and distribution of geospatial information and improved access to geospatial information that is more fully integrated across the various services offered by government. Geoportal technology in particular has evolved to provide a means for posting, discovering, and exchanging existing geospatial information resources in support of both broadly based SDIs and more narrowly focused organization-specific data-sharing communities.

- **Increased Volume and Variability of Data:** Globally, we are witnessing an exponential growth in the amount of data that can be generated and captured. There have been significant advances in digital acquisition and communications technologies from sensors in vehicles, rapid imagery acquisition from satellites, targeted imagery capture using cost effective drones, and automated processing and storage devices that enable large volumes of data to be managed effectively in cloud environments.
- **Community Participation:** Users of social media technologies are creating an ever-increasing amount of geospatial information. This same technology is now being used in ‘community science’ projects to enhance government services and improve the accuracy and quality of maps. The use of the Internet, smart devices, and the increase in location-based services has ushered in an era where the community are not only consumers of geospatial information, but also producers of geospatial data. This affords opportunities for Moldova to continue to enhance its data infrastructure to engage the public to produce, distribute and consume geospatial information.
- **Common APIs:** Application Programming Interfaces (API’s) are making it possible to leverage geospatial data more readily. Many countries have recently developed health-related ‘Apps’ to help inform the situation in regard to the COVID-19 pandemic. Community tracing, quarantine surveillance, and dashboards have been developed which makes use of existing geospatial information and SDI’s⁷².
- **Innovation Hubs and Centre of Excellence:** From mobile innovation to big data and artificial intelligence – technology today is enabling more personalized experiences for consumers of location-based products and services. Digital and mobile innovations have created new opportunities for businesses to get closer to their customers, and facilitated more convenient, secure and engaging touchpoints between businesses and their customers. Innovation initiatives such as innovation hubs and centers of excellence, can stimulate the geospatial marketplace and energize the economy through the development of location-based services.

5.4. Guiding Principles

Following the IGIF, this section outlines how the Action Plan reflects the guiding principles for good governance and institutional arrangements to stimulate consistent management, cohesive policies, guidance, processes and decision-rights for geospatial information management, and proper oversight and accountability.

These principles are as follows:

- **Leadership:** a governance model that is driven from the top, so that participating institutions are well supported and guided in their daily tasks and decisions where the IGIF mandate is concerned
- **Accountability:** clear delegated levels of authority and roles and responsibilities for implementing the IGIF
- **Best Practice:** methods that stimulate the exchange of best practices in national institutional arrangements in the context of geospatial information management
- **Collaboration:** an approach that fosters knowledge and cooperation within and among institutions predicated on a culture of openness and transparency

⁷² <https://gismoldova.maps.arcgis.com/apps/opsdashboard/index.html#/d274da857ed345efa66e1fbc959b021b>

- **Enablement:** an approach that focuses on strategic national imperatives, as well as institutional requirements
- **Participatory:** a governance model that is easily accessible and credible to participating institutions and the public
- **Transparency:** regular cross-sector and cross-committee IGIF reporting and monitoring, complemented by re-evaluation of performance expectations and adjustments where necessary
- **Trusted:** trust cultivated through the authoritativeness and reliability of public sector geospatial information

5.5. Benefits

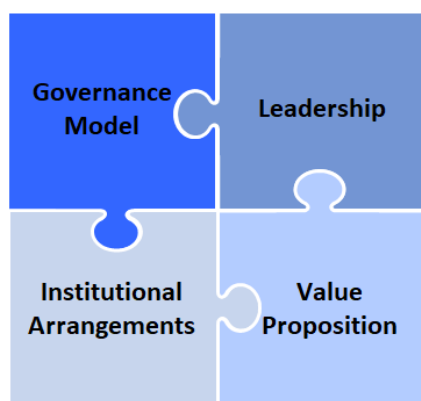
Positive impacts are expected in many parts of the economy, including:

- **Improved public sector efficiency** – of institutions responsible for land administration, property taxation, agriculture, rural and urban development, emergency services, and transport
- **Citizen benefits** – through increased efficiency in road navigation, emergency services dispatch and improved interactions with the public sector, particularly in respect to land transactions and property taxation and the integration of national registers
- **Improvements in agricultural output** – by facilitating agricultural development and improvements in farming processes, and the implementation of precision farming methods
- **Developments in public health** – through improved monitoring of air pollution (a particular source of adverse health effects in children); air pollution is a major environmental health threat and can impose significant costs on the economy
- **Adapting to climate change** – through improved awareness of air pollution, improvements in the assessment of flood risk, and greater resilience to disasters

6. ACTION PLAN

This section sets out the proposed plan and is the “heart” of the document. It is arranged according to the nine strategic pathways of the IGIF. The Action Plan has been harmonized with the EU Twinning project action plan. Where the EU Twinning project actions are repeated, the detail of the actions are not repeated, so readers should refer for task detail to the documents associated with that project.

6.1. Governance and Institutions



*This **strategic pathway** establishes the leadership, governance model, institutional arrangements, and a clear value proposition to strengthen multi-disciplinary and multi-sectoral participation in, and a commitment to, achieving an Integrated Geospatial Information Framework.*

*The **objective** is to attain political endorsement, strengthen institutional mandates and build a cooperative data sharing environment through a shared vision and understanding of the value of an Integrated Geospatial Information Framework, and the roles and responsibilities to achieve the vision.*

6.1.1 Outline of Current Situation

The current situation regarding this Strategic Pathway is the existence of clear institutional arrangements defined in Law. Governance (and Leadership) will underpin the NSDI operating model and will be essential to ensure that the principles of the operating model, when implemented, are maintained over time. Law no 254 from 2016 on National Spatial Data Infrastructure⁷³ governs much of the activity associated with the implementation of IGIF. In terms of Governance and Institutions the Law identifies a coordinating authority, the authority responsible for implementing NSDI policy, a role currently fulfilled by the Agency for Land Relations and Cadastre (ALRC). The Law also identifies a Council for NSDI. While the Law contains no direct reference to a Governance function per se, the Council has been identified as providing a consultative role about NSDI policy (see also Government Decision no 459 of 2017)⁷⁴. While the Law does not specify or describe a governance framework the implementation of this Law, together with the various Government Decisions associated with the Law, provides the necessary political endorsement for the development of a National SDI.

6.1.2 Approach to Strengthening Governance and Institutional Arrangements

The approach for establishing good governance and strong institutional arrangements is centered on achieving several elements. These elements are:

Governance and Leadership. Governance is good. The structure exists but leadership needs to be more active and visible. Effective leadership for this enterprise is considered essential and the operating model must be identified and needs to identify the most appropriate scheme of delegation for the implementation of the National SDI, how community, citizen, and private sector governance will be embedded in the operating model, and consider the form of the operating model (at the current time the

⁷³ https://www.legis.md/cautare/getResults?doc_id=105790&lang=ro

⁷⁴ https://www.legis.md/cautare/getResults?doc_id=114062&lang=ro

operating model is very public sector centric). The issue of Governance is particularly important for establishing and applying the parameters within which the National SDI services will operate. This will include determining service level engagements across several areas (described in Articles 8-13 of the Law), what level of variation between service levels will be acceptable, who determines this, and how these service levels be applied and monitored.

The role of ALRC. While the existence of the Law provides for a form of Governance framework the nature of this framework is not always obvious to the various stakeholders. While the role of ALRC as the coordinating authority for the SDI has been mandated the authority of ALRC is not fully understood. This could be addressed through establishing a Leadership team with a clear mandate for the implementation of the National SDI.

The need for a geospatial strategy. An appropriate strategy would help consolidate the Institutional arrangements provided for in the NSDI Law and help connect the National SDI to other government policy priorities. This would provide structure and direction on where to focus effort and would support the transition from the current situation, which is very dependent on personal relationships, to a more coordinated and regulated arrangement which, in turn, would help support and contribute to a national action plan.

The need for an operating model. During the implementation of the National SDI there needs to be greater clarity on what decisions require approval at the Council level and what decisions can be progressed at the service delivery level, i.e., the coordinating authority role being fulfilled by ALRC. The Law provides a clear strategic view of areas such as Service Collaboration, Data, Interoperability, and such like, together with a set of principles that senior leaders are bought into. This provides a good 'technical' framework for the implementation of the National SDI where exceptions would be through Council level agreement. However, in the absence of an active Council there needs to clear ownership of the 'operating model' by a Leadership team which is visible, engaged, and pro-actively committed to implementing and maintaining a senior level approach to prioritization and decision making.

6.1.3 Actions for Strengthening Governance and Institutional Arrangements

Governance and institutional arrangements and cross-sector information sharing culture are to be strengthened through the following actions:

Action 1.1 Form an SDI Coordination and Project Management team

Support ALRC's role to be the coordination body of the NSDI and associated administrative, secretarial, and managerial tasks.

ALRC will require additional dedicated staff to effectively carry out the NSDI coordination role. There are several roles and responsibilities that the coordination unit will need to deliver. This will require:

- Defining the roles and responsibilities for positions (job descriptions) including a Financial Manager (See Action 3.1) and technical specialists to support government organisations and businesses in both sharing and using data to gain the most benefit
- Recruiting programme management resources to coordinate the NSDI Program
- Monitor progress on activities allocated to the coordination group, in terms of the implementation schedule, cost and quality targets; and alert the Secretariat to deviations from planned delivery of the objectives of the NSDI implementation
- Practical implementation support to NSDI Working Groups

- Arrange reviews of United Nations documents related to global geospatial topics; participate in UN Expert and Working Groups and subcommittees as necessary; and support the preparation for the annual session of the UN-GGIM
- Formulate strategies and produce general standards, policies and guidelines for cross-government data management and access, as well as prepare institutional arrangement guidelines and recommendations

Action 1.2 Re-energize the Geospatial Leadership

Re-energize leadership team with a very clear mandate to drive the implementation of the IGIF Action Plan. The leadership team must have the necessary authority to drive change, to establish and apply the parameters within which the services described in the law will operate, determining, implementing, and monitoring relevant service level agreements, defining the priorities and activities of the working groups, and establishing key performance indicators which will be used to monitor, evaluate, and report progress to the Executive. This team needs to be active and visible. This action incorporates EU Twinning Project objectives 2.2.1 and 2.1.2⁷⁵

Action 1.3 Strategic Geospatial Action Plan embedded in Government Plan

Preparation of a National SDI strategy/geospatial strategy. The strategy should be linked to the National SDI operating model, support the strategic priorities/policy drivers, and provide a clear strategic view of data and service collaboration with a set of principles that senior leaders are bought in to. These principles will act as a decision-making framework.

Action 1.4 Strengthen Institutional Arrangements

Reconsider the composition of the NSDI Council and institutionalize the involvement of the private sector in the NSDI-governance structure.

6.1.4 Key Performance Indicators

The following key deliverables, evidence of achievement and milestones represent the key performance indicators of the Country Action Plan (Table 6.1)

Table 6.1 Key Performance Indicators for Governance and Institutions.

Key Deliverable	Evidence of Achievement	Milestone
Recruit dedicated coordination team and establish responsibilities and targets	Clear Terms of Reference, defined roles and responsibilities, and budget.	Year 1 Quarter 3
Action plan embedded into Government Plan.	Clear references in Government plan with budgetary support.	Year 2 Quarter 1

⁷⁵ EU ENI 2020 Twinning Project: MD 16 ENI OT 01 19 Action Plan of NSDI State Programme 2022-2024 Doc no TWMD-1-122-04

6.2. Policy and Legal



This **strategic pathway** establishes a robust policy and legal framework that is essential for instituting effective, efficient, and secure management and exchange of geospatial information - nationally and sub-nationally.

The **objective** is to address current policy and legal issues by improving the policies and laws associated with, and having an impact on, geospatial information management. This is achieved by proactively monitoring the policy and legal environment, including mandating responsibility for the production of data, and keeping abreast of issues and challenges arising from the evolving, innovative and creative use of geospatial information and emerging technologies.

6.2.1 Overview of Current Situation

The current situation regarding this Strategic Pathway is the existence of the Law 254 from 2016 on national spatial data infrastructures which provides the framework for the implementation of the SDI. This Law, together with various amendments included in 2018, sets the general rules with regard to the establishment of the National SDI and establishes the legal and policy framework for the implementation of the SDI. The scope of the Law is summarized in Section 1.5 of this report.

In terms of this legal and policy framework the study yielded mixed results. There are several low scores from public entities indicating that representatives from some of the stakeholders either have a lack of awareness of the Law or a lack of understanding of the Law or both.

In terms of key activities such as data sharing, data licensing, and data privacy and protection there was reference to the informal agreements which may be in place between public entities. For this to be effective agreements need to be formalized rather than left to individual interpretation. There were comments that these issues would be much more effective if all stakeholders managed their data and shared their data via the data portals, i.e., there is inconsistency in the approach to such data sharing. The legal framework for intellectual property covers all data and is not specific to geospatial data. There are also established processes for data protection which exist through regulations and the legal framework⁷⁶.

6.2.2 Approach to Strengthening the Policy and Legal Framework

Legislation and government decrees provide the legal framework in which the geospatial policies must operate. Moldova is in the very fortunate position that the current legislation (Law 254 of 2016) and associated Government Decisions and Orders⁷⁷ are consistent with international good practice and reflects standards contained within the EU INSPIRE directive.

In addition to the implementation of the Law, ALRC has developed guidelines related to the provision of data and data services. ALRC adheres to the policy of Open Data, spatial data sets and services created by

⁷⁶ <http://www.agepi.gov.md/ro/legislatie/nationale>

⁷⁷ <http://inds.gov.md/transparenta-decizionala/acte-legislative-si-normative>

public entities are available free of charge to the public provided this is for non-commercial purposes. Fees may be charged if the data is to be re-used for commercial purposes, the fees being subject to certain conditions described in the Law. Responsibility (not liability) of public entities for individual spatial data themes are prescribed in government decision 458 of 2017⁷⁸. Responsibilities include the provision of access to the spatial data and services, maintaining the description of the data and ensuring that the themes are current, complete, and available however this is not monitored or enforced. The existence of this Law and associated legislation is a great advantage to the implementation of the SDI. However, the study found no evidence of published regulations regarding the licensing of spatial data⁷⁹. The conditions of use are described in the metadata on National Geoportal (geoportalinds.gov.md) or may be established in individual agreements, with the result that individual institutions can establish individual policies and conditions. This could result in duplication, misinterpretation, and misunderstanding.

To encourage private sector engagement there needs to be certainty on how the data can be used, the limitations, if any, on the use of the data, and costs associated with this use. In terms of the responsibilities of stakeholders it was reported that, while there are some guidelines, the stakeholders have no defined terms of reference which specify the responsibilities of the individual stakeholders. A consequence of this is the risk of lack of consistency in stakeholder engagement.

6.2.3 Actions for Strengthening the Policy and Legal Framework

The Policy and Legal Framework, related to geospatial information management, access and use, can be strengthened through the following actions:

Action 2.1 Adjusting the regulatory framework for the establishment, development, and maintenance of the NSDI

Adjusting the regulatory framework for the establishment, development, and maintenance of the NSDI to the current requirements and principles of INSPIRE Directive. Incorporates EU Twinning Project objective 1.1

Action 2.2 Establishing the tariffs (costs) for spatial data network services

Developing the draft Government Decision on the Methodology for forming tariffs (costs) for spatial data network services as well as determining/updating costs for spatial data network services created by responsible public entities. Incorporates EU Twinning Project objectives 1.2.1 and 1.2.2

Action 2.3 Development of a data licensing regulations

Establish regulations regarding the licensing of spatial data. Clarify the rules/conditions for using geospatial data by the private sector. The private sector needs to understand how the data can be used, what are the limitations if any on the use of the data, and costs associated with this use. Incorporates EU Twinning Project objective 4.2

Task Outline

⁷⁸ https://www.legis.md/cautare/getResults?doc_id=114061&lang=ro

⁷⁹ https://kartverket.sharepoint.com/:x:/r/sites/MoldovaLIGIF/Delte%20dokumenter/General/4-New%20Diagnostic%20Tools/Completed%20Diagnostic%20Templates/1_IGIF_DT_EN_ALRC_IP_JC_DR_v2.xlsx?d=w044a8f185708448b97cb22ac9eb8e572&csf=1&web=1&e=WgNNAe

Engage an external consultant to work with ALRC to:

- Review the current policies and laws relating to pricing and licencing of government data.
- Draft a Pricing and Licencing Framework for fundamental and thematic geospatial information that is:
 - Aligned to the vision of the NSDI and the ability to achieve the stated goals
 - Government accountability/mandates particularly in regard to open data
 - Considers public interest, research and development needs, and the current marketplace
- Validate the proposed framework with stakeholders

Action 2.4 Strengthen Data Sharing Agreements

Although official guidelines for sharing/releasing geospatial information are provided in the context of the NSDI Law, only a few organizations have the knowledge, skills, and resources to apply them appropriately. Incorporates EU Twinning Project objective 2.3

Action 2.5 Create and Operationalize "All of Government" Procurement Policy for Geospatial services and data

Having a centralized procurement policy will provide opportunities for saving on expenditures.

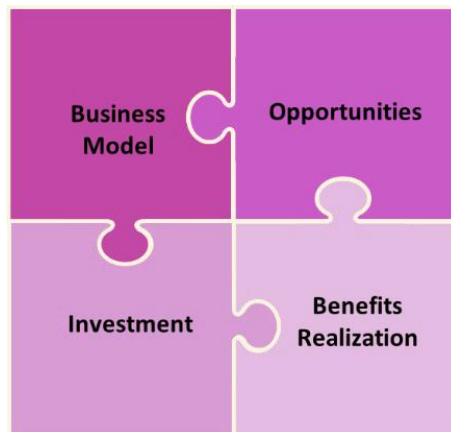
6.2.4 Key Performance Indicators

The following key deliverables, evidence of achievement and milestones represent the key performance indicators of the Country Action Plan (Table 6.2)

Table 6.2 Key Performance Indicators for Policy and Legal.

Key Deliverable	Evidence of Achievement	Milestone
Data licencing framework in place.	A contractual framework published and adoption for existing and new users is operational.	Year 2 Quarter 4
Data sharing guidelines are published.	A template set of contracts have been drafted and are available for use by parties sharing data.	Year 2 Quarter 4

6.3. Financial



*This **strategic pathway** establishes the business model, develops financial partnerships, and identifies the investment needs and means of financing for delivering integrated geospatial information management, as well as recognizing the benefits realization milestones that will achieve and maintain momentum.*

*The **objective** is to achieve an understanding of the financial plans required to establish and maintain an integrated geospatial information management, as well as the longer-term investment program that enables government to respond to evolving societal, environmental and economic demands for geospatial data.*

6.3.1 Overview of Current Situation

The current situation regarding this Strategic Pathway is that Moldova has been successful at accessing external funding. There has been, and continues to be, excellent collaboration with various international donors, such as the Norwegian Mapping Authority, European Commission, US AID and World Bank, all of which have provided funding for projects which support the implementation of the National SDI. However, outside of the various donors, there appears to be a lack of a cohesive and consistent understanding of how the implementation of the National SDI will continue to be financed and, at present, there is no business model supporting the National SDI.

The concept of a central function for the financial management to support the implementation of the National SDI is missing. There is no single authority with financial responsibility and accountability for ensuring investment in the National SDI is identified, is appropriate, is achieved, and is sustainable. ALRC is the coordinating authority with responsibility for implementing policy relating to the National SDI, but this role does not have any stated financial responsibility provided for in the Law.

Additionally, while individual public entities have been identified as the responsible entities for specified data themes, the funding needed to sustain this needs to be secured annually from the government. Each entity has to seek funding from central government and provide appropriate justification. Where this funding is needed to support any National SDI/geospatial activities or projects there is the possibility of multiple projects having similar objectives with the risk of duplication of effort.

6.3.2 Approach to Strengthening the Financial Framework

The approach for strengthening the financial framework is centered on achieving a number of elements which are outlined below.

Moldova has been very successful at securing external investment to support its SDI initiative however there is a demonstrable lack of leadership in securing internal investment. External investment is good, but it is highly dependent on external donors maintaining their commitment and this represents a risk. Securing the necessary internal investment to facilitate the implementation and ongoing support of the SDI initiative should be one of the priorities. Considering this more broadly, from the perspective of the private sector it is reported that at present there is no sustainable business model based on data

associated with the National SDI programme. While reference data is readily available, it was reported that initiatives to provide enhanced data based on pricing via a basic plan, standard plan, premium plan, or enterprise plan, method has failed. The reason provided is that this model is dependent on the provision of bulk data and, it was reported, at present there is no market for bulk data.

Additionally, while there is some understanding of the opportunities to be offered as an outcome of the implementation of the National SDI these opportunities, where they exist, have not been exploited due to a lack understanding of the potential benefits to be gained through the implementation of the National SDI. There is no evidence of any assessment or evaluation of potential revenue streams which may become available because of the implementation of the National SDI.

Another key factor is that the private sector needs to know the 'rules of the game' to ensure there are no surprises. If the private sector is to realize the benefits of the SDI there needs to be clarity and certainty on how the data can be used and what the limits on this use are. If private sector investment is going to be encouraged, and the potential benefits of SDI realized, there needs to be confidence that the rules are consistent and that the public sector, which provides the framework within which the SDI will operate, needs to have a good understanding and appreciation of the needs of the private sector.

The government has committed to investing and financing the National SDI for activities related to data creation, sharing, maintenance and associated services. The Law identifies which agencies are responsible for which data themes and the financing (in theory) is available through the budgets of the individual entities, however, there is no evidence of a coherent approach to this.

6.3.3 Actions for Strengthening and Sustaining Geospatial Investments

The Financial Framework for the National SDI will need to be formulated to stimulate a well-developed geospatial economy with a vibrant geospatial product and services market. Such a sustainable business model can be achieved through the following actions:

Action 3.1 Develop a Sustainable Business Model for SDI

Develop a suitable business model and implement.

Task Outline

- agree the budget needed to support the implementation of the National SDI
- identify options for how this will be funded
- re-state the potential benefits to be realized (reference to the socio-economic impact assessment investment plan)
- create business plan covering the initial three years of the National SDI.

This incorporates EU Twinning Project objectives 4.1.1, 4.1.2.

Action 3.2 Commission Sustainability Strategy for cover withdrawal of donor support

The strategy needs to outline plans for ongoing support of existing products and services currently covered by donor agencies so that the gains made are not lost.

Task Outline

- Develop tender specification for sustainability report
- Tender and appoint contractor
- Implement recommendations

Action 3.3 Measure and Document Benefits Realization

Define the key performance indicators (KPI’s) and how these will be measured.

Task Outline

- Review recommended KPIs embedded in this document
- Agree with SDI financial manager how these will be measured
- Implement measurement and reporting process
- Review regularly by Council to guide on-going priorities

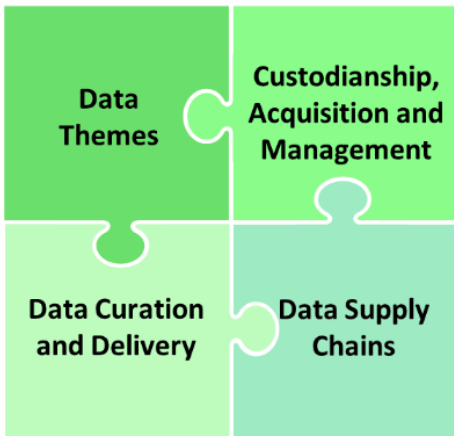
6.3.4 Key Performance Indicators

The following key deliverables, evidence of achievement and milestones represent the key performance indicators of the Country Action Plan (Table 6.3)

Table 6.3 Key Performance Indicators for Financial

Key Deliverables	Evidence of Achievement	Milestone Date
NSDI Business Model established and business plan in place.	Options evaluated and chosen model is agreed. The initial business plan is in place.	Year 1 Quarter 2
Key Performance Indicators (KPIs) operational.	KPIs are agreed, processes are in place for their measurement.	Year 1 Quarter 3

6.4. Data



This strategic pathway establishes a geospatial data framework and custodianship guidelines for best practice collection and management of integrated geospatial information that is appropriate to cross sector and multidisciplinary collaboration.

The objective is to enable data custodians to meet their data management, sharing and reuse obligations to government and the user community through the execution of well-defined data supply chains for organizing, planning, acquiring, integrating, curating, publishing, and archiving geospatial information.

6.4.1 Overview of Current Situation

The current situation regarding this Strategic Pathway is that the government fundamental geospatial and statistical data holdings are well organized and mainly conform to the UN-GGIM recommended fundamental themes. In terms of the fundamental data themes, the data custodians have been partly allocated/mandated with the responsibility for the management of their data with the consequence that only few agencies fully comply with existing guidelines and have implemented the required responsibility.

Very few organizations have a Data Quality Management (DQM) plan, and so quality dimensions are poorly monitored. In order to ensure the quality of spatial data services, Government Decision nr 737/2017 on rules for creating of network services for spatial data has been established. However, only a very limited number of data/service providers have the resources to fulfill these requirements. Data exchange is not properly formalized at a national level, so agreements have mainly been based on individual/ad hoc basis and interoperability issues are common.

There is a common national geodetic datum reference, projection and co-ordinate system (MOLDPOS/MOLDREF99), where associated information is easily accessible and used by the majority of stakeholders.

The management quality of geospatial information differs significantly among the NSDI-stakeholders organizations. For example, some entities capture and/or maintain their data within their care, meanwhile others do not invest much in their data capture/maintenance. This means that several duplicated datasets still exist, however there are initiatives to resolve this costly overhead for some data themes (such as aerial imagery). Metadata are maintained for most datasets, but not for all datasets.

6.4.2 Approach to Strengthening the NSDI Data Management Framework

The approach for promoting consistent data management, data sharing, and data reuse is centered on achieving four key elements, having the appropriate data themes, having a consistent process for the collection, management, maintenance, and dissemination of 'fit-for-purpose' data, a culture of cooperative data sharing and integration (data supply), and maintaining the value of the data and delivering it to end users in a way it can be visualized and used, the most common method being via a portal.

While the data framework in Moldova is very good, with many of the fundamental geospatial and statistical data holdings being well organized and (for the most part) aligned with the INSPIRE Directive, more attention needs to be applied to data quality data release, and data custodianship. Other areas of weakness are data interoperability, data supply chain and data gap analysis, and the high diversity of data theme roadmap, data capture and data acquisition.

Few of the fundamental data themes are managed according to a so-called Data Quality Management (DQM). A suitable DQM plan will help provide information that is fit-for-purpose. Additionally, although there are guidelines for sharing/releasing geospatial data (provided in the context of the NSDI Law), only a few organizations have the resources to apply them appropriately.

Data custodianship has been partly assigned, and guidelines for this exist, but only a few agencies are compliant. In the context of data interoperability, relevant data models comply with a national standard and are curated and aggregated at a national level, there are only a limited number of available data sets integrated and used.

There is also a need to have a consistent and systematic approach to the supply of geospatial data (the data supply chain). Much of the data supply has been established on an individual (between agencies) or an ad-hoc basis. This means that the governance of data supply is arbitrary and fragmented leading to inefficient data exchange processes.

Finally, the organizational diversity in terms of data theme roadmap, data acquisition, data curation, and data delivery is high and the risk of data duplication is an issue.

6.4.3 Actions for Strengthening the Data Management Framework

Action 4.1 Maintain the National Orthophoto-maps

The value of data is directly related to its currency. This action would implement the process of continuous revision of orthophoto maps for territory of Moldova, excluding Transnistria.

Task Outline

- Undertake planned aerial refresh as budgeted in 2022
- Re-design processes to reflect outcome of tendered current consultancy
- Implement continuous revision using change detection and drone technologies to supplement comprehensive aerial or satellite refresh

Action 4.2 Change Detection

Change detection is required to make continuous revision more effective. Services are now available from commercial suppliers to detect real world change for fundamental themes included in topographic base mapping. These services use satellite imagery making them cost effective in determining where updating is required.

Task Outline

- Evaluate market offerings
- Invite bids from identified parties
- Implement process to use results to guide revision program

Action 4.3 Revision of National Topographic Base maps (vector line maps)

Maintenance of the topographic basemaps (line maps) derived from aerial imagery provided under the Kartverket contract. This task is linked to the continuous revision outlined in Action 4.1.

Action 4.4 Maintain the National Register of Addresses

Maintenance of the address register will need to include a process for harvesting data from the local public authorities.

Task Outline

- Complete the Street Address database; this task will require working closely with municipalities
- Undertake Ongoing Operation and Maintenance of address database

Action 4.5 Complete the Cadastre/Land Registration

Continuation of the LRPVP Project (completion now forecast to be end 2025). The following outlines the tasks identified for the completion of the primary mass registration project. For a full description of the tasks reference the implementation guide published by the Agency for Public Services (PSA)⁸⁰ and the workflow outlined in Annex 20 of the guide⁸¹.

Task Outline

- Establish the boundaries of the various administrative and territorial units

⁸⁰ <https://www.asp.gov.md/en/pief/acte-normative-proceduri-de-executie/ghiduri>

⁸¹ https://www.asp.gov.md/sites/default/files/main-page/Gidului_Practic_.pdf

- Establish the boundaries of the built-up areas of the localities
- Preparation of the preliminary materials required for the initiation of the cadastral work including collating the various parameters required for the identification and valuation of the property
- Execution/demarcation of the cadastral works for the purpose of delimiting the properties/parcels
- Quality review and verification
- Public consultation
- Approval of materials
- Receipt of the cadastral works
- Registration
- Maintain Cadastre and Land Ownership Register

Action 4.6 Transport Data Integration

Develop and implement the process for data sharing between the road agency and the SDI. The roads agency has well developed data of the main trunk roads and local authorities have similar data for local roads. This data could be supplied to ALRC to reduce the effort required to maintain the topographic basemaps.

Task Outline

- Setup a working group between ALRC and the Roads agency
- Research examples of good practice such as in Sweden and Norway
- Investigate practical issues of data sharing, such as accuracy specifications and update frequency
- Pilot the electronic exchange of data in a limited area
- Roll-out to all parts of the country
- Extend the scope to cover other transport datasets

Action 4.7 Create Digital Twin for Urban Centers

Develop and implement a digital twin for urban centers. City centers have been partly created in Chisinau and Orghei but need to be further developed. Full digital twin mesh models support multiple purposes including public engagement, construction permitting, pollution monitoring, and valuation for taxation, amongst other use cases.

Task Outline

- Setup technical working group between ALRC, CALM and US AID with representation from key candidate early adopters Chisinau and Orghei municipalities
- Research examples of good practice, including Helsinki and Oslo cities
- Establish a simple business case outlining the strategic and financial benefits of sharing
- Create a tender specification for data acquisition and processing, management and visualization software and training
- Select contractor and implement

Action 4.8 Maximize the use of GNSS

A strong geodetic network has been developed; promote the further usage of this through investigation of the current licensing model and opportunities for 'free to use'.

Task Outline

- Collate data about market requirements and current usage.

- Create a business plan for long-term sustainability

Action 4.9 Complete the Land Use/Land Cover Map of Moldova

This helps to meet EU Accession criteria by joining CORINE network to monitor land degradation. This in turn will provides better access to EU green deal funds. An accurate land use map which is kept up to date will also assist the property tax criteria by creating a more accurate property valuation system.

Task Outline

- Sign agreement accepting EU proposal
- Put in place resources to process the data once supplied
- Make available to interested agencies via the geoportal or EU service

Action 4.10 Integrate the Water and Sewage Databases with the SDI

Water authorities have geospatial data to support their operations and have indicated a willingness to share as part of the SDI initiative. This task would involve working with the water companies to develop and implement the process for the integration of these data themes into the SDI.

Task Outline

- Create a working group with water authorities to examine the practical issues of sharing, this will include access control to sensitive data but also currency and quality issues
- Establish a simple business case outlining the strategic and financial benefits of sharing
- Design the processes to share data
- Pilot sharing in a limited area
- Roll-out to national scale

Action 4.11 Establish and Operate a Centre of Excellence for Satellite Imagery

Existence of use cases related to emergency management, urban planning, army topographic mapping, precision agriculture, forestry management, land management/land relations.

Task Outline

- Assemble key stakeholders to form a policy group
- Agree role and resourcing
- Present proposals to Government

Action 4.12 Develop Geo-statistical Analysis capabilities

Implement best international practice using Global Statistical Geospatial Framework (IGIF for Statistics).

Task Outline

- Arrange briefing by international experts for ALRC, Statistics and other key stakeholders on best practice and available resources.
- Investigate special arrangements for Esri geo-statistical software that have negotiated with UN GGIM
- Pilot project to prove process flow-lines
- Implementation to coincide with next census round

Action 4.13 Closer Integration with Emergency Services

The socio-economic impact assessment has demonstrated the high value of closer collaboration between ALRC and emergency situations agency.

Task outline

- Form working group between agencies
- Develop project plan for closer integration
- Prepare business case for additional resources including funding of additional tablets and software to fully equip all vehicles
- Phased implementation to coincide with enhancement of National Address Database

Action 4.14 Enhancements to the Geoportal

Ensuring the network service (as derived from the EU Twinning project). Maintenance of discovery and view services, creation of download services, publication of spatial data CLC 2000, 2018 (Corine Land Cover), and Modernization of spatial data infrastructure moldova-map.md on MCloud platform. Incorporates EU Twinning Project objective 3.3.

Action 4.15 Enhancing Metadata Catalogue on the Geoportal

Updating Metadata Catalogue on NSDI Geoportal, increasing the number of metadata record for harmonized spatial data sets and network services on the Geoportal. Incorporates EU Twinning Project objectives 3.4 and 3.5.

Action 4.16 Analogue to digital conversion and georeferencing of spatial data /products

Analogue to digital conversion and georeferencing of spatial data /products. Develop specification and methodology and convert 5 datasets per annum over 2 years. Incorporates EU Twinning Project objective 3.1.

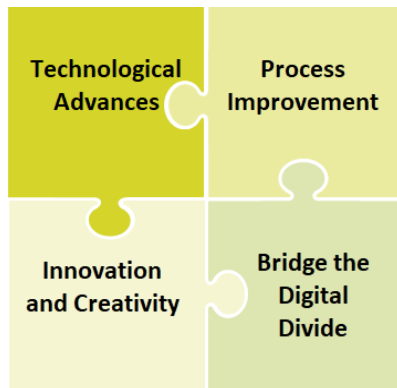
6.4.4 Key Performance Indicators

The following key deliverables, evidence of achievement and milestones on the highest priority tasks represent the key performance indicators of the Country Action Plan (Table 6.4)

Table 6.4 Key Performance Indicators for Data.

Milestone	Evidence of Achievement	Expected Achievement Date
New aerial imagery acquired and orthophoto maps, produced and disseminated.	Available through geoportal to all stakeholders.	Year 1 Quarter 4
Continuously updated National Address Database full operational and widely disseminated	Five additional organisations taking continuous feeds of the database via API and using as their master address source.	Year 2 Quarter 2
Completion of land cadastre.	Data publicly available	Year 4 Quarter 4.
Digital Twin for central area of four cities completed.	Data publicly available and software for its use available. Plans for maintenance in place.	Year 5 Quarter 4

6.5. Innovation



*This **strategic pathway** recognizes that innovation has the potential to stimulate, trigger and respond to rapid change, leapfrog outdated technologies and processes, and to bridge the geospatial digital divide. Technology is continually evolving, creating new opportunities for innovation and creativity.*

*The **objective** is to leverage the latest cost-effective technologies, innovations and process improvements so that governments, businesses and academia, no matter their current situation, may leapfrog to modern geospatial information management systems and practices.*

6.5.1 Overview of Current Situation

The current situation is that there are examples where innovation is being used and continues to be used, in support of geospatial activities. However, this innovation tends to be done on an individual basis by individual stakeholders or private sector and does not represent a coordinated approach on behalf of the government. While there is no geospatial or SDI specific innovation group or innovation laboratory, Moldova does have the National Agency for Research and Development⁸². This Agency provides for research, innovation, and development generally and is available for specific sectors. Of relevance to the National SDI is the Technology Working Group⁸³. This WG has responsibilities for the technical aspects of implementing the National SDI and falls within the remit of ALRC however there is no evidence that this WG is a conduit for research or innovation.

Moldova has a very well-developed ICT infrastructure which will facilitate the implementation of the National SDI. The geoportals are well established but there is no evidence of a national strategy for geospatial digital transformation. There is the national strategy 'Digital Moldova 2030'⁸⁴ published in 2018, which describes a number of sustainable development objectives, but the strategy does not specify geospatial data or services. There is no evidence of any formal investment for geospatial innovation projects or innovation hubs actively managing and communicating information. SE INGEOCAD is reported to be active in this respect however the feedback from INGEOCAD is that there is no formal program but that this may be planned in the future.

The institutional governing body in charge of several e-services in Moldova is the E Government Agency⁸⁵. The Agency was established in 2010 and has a remit to transform government services through the application of ICT and this includes the modernization of services through re-engineering and digital transformation. While the work of E-Government is not directly linked to geospatial innovation, its strategic goals⁸⁶ will provide support for the implementation of the National SDI. For example, the MConnect platform provides for interoperability between information systems and currently includes

⁸² <https://ancd.gov.md>

⁸³ https://www.legis.md/cautare/getResults?doc_id=120942&lang=ro

⁸⁴ <https://moldova.un.org/en/15729-national-development-strategy-moldova-2030-approved-government>

⁸⁵ <https://egov.md>

⁸⁶ <https://egov.md/en/about#affix-target-1>

linking cadastral information from the Agency for Public Services with information from Real Estate Registry.

6.5.2 Approach to Stimulating Innovation in Geospatial Information Management

The approach to stimulating the use of the latest technologies, process improvements and innovations will be dependent on making use of advances in technology, continuous improvements in operational processes, and targeting investments in science and technology to generate economic growth.

An appropriate Innovation Framework would support and help to stimulate the use of the latest technologies, process improvements and innovations. To progress this the SDI Council should work with National Agency for Research and Development to embed geospatial concepts into the national approach to innovation. This would encompass the ideas set out in the Moldova IGIF Baseline Diagnostic Report 2021 v1.0 (available from ALRC). Such an approach can help support the development of geospatial strategy and help implement and embed government policies as the government develops its operating model and ways of engaging with the private sector. Resources 'seconded' to support national innovation initiatives could help translate the needs of their individual agencies into functional requirements which can be examined objectively and without bias. It is important that the approach is seen to be agency or service 'agnostic' and focused on developing best practice. This is needed to ensure a consistency of approach across the spectrum of the National SDI as well as developing the relationships needed to develop a culture of innovation and collaboration. Additionally, leading on technical research and innovation, the governing council could investigate opportunities for commercialising some of the services provided through the National SDI. This should be in collaboration with private sector partners, would be some way into the future, but should be an aspiration.

6.5.3 Actions for Stimulating Innovation in Geospatial Information Management

Action 5.1 Annual Technology Tracking Review

Technology continues to evolve which will create new opportunities for innovation and creativity. Maintaining an awareness of these development needs to become business as usual will provide an environment for Moldova to leverage the opportunities presented.

Task Outline

- Time allowance for continuous scanning by senior staff in ALRC of technical press to track general trends
- Annual review supported by an International Geospatial Technology expert for annual review against objectives of the Action Plan

Action 5.2 Implement a Coordinated Approach to Geospatial Innovation

There are initiatives within Moldova focused on innovation but there appears to be little connection with geospatial, in either the use of SDI data or technology. Open access to fundamental geospatial data for start-ups and researchers would help to stimulate innovation in the sector.

Task Outline

- ALRC to open a dialogue with the National Agency for Research and Development to ascertain what access would assist start-ups

- Regular sponsor of a geospatial innovation campaign featuring a hackathon or similar event focused on start-ups companies, with a theme related to some of the use cases which are economically significant to generate new geospatial applications

Action 5.3 Incubate Geospatial Start-ups

For the NSDI to be successful in the long-term, the Action plan needs to make provision for investment in the incubation of geospatial start-ups. Although there is limited scope to make major growth in Moldova as the potential market is small, these start-ups could use NSDI data to prototype software solutions that could be marketed internationally. This might also help to reduce the move of the “best brains” overseas.

Task Outline

- Provide the winners from such events with free technical support to develop promising ideas identified through hackathons into viable products (see Action 5.2)
- Actively seek to cooperate with the Open Street Map (OSM), offering them support in return for active identification of errors and omissions in national datasets
- Recruit university researchers to work on projects that advance the aspirations in this Action Plan

6.5.4 Key Performance Indicators

The following key deliverables, evidence of achievement and milestones represent the key performance indicators of the Country Action Plan

Table 6.5 Key Performance Indicators for Innovation

Milestone	Evidence of Achievement	Expected Achievement Date
Integration of geospatial into national innovation programme.	NSDI data used in at least one national innovation campaign.	Quarter 2 Year 3
Local start-ups generating apps based on NSDI data.	One start-up incubated (actively supported) by ALRC reaches turnover of MLD 1 million per annum.	Quarter 2 Year 4.

6.6. Standards



*This **strategic pathway** establishes and ensures the adoption of best practice standards and compliance mechanisms for enabling data and technology interoperability to deliver integrated geospatial information and location-based knowledge creation.*

*The **objective** is to enable an efficient and consistent approach for different information systems to be able to discover, manage, communicate, exchange, and apply geospatial information for a multitude of uses, improved understanding and decision-making.*

6.6.1 Overview of Current Situation

The current situation regarding Standards is based on the Law 254 from 2016 and is strongly aligned with the EU INSPIRE Directive. National data standards and technical specifications have been defined for the geospatial domain. Initiatives have been taken to establish a community of practice to share skills, knowledge, and experiences about the implementation of standards. Additionally, Moldova is nationally represented on the international Standards Development Organizations, such as ISO and CEN. However, there is still no centralized/consistent approach for different existing information systems to be able to discover, manage, communicate, exchange, and apply geospatial information for a multitude of uses and decision-making. So far, the adoption of best practice standards and compliance mechanisms for enabling data and technology interoperability is still limited, there is no proper system of compliance in use to ensure that organizations are correctly implementing nationally or internationally endorsed standards. Moldova does have the Institute for Standardization of Moldova (ISM), which is responsible to ensure the access to the international standards, however, a specific Working Group focusing on geospatial standards is currently not operational. The Government Decision on interoperability 683 from 2018 establishes a list of standards that need to be applied for relevant geospatial data themes and related services⁸⁷.

6.6.2 Approach to Strengthening the Standards Framework

The approach to establishing best practice standards includes the need for standards policy and governance, having an interoperability framework which is effective, and the need for compliance to this. Despite the constructive work completed on the implementation of the INSPIRE data specifications, interoperability at the technical, semantic and organizational levels remains a problem with the consequence that a very limited number of datasets are exchanged across the country and that information systems operate in isolation from each other. Another area for consideration is that of standards compliance. A system of compliance needs to be implemented to monitor organizational use and compliance with nationally or internationally endorsed standards.

To date the national need for geospatial information management standards has not been undertaken, priorities have not been agreed or an on-going review process has still not been established. There is a need to establish/develop/review/endorse a standards strategy, the development of a common framework of national data and technology standards. While most of the responsible public data providers are aware about standards, they need to use there is no active awareness program that raises,

⁸⁷ https://www.legis.md/cautare/getResults?doc_id=108815&lang=ro

advocates, and promotes the principles, values, needs and benefits of geospatial data and technology standards (this is despite the existence of Government Decision 683 from 2018 on the interoperability of spatial data sets and services⁸⁸).

If the National SDI is to be effective then effort needs to be invested in standards leadership, active standardization awareness programs, and the implementation of a robust compliance system.

6.6.3 Actions for Strengthening the Standards Framework

Action 6.1 Establish a Working Group on Standards

Working group under the governing Council, to deal with issues related to not only technical standards but also compliance with standards and where necessary creation of regulation, needs to be established. The World Bank has already identified this area as one where it is willing to assist with funding consultancy support.

Task Outline

- Council to agree terms of reference
- Appoint chairperson, ideally from academia or the user community, and invite key stakeholders from both public and private sectors to propose members
- Engage with the Institute for Standardization to agree scope for working group and relationship to other Institute bodies
- Agree work plan with interoperability and data specifications as key early deliverables

Action 6.2 Develop Data Specifications for Spatial Data Sets and Products

The transposition of technical specifications for spatial data sets which are part of annexes 1, 2 and 3 of the Law 254/2016; development of technical specifications for other types of spatial data sets/products. Incorporates EU Twinning Project objective 3.2.

Action 6.3 Implement International Standards

The adoption of appropriate International Standards (notably from OGC or ISO) to be the default approach for all types of standards.

Task Outline

- Recruit an international standards consultant to recommend and identify appropriate standards to support the implementation of all elements of the Action Plan; the consultant will report to the Working Group

⁸⁸ https://www.legis.md/cautare/getResults?doc_id=108815&lang=ro

Action 6.4.1 Establish Common Data Quality Standard

Establish, maintain, and monitor compliance with common data quality standards based on relevant international standards (ISO and OGC-standards). The international standards consultant will also assist in the definition of this standard.

Action 6.4.2 Implement a Data Quality Management Plan

Prepare and implement a Data Quality Management (DQM) plan that assures information is fit-for-purpose.

Action 6.5 Improve Interoperability through Development of APIs

In terms of interoperability, some data models comply with a national standard and are curated and aggregated at the national level, but there are only a very limited number of available data sets integrated and used (see also geoportal development Action 4.14).

6.6.4 Key Performance Indicators

The following key deliverables, evidence of achievement and milestones represent the key performance indicators of the Country Action Plan (Table 6.6)

Table 6.6 Key Performance Indicators for Standards

Milestone	Evidence of Achievement	Expected Achievement Date
Standards Working Group formed and operational.	Terms of Reference agreed, membership agreed, international consultant selected, and tangible outputs delivered.	Year 1 Quarter 2
Needs Assessment into Data Quality and Technology Standards completed	Standards Review Document Inventory of standards in use and Gap Analysis Stakeholder communications relating to standards and stakeholder feedback.	Year 2 Quarter 4

6.7. Partnerships



This **strategic pathway** establishes cross-sector and interdisciplinary cooperation, coordination and collaboration with all levels of government, the geospatial industry, private sector, academia, and the international community, as an important premise to developing and sustaining an enduring nationally integrated geospatial information framework.

The **objective** is to create and sustain the value of geospatial information through a culture based on inclusion, trusted partnerships and strategic alliances that recognize common needs, aspirations and goals, towards achieving national priorities and outcomes.

6.7.1 Overview of Current Situation

The current situation can be characterized as good in terms of cooperation, coordination and collaborations between public sector institutions (including academia) which helps to reduce duplication and costs in the delivery of their services, but public-private partnerships are still underdeveloped. International collaborations on geospatial information management have been initiated and are active and on-going (see e.g., cooperation agreements with Norwegian Mapping Authority (ALRC), Twinning project of the European Commission (ALRC), and Erasmus+ projects (Technical University of Moldova, Tiraspol State University).

Active citizen participation in geospatial information management where individuals and community groups are involved in geospatial information projects is still rather limited – but there are positive exceptions (see Orghei city and OpenStreetMap). Stakeholder representatives are members of NSDI Working Groups and actively participate at the SDI events including workshops, conferences, round tables, and training. Several international collaborations have been initiated and are active and on-going (e.g., EuroGeographics, FIG, EUREF, EUPOS memberships, projects with the Norwegian Mapping Authority and the EU).

6.7.2 Approach to Strengthening Partnerships

An approach for establishing a suitable partnership framework is required to create and sustain the value of the National SDI. The framework needs to include further cooperation and collaboration (public, private, and academia), continued international cooperation, and citizen engagement. The approach needs to raise the awareness around public private partnering and the opportunities this may offer. While collaboration between public sector agencies is common, and generally very well supported, there is a need to promote and encourage partnering between the public and private sector. A key issue identified by private sector stakeholders was attracting public sector investment. Achieving funding for prototyping or undertaking proof of concept work was said to be 'challenging'. It was reported that there is a reluctance on behalf of the public sector to engage in prototyping initiatives as it was regarded as outside 'normal' business. This needs to change, for example, where prototyping is deemed as desirable this could fall within the remit of a Centre of Excellence.

6.7.3 Actions for Strengthening Partnerships

Action 7.1 Strengthen the Partnerships between Public Sector Stakeholders

Many of the public sector stakeholders operate in silos, developing the partnering strategy will help secure active stakeholder engagement and encourage greater commitment from these stakeholders. Incorporates EU Twinning Project objectives 2.2 and 6.3.

Action 7.2 Establish Partnerships with Private Sector Stakeholders

There is a need to promote and encourage greater engagement with the private sector with the aim of establishing public private partnerships (PPP) where opportunities for this exist or can be created.

Task Outline

- Form an advisory group of private sector business experts within the NSDI governance structure
- Set Terms of Reference for this group to discuss what the Government can do encourage private sector businesses to invest in the NSDI
- Identify and implement pilot public-private partnership
- Incorporate proposals for public-private partnerships into NSDI business plan

Action 7.3 Engage more widely with International Bodies

Moldova is engaged in UN GGIM and has a very good profile and reputation for contributing to other international initiatives, such as FIG. However, currently the representation tends to be focused very strongly on ALRC whereas it would be beneficial if the opportunities for engagement were more widely shared across multiple agencies.

Task Outline

- Prioritize involvement with bodies which are most relevant to NSDI development
- Widen the choice of representatives representing Moldova to include other stakeholders, such as Statistics

6.7.4 Key Performance Indicators

The following key deliverables, evidence of achievement and milestones represent the key performance indicators of the Country Action Plan (Table 6.7).

Table 6.7 Key Performance Indicators for Partnerships.

Milestone	Evidence of Achievement	Expected Achievement Date
Membership of Governing Council and Working Groups widened to include private sector.	All bodies in Governance structure have at least two private sector members.	Year 1 Quarter 2
Representation on International bodies widened.	Representatives from at least 3 different organisations attend UN GGIM events.	Tear 2 Quarter 1

6.8. Capacity and Education



This **strategic pathway** establishes enduring capacity development and education programs so that the value and benefits of integrated geospatial information management is sustained for the longer term.

The **objective** is to raise awareness, build and strengthen knowledge, competencies, skills, instincts, processes, resources, and innovative entrepreneurship that organizations, communities and individuals require to utilize geospatial information for evidence based decision-making and effective service delivery.

6.8.1. Overview of current situation

The current situation regarding this is that awareness about the benefits and value of geospatial information has been raised across key decision makers, institutions in government, and also across the education sector, for example, there is a NSDI Working Group on Capacity and Education and ALRC have provided various workshops and seminars. Additionally, there are courses at universities offered to develop the geospatial information management competencies and skills required by the geospatial information sector workforce. There have been a few, embryonic innovation programs, available in the country with the aim of stimulating entrepreneurship, but with mixed results. The downside is that there are very few technical and professional training, lifelong learning, or internship development opportunities in geospatial information management offered by professional associations. Opportunities for continual professional development for staff would help develop and sustain geospatial information management capabilities.

6.8.2 Approach to Establishing the Capacity Building and Education Program

The approach for establishing enduring capacity building programs and education systems needs to include an awareness for the need for these programs, for continued formal education, and the need for opportunities for continued professional development. This needs to include an inventory of existing competencies, identifying priority areas for development, together with a capability and capacity assessment.

There is a need for appropriate outreach awareness programs with the aim of promoting the principles, needs and benefits of geospatial information. In the context of the EU Twinning project, ALRC executed several outreach initiatives, including online courses. In addition, the universities have organized several GIS seminars, conferences, and extra curricula courses, but there is a need to build on these.

An inventory of knowledge, skills, and resources associated with geospatial information management is required. The development of such an inventory would catalogue the capacity development, education policies, programs, and resources (technological, financial, and human) that are currently in place and help inform future needs and contribute to the development of a capacity development and education strategy (the Working Group on Capacity and Education has expressed the need for establishing such a strategy). The study also identified that many of the current educational courses offered by the

universities are not tailored to the current demands from the stakeholders. Many stakeholders reported that they are required to invest in capacity building for their own staff for which resources are not always available. Additionally, there is a need to look at the opportunity to encourage and promote geospatial literacy in primary and secondary education.

Finally, developing an understanding of the benefits of continued professional development needs to be encouraged and developed.

6.8.3 Actions for Establishing the Capacity Building and Education Program

Action 8.1 Re-energize the Working Group on Capacity and Education and Form a Relationship with the Ministry of Education

To understand the industry needs, NSDI Council should fund the undertaking of a capability and capacity assessment (a gap analysis of skills and resources) and link this to Government strategies for staff retention.

Task Outline

- Reform Working Group – invite new members and replace those that don't contribute; this should include representatives of all stakeholders, not just academics
- Commission "skills gap analysis" study with support from an international consultant to determine industry needs in terms of skills and experience
- Discuss results with academic sector to find long and short-term potential solutions including curriculum adjustments and new staff

Action 8.2 Encourage Universities to Teach Geospatial to other Disciplines.

The use of geospatial information is growing rapidly, students and researchers in many different disciplines need to be taught the basics of geospatial data management and analysis. Universities specializing in Geospatial science need to be encouraged to develop a multi-disciplinary approach to teaching the subject. Incorporates EU Twinning Project objective 6.2.3.

Task Outline

- NSDI coordination group to facilitate workshop to discuss the requirement
- Universities to be encouraged to bid for funding under ERASMUS+ scheme for a lectureship dedicated to the wider understanding of geospatial science
- NSDI Council to support bids for support under this scheme

Action 8.3 Provide Spatial Awareness Resources to Schools

Engage with primary and secondary schools and explore opportunities for introducing geospatial literacy into STEM (Science Technology Engineering Mathematics) and Social Science curriculum.

Task Outline

- NSDI coordination team to meet with Ministry of Education curriculum advisors and review material used currently to teach spatial awareness in schools
- Recruit a local education consultant to review international best practice and make recommendations for development of resources or use of modern equipment such as smartphones to teach spatial skills in a more relevant and interesting way
- Pilot the use of new resources, either with particular subjects or age groups
- Roll-out changes to all age groups and subjects

Action 8.4 Encourage the Principles and Promote the Benefits of Continued Professional Development

Promote lifelong learning and professional development as an ongoing, voluntary, and self-motivated pursuit of knowledge. Incorporates EU Twinning Project objectives 6.1, 6.2.1, and 6.2.2.

6.8.4 Key Performance Indicators

The following key deliverables, evidence of achievement and milestones represent the key performance indicators of the Country Action Plan (Table 6.8)

Table 6.8 Key Performance Indicators for Capacity and Education.

Milestone	Evidence of Achievement	Expected Achievement Date
NSDI Skills Gap Analysis completed	An inventory of knowledge, skills and resources completed	Year 2 Quarter 1
New resources for teaching spatial awareness in schools developed.	Pilot of new teaching techniques and resources completed.	Year 3 Quarter 1.

6.9. Communications and Engagement



This **strategic pathway** recognizes that stakeholders are integral to the implementation of integrated geospatial information management systems and that their buy-in and commitment is critical to success.

The **objective** is to deliver effective and efficient communication and engagement processes to encourage greater input from stakeholders in order to achieve transparent decision-making processes when implementing the Integrated Geospatial Information Framework.

6.9.1 Overview of current situation

The current situation regarding this is that not many effective, efficient, and transparent engagement methods have been applied to strengthen the stakeholders' participation and contribution to the further implementation of the National SDI. Even though there is strong stakeholder awareness about the need to invest in strong communication and stakeholders engagement, no much efforts have been undertaken to establish an agreed engagement strategy, to build a dedicated communications team, to set up a specific communication plan, to assemble a database of case studies, to strengthen the link between the National SDI and the UN Sustainable Development goals, and to monitor and evaluate the effectiveness of engagement and communication about the SDI development. Stakeholder's engagement is ongoing

but could be more active and does not currently involve all the potential stakeholder groups. The consequence of this all is that stakeholders are not fully informed about the significant efforts and progress of the National SDI.

6.9.2 Approach to Establishing Communication and Engagement Framework

The approach for achieving effective communication and engagement includes the need to develop the stakeholder relationships, understand the need for, and develop, appropriate messaging for the stakeholders, have a strategy for communicating these messages, and continue to monitor, evaluate, and seek continued improvements in the engagement with stakeholders.

The need to develop and establish a stakeholder communication and engagement strategy is recognized. The aim of this will be to identify individuals and groups of stakeholders and their needs, to effectively communicate geospatial policy and benefits, and to develop constructive, collaborative, and enduring stakeholder relationships. ALRC, as the administrative authority for the National SDI, has a dedicated team supporting the SDI but the team is limited in terms of having the time available to develop and support such a communications and engagement strategy. It was reported that while there is excellent engagement with specific individuals within ALRC these individuals have many other commitments and, therefore, the engagement can be intermittent. However, without these informal networks it was stated that it would be difficult to maintain awareness of what is planned or what is happening. This ad-hoc approach to engagement needs to change; whilst the Law on NSDI clearly defines roles, responsibilities, and activities allocated to specific entities and stakeholders, not all stakeholders or potential stakeholders are fully engaged.

6.9.3. Actions for Establishing Communication and Engagement Framework

Action 9.1 Develop a Stakeholder Communication and Engagement Plan

Develop and implement a stakeholder communication plan or, if such a plan exists, review and reinvigorate the plan to communicate the role of ALRC, its responsibilities, and how these responsibilities will support and promote the work of the individual stakeholders. Incorporates EU Twinning Project objective 5.1.

Action 9.2 Create a National SDI Outreach Team

The goal of the Outreach team will be to develop, agree, and implement a communication and engagement strategy. The strategy will include: identifying and developing relationships with stakeholders and other potential partners/users (which will be ongoing as needs evolve over the course of the project); developing the storyboard/narrative to create clear, concise, and compelling messages for all audiences, using these methods to inform, influence, promote and grow the use of the SDI service; customize the plans and methods to the needs of the various stakeholders; and establish performance measures to monitor and evaluate the effectiveness of the communication and engagement plans and methods.

Action 9.3 Annual Market Survey of User Satisfaction

To support the monitoring and evaluation requirement, undertake an annual survey of users.

Task Outline

- Engage local market research company

- ALRC supply list of known stakeholders and invite contract to add from their knowledge in sectors which ALRC do not know well
- Define short questionnaire focusing on key areas of interaction with stakeholders
- Issue questionnaire and allow reasonable period for responses
- Analyze responses
- Set up workshop with Council to review results and discuss necessary adjustments to the action plan

Action 9.4 Create a Value Proposition for the SDI

Create the value proposition collateral and socialize to support the advocacy of the strategy/plan to politicians. The material will include a slide deck and possibly videos to back up a briefing paper with key messages plus a plan of how and when this will be presented.

Task Outline

- Distill material gathered in the IGIF study to identify the key messages that will gain the interest of politicians; think through what you want them to do – what is the call to action?
- Consider whether it is necessary to create a video as well as a presentation; videos consume less time for busy officials and can be watched at the recipient’s convenience
- Select influential politicians, starting with the Ministry responsible for ALRC, who need to be engaged; often it is useful to contact and present to advisors before the Minister
- Organise a campaign of visits
- Debrief after each visit and refine the message

Action 9.5 Create the Monitoring and Evaluation Framework

Develop a monitoring and evaluating framework to assess the effectiveness of engagement and communication about the development of the National SDI.

Task Outline

- The framework will set out the subject matter and timetable for regular reviews
- Key Performance Indicators will be defined at the start of the project, these will define progress
- The annual market surveys will provide an external view of needs

6.9.4 Key Performance Indicators

The following key deliverables, evidence of achievement and milestones represent the key performance indicators of the Country Action Plan (Table 6.9)

Table 6.9 Key Performance Indicators for Communication and Engagement.

Milestone	Evidence of Achievement	Expected Achievement Date
NSDI Communication and Engagement Plan Approved	Stakeholder Communication and Engagement Strategy and Plan completed	Year 1 Quarter 2
Outreach group recruited and operational	Team is delivering monthly communications to full range of stakeholder types.	Year 1 Quarter 4

7. IMPLEMENTATION

In this section, a draft program plan, suitable for use by the implementation team is described.

7.1. Investment Plan

The table below provides both the levels of investment in the Actions detailed in the report but also the nature of the expenditure and suggested timescales for delivery. The levels of investment estimates are to be regarded as “order of magnitude” costings for each activity. They will be refined in the detailed planning stage.

Under the column headed ‘Capital’ or ‘Recurrent’, items that are one-off costs are designated Capital (C) and those that are recurrent, so needing to continue to be funded beyond the project period are designated Recurrent (R).

Under the column headed ‘Funding’, the following codes are used:

- FA Fully Funded from State Budget.
- PA Partially funded from State Budget.
- NF No current source of Funding.
- BAU Business as Usual.

Business as Usual actions have an investment value of zero. These are activities for which it is expected that stakeholders will contribute staff time as part of their usual activities and will not expect to recover charges from the project budget.

Depending on how these tables are viewed on screen, it may be necessary to increase the zoom factor to comfortably view them.

A separate investment plan spreadsheet, which provides more detail, is included in the package of supporting documents supplied with this report.

Action Ref	Title	GGIM Strategy Pathway Type	Task Type		Financial				Timeframe							
			Priority	Description	Total Investment MDL	Total Investment US\$	Expenditure Capital or Recurrent	Funding Source	Start Date	End Date	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
1.1	Form an SDI Coordination and Project management team	Governance and Institutions	Medium	Support ALRC's role to be the coordination body of the NSDI and associated administrative, secretarial and managerial tasks	1,429,722	80,921	R	NF	0.75	6.00						
1.2	Re-energize Geospatial Leadership	Governance and Institutions	High	Re-energise leadership team with a very clear mandate to drive the implementation of the IGIF Action Plan. The leadership team must have the necessary authority to drive change, to establish and apply the parameters within which the services described in the law will operate, determining, implementing, and monitoring relevant service level agreements, defining the priorities and activities of the working groups, and establishing key performance indicators which will be used to monitor, evaluate, and report progress to the Executive. This team needs to be active and visible.	0	0	C	BAU	0.75	3.00						
1.3	Strategic Geospatial Action Plan embedded in Government Plan	Governance and Institutions	High	Preparation of a National SDI strategy/geospatial strategy. The strategy should be linked to the National SDI operating model, support the strategic priorities/policy drivers, and provide a clear strategic view of data and service collaboration with a set of principles that senior leaders are bought in to. These principles will act as a decision-making framework	687,708	38,924	C		1.50	2.50						
1.4	Strengthen Institutional Arrangements	Governance and Institutions	Medium	Reconsider the composition of the NSDI Council + Institutionalise the private sector in the NSDI-governance structure	0	0	R	BAU	1.00	2.50						

Table 7.1: Investment Plan- Governance Strategic Pathway

Action Ref	Title	GGIM Strategy Pathway Type		Description	Total Investment MLD	Total Investment US\$	Capital or Recurrent	Funding	Start Date	End Date	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
2.1	Adjusting the regulatory framework for the establishment, development and maintenance of the NSDI	Policy and Legal	High	EU Twinning Project: Adjusting the regulatory framework for the establishment, development and maintenance of the NSDI to the current requirements and principles of INSPIRE Directive (Objective 1.1)	3,498,293	198,000	C	NF	2.50	4.00						
2.2	Establishing the formation, determination and updating of tariffs (costs) for spatial data network services	Policy and Legal	Medium	Developing the draft Government Decision on the Methodology for forming tariffs (costs) for spatial data network services as well as determining/updating costs for spatial data network services created by responsible public entities	207,688	11,755	C	PF	1.00	2.00						
2.3	Develop Data Licenses	Policy and Legal	Medium	Establish regulations regarding the licensing of spatial data. Clarify the rules/conditions for using geospatial data by the private sector. The private sector needs to understand how the data can be used, what are the limitations if any on the use of the data, and costs associated with this use. The rules need to be clear and not applied retrospectively and, it was suggested, that this depends on the Decision makers having a good understanding of the needs of the private sector. Until the private sector has this confidence then this will remain a barrier to the deployment of the National SDI.	1,119,454	63,360	C	NF	2.50	4.50						
2.4	Strengthen Data Sharing Agreements	Policy and Legal	Medium	Although official guidelines for sharing/releasing geospatial information are provided in the context of the NSDI Law, only a few organizations have the knowledge, skills and resources to apply them appropriately.	1,119,454	63,360	C	NF	1.00	3.00						
2.5	Create and Operationalise "All of Government" Procurement Policy for Geospatial services and data	Policy and Legal	Medium	Relevant - but not really come to the front so far as an important action point	1,375,417	77,847	C	NF	2.50	4.50						

Table 7.1: Policy Strategic Path

Action Ref	Title	GGIM Strategy Pathway Type	Priority	Description	Total Investment MLD	Total Investment US\$	Capital or Recurrent	Funding	Start Date	End Date	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
3.1	Develop Sustainable Business Model for SDI	Financial	High	Develop a suitable business model and commence the development of this: a. identify the budget needed to support the implementation of the National SDI b. identify options for how this will be funded, and c. re-state the potential benefits to be realized (a socio-economic analysis will be undertaken as part 2 of this current study) d. alignment of the National SDI with government policies e. Create business plan for first three years.	1,749,146	99,000	C	NF	1.50	2.50						
3.2	Commission Sustainability Strategy for cover withdrawal of Norway donor support	Financial	High	The plans for support of existing products and services covered by Kartverket into the future, so gains made are not lost.	874,573	49,500	C	NF	1.00	1.25						
3.3	Measure and Document Benefits Realisation	Financial	Low	Define KPIs and how to measure them.	275,083	15,569	C	NF	1.00	1.50						

Table 7.2: Financial Strategic Path

Action Ref	Title	GGIM Strategy Pathway Type	Priority	Description	Total Investment MLD	Total Investment US\$	Expenditure Capital or Recurrent	Funding Source	Start Date	End Date	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
4.1.1	Finish Current Cycle of National Orthophoto maps	Data	High	Costs of completing coverage (not including Transnistria) in 2022.	3,984,000	225,490	C	FF	1.00	2.00						
4.1.2	Update National Orthophotomaps (Continuous Revision)	Data	High	For consideration..... If supported by change detection this can be reduced to only capture major change areas in each year.	7,494,956	424,207	C	NF	2.00	6.00						
4.2	Change Detection	Data	High	Using satellite imagery - determines where updates are necessary.	524,408	29,681	R	NF	2.00	6.00						
4.3	Revision of National Topographic Base maps (vector line maps)	Data	High	Maintaining the topographic basemaps (line maps) derived from aerial imagery under Kartverket contract.	13,690,929	774,893	C	NF	1.00	5.00						
4.4	Maintain address database (to include streets).	Data	High	Maintaining will need include a process for harvesting data from local authorities. This is assumed as implemented through API (costed covered in SP5).	8,375,000	474,017	C	FF	1.00	6.00						

Table 7.3: Data Strategic Path (Part 1)

Action Ref	Title	GGIM Strategy Pathway Type	Priority	Description	Total Investment MLD	Total Investment US\$	Expenditure Capital or Recurrent	Funding Source	Start Date	End Date	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
4.5.1	Complete Cadastre and land ownership registration	Data	High	LRPVP Project This is already funded by WB Loan, the net benefits related to land registration only are calculated in the land value sheet	0	0	C	DON	1.00	5.00						
4.5.2	Maintain Cadastre and land ownership register	Data	High	Annual maintenance costs taken from ALRC budget, PSA budget, Ingeocad budget (for source references see 'Land Value' Table 5)	0	0	R	FF	1.00	6.00						
4.6	Transport Data Integration (two way flow).	Data	Medium	Emulate the Swedish system of data sharing between the roads agency and the SDI.	889,560	50,348	C	NF	3.00	6.00						
4.7	Create Digital Twin for Urban centres.	Data	High	A Digital Twin for city centres have been partly created in Chisinau and Orhei currently. Assume high resolution including processing for city centres (4 main cities including Chisinau).	1,600,000	90,558	C	NF	3.00	6.00						
4.8	Maximise use of GNSS	Data	Medium	A strong geodetic network has been developed - although the usage of DGPS/CORS could be better exploited if made free.	2,500,000	141,498	C	FF	1.00	6.00						
4.9	Complete Land Use / Land cover map of Moldova	Data	High	Refer to EEA quote for processing the Copernicus land service. This helps to meet EU Accession criteria by joining CORINE network to monitor land degradation. This in turn provides better access to EU green deal funds. An accurate land use map which is kept up to date can also assist in reforming the tax system by creating a more accurate valuation system.	2,830,441	160,200	C	NF	2.00	5.00						
4.10	Integrate piped water and sewage database with SDI	Data	Medium	A local consultant would be employed to support this integration working with ALRC and the water companies.	1,237,875	70,063	C	PF	3.00	6.00						

Table 7.4: Data Strategic Path (Part 2)

Action Ref	Title	GGIM Strategy Pathway Type	Priority	Description	Total Investment MLD	Total Investment US\$	Expenditure Capital or Recurrent	Funding Source	Start Date	End Date	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
4.11.1	Establish a centre of excellence for Satellite-derived imagery.	Data	High	Existence of Use cases related to emergency management, urban planning, army topographic mapping, precision agriculture, forestry management, land management/relations	1,399,317	79,200	C	PF	1.50	2.50						
4.11.2	Operate centre of excellence for Satellite-derived imagery.	Data	High	On-going operation for capability (follows 4.11.1)	1,037,820	58,740	C	NF	2.50	6.00						
4.12	Develop Geo-statistical Analysis capabilities.	Data	High	Implement best international practice using Global Statistical Geospatial Framework (IGIF for Statistics)	222,390	12,587	C	NF	1.50	3.00						
4.13	Integration with Emergency Services	Data	High	Estimated funding of additional tablets and software.	1,908,160	108,000	C	NF	2.00	3.50						
4.14.1	Revamped Geoportal	Data	High	Ensuring the network service (as derived from the EU Twinning project). These costs refer to Maintenance of discovery and view services, Creation of download services, Publication of spatial data CLC 2000, 2018 (Corine Land Cover), and Modernisation of spatial data infrastructure moldova-map.md on MCloud platform	3,605,260	204,054	C	DON	1.00	2.00						
4.14.2	Maintain Geoportal	Data	High	On-going operation of geoportal	1,875,569	106,155	R	BAU	2.00	6.00						
4.15	Enhancing Metadata Catalogue on NSDI Geoportal	Data	High	Specific Objective 3.4: Updating Metadata Catalogue on NSDI Geoportal. Specific Objective 3.5: Increasing the number of metadata record for harmonized spatial data sets and network services on the NSDI Geoportal.	0	0	C	BAU	1.00	3.00						
4.16	Analogue to digital conversion and georeferencing of spatial data /products.	Data	Medium	Analogue to digital conversion and georeferencing of spatial data /products. Develop specification and methodology and convert 5 datasets per annum over 2 years.	250,000	14,150	C	NF	3.00	5.00						

Table 7.5: Data Strategic Path (Part 3)

Action Ref	Title	GGIM Strategy Pathway Type	Priority	Description	Total Investment MLD	Total Investment US\$	Expenditure Capital or Recurrent	Funding Source	Start Date	End Date	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
5.1	Annual International Best Practice Tracking Review	Innovation	High	In order to ensure that Moldova remains abreast of best practice not only in technology but also in management and process design.	530,044	30,000	R	NF	1.00	6.00						
5.2	Implement a coordinated approach to (geospatial) innovation	Innovation	High	There is a lack of a coordinated approach to innovation and there is no individual group tasked with innovation and having responsibility for innovation. Moldova is also missing a geospatial innovation strategy. There is no evidence provided related to geospatial research programs, and no 'centre of excellence' to help focus geospatial research.	412,625	23,354	C	NF	2.00	3.00						
5.3	Incubate Geospatial Start-ups	Innovation	Medium	Limited scope for invest in the incubation of geospatial start-ups as market small, so embedded in digital transformation program and encompassing liaison with OSM.	250,000	14,150	C	NF	3.00	5.00						

Table 7.6: Innovation Strategic Path

Action Ref	Title	GGIM Strategy Pathway Type	Priority	Description	Total Investment MLD	Total Investment US\$	Capital or Recurrent	Funding	Start Date	End Date	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
6.1	Establish a Working Group on Standards	Standards	High	Working group dealing with issues related to Interoperability, Standards Needs assessment, National Standards Strategy, an active standards awareness program, and a national action plan for rolling out data standards and technical specification	0	0	R	BAU	1.00	6.00						
6.2	Develop technical data specifications for spatial data sets and products	Standards	High	Transposition of Technical Specifications for spatial data sets which are part of annexes 1, 2 and 3 of the Law 254/2016 . Development of Technical Specifications for other types of spatial data sets/products. EU twinning states within existing budgets.	0	0	C	BAU	1.00	2.00						
6.3	Implement International Standards	Standards	High	International standards are frequently adopted (see ISO, OGC-standards). In order to sustain once SK exit. Needs external international expert advisor over several years.	1,119,454	63,360	C	NF	2.00	4.00						
6.4.1	Establish Common Data Quality Standards	Standards	Medium	A common data quality standards have not been established. Needs help of external expert (as above in terms of resource).	1,119,454	63,360	C	NF	2.00	3.00						
6.4.2	Implement Data Quality Management Plan	Standards	Medium	Prepare and implement a Data Quality Management (DQM) plan that assures information is fit-for-purpose. Follows 6.4.1 When completed passes to the coordination group.	8,395,903	475,200	C	NF	3.00	6.00						
6.5	Improve Interoperability (API development)	Standards	Medium	In terms of interoperability, relevant data models comply with a national standard and are curated and aggregated at the national level, but there are only a very limited number of available data sets integrated and used.	1,000,000	56,599	C	NF	2.00	6.00						

Table 7.7: Standards Strategic Path

Action Ref	Title	GGIM Strategy Pathway Type	Priority	Description	Total Investment MLD	Total Investment US\$	Capital or Recurrent	Funding	Start Date	End Date	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
7.1	Strengthen partnerships with other public sector stakeholders	Partnerships	Medium	Securing active stakeholder engagement in order to make stakeholders of the public sector more committed The feeling is that most public sector stakeholders operate in silos - Therefore, engagement with other public sector stakeholders would be welcomed	0	0	R	BAU	1.00	5.00						
7.2	Establish partnerships with private sector stakeholders	Partnerships	High	Engaging with the private sector and establish PPP where relevant. Needs international marketing recruit who does skills transfer to local over period of say 2 years.	4,664,391	264,000	C	NF	1.50	3.50						
7.3	Engage Actively in UN GGIM	Partnerships	Medium	Moldova is engaged in UN GGIM - involvement should be spread between multiple agencies	0	0	R	BAU	1.00	6.00						
Action Ref	Title	GGIM Strategy Pathway Type	Priority	Description	Total Investment MLD	Total Investment US\$	Capital or Recurrent	Funding	Start Date	End Date	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
8.1	Re-energise working party and form a relationship with Ministry of Education	Capacity and Education	High	What does industry need - capability assessment; complete a gap analysis as first activity; link to Government strategies for staff retention;	2,798,634	158,400	C	NF	1.00	2.00						
8.2	Encourage Universities to teach geospatial to other disciplines.	Capacity and Education	Low	ERASMUS - possible funding source, see comment. Create an overarching academic teaching post with focus on train the trainer.	6,000,000	339,594	C	NF	3.00	6.00						
8.3	Provide spatial awareness resource to Schools	Capacity and Education	Medium	Only a very few primary and secondary schools have run pilots to test how geospatial literacy can be embedded into some core courses, with mixed results.	370,650	20,978	C	NF	2.50	5.00						
8.4	Continued Professional Development for Data Supply Agencies.	Capacity and Education	High	Lifelong learning as an ongoing, voluntary, and self-motivated pursuit of knowledge for either personal or professional reasons is not common practice in Moldova. It is recommended to invest in Adult education, Continuing education, Lifelong learning institutes, Knowledge work, Personal learning environments or self-directed learning	415,376	23,510	R	NF	1.00	6.00						

Table 7.8: Partnerships and Capacity Strategic Paths

Action Ref	Title	GGIM Strategy Pathway Type	Priority	Description	Total Investment MLD	Total Investment US\$	Capital or Recurrent	Funding	Start Date	End Date	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
9.1	Develop Strategic Communication Plan	Communications and Engagement	High	Develop and implement a stakeholder communication plan or, if such a plan exists, review and reinvigorate the plan + Communicating the role of ALRC, its responsibilities, and how these responsibilities will support and promote the work of the individual stakeholders + Although the need for establishing such a communication plan has been strongly recognized by the stakeholders, there is no evidence of a communication plan being defined, agreed, and implemented for the various stakeholder audiences.	699,659	39,600	C	NF	1.50	1.75						
9.2	Create and operate SDI outreach department	Communications and Engagement	High	Team of locally recruited staff to manage engagement with stakeholders and continuous outbound and inbound communication to politicians, business and citizens. Celebrate success, involve citizens in reporting errors and liaison with consumer groups.	1,157,394	65,507	C	NF	1.75	6.00						
9.3	Annual market survey of users satisfaction	Communications and Engagement	Medium	Supports monitoring and evaluation requirement by getting annual feedback from all stakeholder groups.	412,625	23,354	R	NF	1.00	6.00						
9.4	Create Value Proposition Slideset and socialise widely.	Communications and Engagement	High	Required to enable advocacy of action plan to politicians and the public. Different slides and explanation required for different audiences.	349,829	19,800	C	NF	1.00	1.25						
9.5	Develop a framework for monitoring and evaluating the effectiveness of engagement and communication about NSDI development	Communications and Engagement	Low	No framework is operational for monitoring and evaluating the effectiveness of engagement and communication about the SDI development. However, most stakeholders recognize the need for such a framework.	103,156	5,839	C	NF	1.50	2.00						

Table 7.9: Communications Strategic Path

7.2. Risk Management

This section outlines the risks inherent in the delivery of the Action Plan and how they can be managed and mitigated.

Risk management is a complex subject and requires development of a comprehensive and constantly updated risk management plan. The Action Plan seeks only to identify the most significant risks and have in place mechanisms for their management.

Risks are usually categorized against two criteria a) probability b) impact. Those risks with high impact and high probability are considered critical and should be considered first.

The table below indicates some of the significant risks identified at this stage.

Risk	Impact	Probability	Management
Lack of buy-in by stakeholders	High	Medium	Strong high-level mandate and agreed governance. Effective engagement with all stakeholder groups through an engagement strategy
Expected benefits not realized	High	Low	Tracking of measurable Key Performance Indicators and, if necessary, reallocating investment away from under-performing components
Costs overrun	High	Medium	Detailed costing of investments and strong project management
Incompatible Technologies	High	Low	Adoption of open interoperability standards, detailed technology assessment prior to implementation.
Insufficient human capacity in country to deliver.	Medium	High	Mitigated in short-term by overseas consultancy support, longer term via capacity building programs (Centre of Excellence)

Table 7.10: Risk Management Strategy

8. BUSINESS CASE

8.1. Introduction

The term “business case” does not have universal recognition. A business case is a written value proposition that is intended to educate a decision maker and convince them to take some type of action. It may be necessary to use alternative terminology in some countries – socio-economic justification may for instance be a useful alternative.

In summary, best practice advice⁸⁹ is to consider the business case from five separate perspectives:

- Strategic case – the business need and contribution to the nation’s development strategy
- Economic case – presenting the costs and benefits to show value for money
- Commercial case – how engagement or partnering with the commercial sector will be handled
- Financial case – affordability, what funding will be necessary and when
- Management case – ability to deliver a successful project.

For the Action Plan, the important elements are the strategic case and economic case, the remaining components are key features of the detailed implementation plan.

8.2. Strategic Case

The strategic case is drawn from the geospatial policy alignment, socio-economic impact assessment and action plan. Key national priorities that are expected to be supported by the Action Plan are direct economic impacts, as well as societal and environmental benefits. In this section we draw out a small subset of these:

Economic benefits

i) To Government:

- **Increase business tax revenue collection** by identifying unrecorded properties from a single national street addressing system
- **Support to the National Development Strategy** with online access to more current and complete geospatial information
- **In the longer-term to reform land use fees and taxes collection based on completing** the land cadastre and register

ii) To Business:

- **Increased crop yields** by use of precision agriculture techniques to link satellite imagery to fertilizer distribution
- **Better asset management for utilities** – the NSDI program will enhance the availability of current geospatial data enabling digitalization of paper records to be more accurate and converted more quickly

⁸⁹ An example of this approach is contained in the UK Treasury Green Book -

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/685903/The_Green_Book.pdf

- **Quicker and less costly land and construction survey work** from increased use of the CORS geodetic network
- **The real estate sector enabled to use web technology** to provide new and better commercial and residential property services to citizens using location data

iii) **To Citizens:**

- **Improved emergency response** by equipping more vehicles with geospatially enabled software
- **Greater efficiency of transactions between citizens and businesses**, especially by having a single national address database augmented with geographical position

Societal benefits

Key impacts that are not easily expressed in economic terms, include:

- **Completion of land registration and cadastral registers providing a more transparent, consistent, and up to date database** to underpin growth of the land market by increasing the level of mortgages secured on land rights
- **Improved disaster response**, making mobilization faster so reducing loss of life and costs of damage to forests, crops, and property

It should also be observed that many benefits are multi-dimensional, positively impacting public, private sectors and civil society.

8.3. Economic Case

The linked report titled “**Moldova NSDI – Socio-Economic Impact Analysis**” provides a full analysis of the economic case for investment. Here we present the summary from the analysis in a Cost-Benefit Analysis (CBA) model. This provides an “order of magnitude” assessment in financial terms of the Return on Investment (RoI).

Discounted Cash flow

The financial values for the investment plan and on-going recurrent expenditure have been entered into a discounted cash flow spreadsheet to calculate the likely Return on Investment using a standard Cost-Benefit Analysis approach.

The results for the mean case, values in MDL and USD (Thousand) are as follows:

Financial year	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Total
Year number	1	2	3	4	5	6	7	8	9	10	11	12	
Net benefits to users	0	717	2,336	8,121	13,905	45,905	74,755	103,604	132,454	161,304	190,153	218,286	951,540
Cost to organisation	-22,710	-20,323	-22,664	-17,348	-12,015	-14,512	-14,512	-14,512	-14,512	-14,512	-14,512	-14,512	-196,646
Net cash flow	-22,710	-19,606	-20,328	-9,227	1,890	31,393	60,242	89,092	117,942	146,791	175,641	203,774	754,894
Discount factor	1.000	0.952	0.907	0.864	0.823	0.784	0.746	0.711	0.677	0.645	0.614	0.585	
Present value of cash flow	-22,710	-18,673	-18,438	-7,971	1,555	24,597	44,954	63,316	79,828	94,623	107,828	119,142	468,052
Net present value	468,052		\$26,418										
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Total
Present value of benefits	0	683	2,119	7,015	11,440	35,968	55,783	73,630	89,650	103,978	116,738	127,627	624,630
Present value of costs	-22,710	-19,355	-20,557	-14,985	-9,885	-11,371	-10,829	-10,314	-9,823	-9,355	-8,909	-8,485	-156,578
Net Cashflow	-22,710	-18,673	-18,438	-7,971	1,555	24,597	44,954	63,316	79,828	94,623	107,828	119,142	468,052
Sum of discounted benefits	624,630	\$35,255											
Sum of discounted costs	156,578	\$8,838											
Benefit to Cost Ratio	3.99												

The predicted discounted cash flow forecast is shown in chart below.

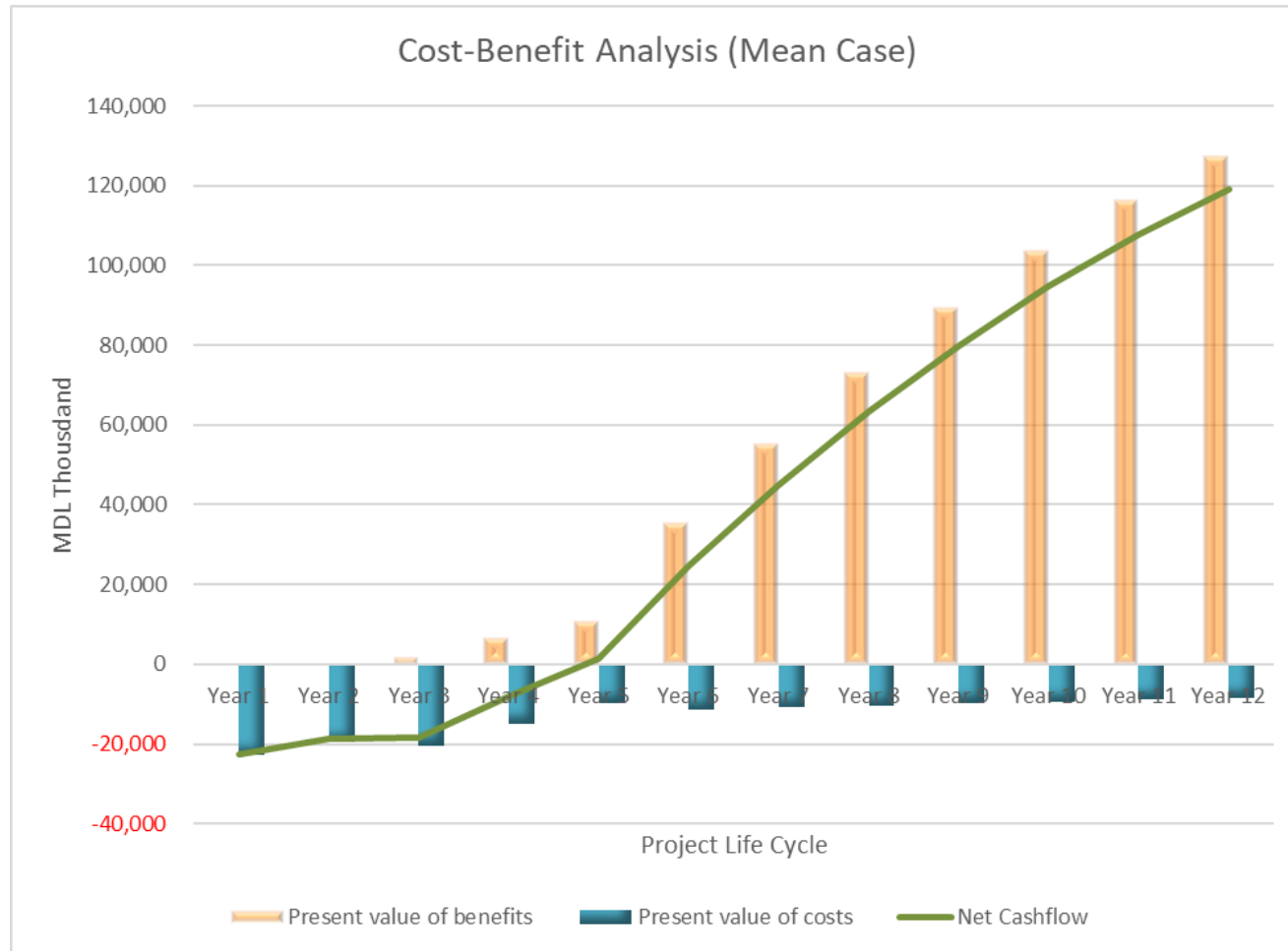


Table 11: Order of Magnitude Cost-Benefit Analysis

It is important to stress that the assessment is based upon quantification of 20% of the identified use cases. If data and time were not constrained, and more case studies had been quantified, it is our expert opinion that the calculated Return on Investment would be significantly higher.

Sensitivity analysis

To assess the robustness of the cost-benefits analysis, sensitivity analysis was conducted by making the following changes to the mean case outlined above:

Lower Bound

For the most conservative benefit estimate, low bound impacts were used for all those quantified cases where ranges were available, as follows:

Emergency Situations – lower bound estimates

Augmented GNSS – lower bound estimates

Digital Mapping Value – reduced annual growth from 5% to 2.5%

Precision Agriculture – reduced take-up rate from 5% to 2.5%

The impact on the key metrics were:

Benefit to Cost Ratio: 3.17 (reduction from 3.99 for mean case)

Cumulative Net Present Value: MDL 340 million (reduced from mean case MDL 468 million)

Upper Bound

For the upper bound (optimistic case), we have applied the upper bound range of values for the same set of use cases as used in the lower bound, as follows:

Emergency Situations – upper bound estimates

Augmented GNSS – upper bound estimates

Digital Mapping Value – increase annual growth from 5% to 7.5%

Precision Agriculture – increase take-up rate from 5% to 7.5%

The impact on the key metrics were:

Benefit to Cost Ratio: 4.82 (increase from 3.99 for mean case)

Cumulative Net Present Value: MDL 598 million (increase from mean case MDL 468 million)

We conclude that the policy advice that this is viable investment would not change even in the lower bound case.

9. NEXT STEPS

9.1. Approval

Following review and feedback by SK and ALRC this version represents the final version of the Action Plan and presents the outcomes and results from the financial analysis.

9.2. Refine the Investment Plan

Given the nature of the investment and limited time and resources for the analysis, it must be re-stressed that the plan only provides an “order of magnitude” indication of the likely benefits.

The Action Plan may need to be “packaged” into a series of more detailed business cases for presentation to potential sponsors. In doing so, it must be considered that unbundling runs the risk that the level of benefits may be reduced on the basis that the “whole is greater than the sum of the parts”.

9.3. Implementation

It is acknowledged that the preparation of the Action Plan is only the start of a long-term program. The “selling” of the NSDI value proposition to gain funding will need to be an early task.

However, there are some components of the investment plan that have already been approved, this is indicated in the Investment plan spreadsheet. Further, there are several “quick wins” actions that can be implemented relatively quickly and could be approved by an SDI ‘Task Force’ for action by individual Ministries and Agencies. Early wins will engender confidence in decision makers in the benefits of investment.

APPENDIX A: LIST OF STAKEHOLDERS

<i>Key Stakeholder</i>	<i>Abbreviation</i>	<i>Functions</i>	<i>Centralized / Decentralized</i>	<i>Influence</i>
Agency for Land Relations and Cadastre https://www.arfc.gov.md/	ALRC	The functions of ALRC include Geodesy, National Mapping, Geoinformatics, Cadastre, Real Estate Valuation, and Land Reform programs including the implementation of the state policy in the field of land relations and their alignment to European standards; ALRC is the coordinating authority for the National SDI and is responsible for implementing associated government policy.	Centralized	ALRC is the coordinating authority for the National SDI and is responsible for implementing government policy
Public Services Agency http://www.asp.gov.md/	PSA	The functions of PSA include the management and administration of state registers and information systems including population, legal entities, vehicles, drivers, cadastre of real estate, administrative units, and addresses.		PSA/Cadastral Department is responsible for the creation and maintenance of the real estate cadastre, execution of cadastral and real estate evaluation works, administration of the real estate cadastre central database, and registration of real estate and ownership rights Cadastre Department is responsible for the Administrative units,

				<p>Cadastral parcels, Buildings, Addresses</p> <p>A new solution for parcels, property rights and valuation (MoldLIS) was developed with the support of Norway Government...</p> <p>http://cadastru.md/ecadastru/</p>
<p>Ministry of Agriculture, Regional Development, and Environment</p> <p>https://www.madrm.gov.md/</p>	MARDE	<p>As the title suggests the functions of MARDE include Agriculture (subsidies, project support, policy, regulatory control); Regional Development (planning, rural development, international collaboration, urban revitalization), and Environment (policy and monitoring, water resource management, waste management, environmental impact assessments).</p>	Centralized	<p>MARDE is responsible for the implementation of the national strategy for agriculture and rural development.</p> <p>MARDE is a central public authority responsible for implementing government policy</p>
<p>Ministry of Economy and Infrastructure</p> <p>https://mei.gov.md/en</p>	MEI	<p>Functions include economic policy, economic forecasting and modelling, energy policy (including energy efficiency and the use of renewable energy resources), transport (including the development of transport strategy).</p>	Centralized	<p>Will have influence in regard to the socio-economic impact assessment and its potential influence on economic policy</p> <p>MEI is a central public authority responsible for</p>

				implementing government policy.
E-Government Agency www.egov.md	e-Gov	The primary function of e-gov is the implementation of the governments digital transformation strategy including the modernization of public services through their digitization, improving governance through data exchange between agencies and public service institutions (use of MConnect), and improved access channels to public services (through the use of government portals and, offline, through the provision of centres for the provision of public services, this in association with PSA)	Centralized	E-gov will influence strategy for government portals and interoperability . Has limited capacity in GIS applications.
Congress of Local Authorities of Moldova https://www.calm.md/ (representing individual Local Public Authorities (LPA's)s including the cities of Chisinau and Orhei)	CALM	The function of CALM is to represent all local authorities, providing a centre for information, training, expertise, experience, and provision of other services to support the local public authorities (LPA's)	De-centralized	Influence of the individual LPA's in terms of promotion of recognized good practice; will influence the implementation of the SDI at the LPA level
Orhei City Hall https://orhei.md/index.php?l=en	Orhei	The functions of Orhei cover all the aspects of local government administration including the provision of public services, urban regeneration, infrastructure maintenance. The economy is represented by three key sectors: industry, transportation, and other public services (telecommunications, electricity and	Centralized	Orhei is prominent in the use and application of geospatial information and citizen engagement. This experience can help influence other LPA's regarding the potential

		thermal energy, water supply and sanitation, waste management)		benefits for SDI for local administrative purposes
Chisinau City Hall	Chisinau	The functions of Chisinau cover all the aspects of local government administration (see also CALM and Orhei)	Centralized	Chisinau as the capital city is also important in the use and application of geospatial information and citizen engagement. This experience can help to influence other LPA's regarding the potential benefits for SDI for local administrative purposes
General Inspectorate for Emergency Situations https://www.mai.gov.md/	GIES	GEIS is part of the Ministry of Internal Affairs, and its functions include all elements of emergency and disaster response (natural and manmade) including epidemics, weather phenomena (floods, droughts, storms, earthquakes) accidents and emergencies, transport accidents, emergency rescue, fire, hazardous waste, and civil protection. The scope of GIES ranges from single one-off events through local, territorial, national, and transboundary	Centralized (coordination function) with decentralized/region al offices	User of the NSDI GEIS has a WMS-service for data related to Exceptional Accidents and Incidents. The service is used internally only at present
National Bureau of Statistics https://statistica.gov.md/index.php?!=e_n	NBS	NBS is the central administrative authority with the function of managing and coordinating all statistical activities. The bureau is responsible for approving the statistical methods and statistical	Centralized	NBS influence covers the development, production, dissemination, and coordination of all official statistics. The use of

		indicators used and for monitoring alignment with international standards, especially those of the EU		National statistical data will be a key contributor to the SDI
Energy Efficiency Agency https://www.aee.md/ro	EEA	EEA (part of the Ministry of Economy and Infrastructure) has a primary function of implementing state policy in the field of energy efficiency, energy performance of buildings, capitalization of renewable energy sources, financing projects relating to energy efficiency and renewable energy sources	Centralized	Influential in the areas of environment and climate change
Military Topographic Service ⁹⁰ https://www.army.md/	MoD	Part of the Ministry of Defence	Centralized	Influential for release of mapping and imagery data to business and citizens.
State Enterprise "Ingeocad" https://www.ingeocad.md/	INGEOCAD	Ingeocad is part of ALRC (one of 4 state enterprises within ALRC) which functions include Institute of Geodesy, Engineering Research and Cadastre (INGEOCAD) and is the leading state enterprise for geodetic, geological, topographic mapping and cartographic production. Ingeocad also provides engineering-geological and	Centralized	Key agency for technical development of SDI, including national geoportal

⁹⁰ SEIA interview may not be possible for reasons of security

		surveying/geodetic work for construction sites		
State Enterprise "The State Planning Institute for Land Management" https://ipot.md/en/about-us.html	IPOT	Institute for Land Management is part of ALRC (one of 4 state enterprises within ALRC) and has the primary function of regulating land ownership and monitoring of the land. Functions include land management services (including land consolidation projects; land monitoring, land inventory); cadastral services (including boundary/parcel demarcation, maintaining cadastral plans and records for property transactions); soil surveys; and surveying services (including large scale topographic surveys, engineering surveys for roads, railways, pipelines and other infrastructure		Influential in the field providing public access to specific services/information, providing public access to information on land and property
Ministry of Health, Labour, and Social Protection https://msmps.gov.md/en/	MoHLSP	The function of the MoHLSP is that of the central specialized agency responsible for the implementation of government policies in the fields of health, labour, equal opportunities, social protection, and demography.	Centralized (with local and regional offices)	The National Development Strategy (Moldova 2030) and the CoE Action Plan 2021-2024 both include specific references to SDG's which will fall under the remit of the MoHLP. MoHLSP will be influential in promoting these goals but has a limited capacity for GIS applications.

<p>Ministry of Finance</p> <p>https://www.mf.gov.md/ro</p>	<p>MoF</p>	<p>The functions of the MoF includes budget development and approval, accounting and auditing of the public sector, management of the public finances, management of the public sector debt, and treasury functions such as forecasting and managing the state budget and the preparation and publication of reports on the implementation and performance of the budget.</p>	<p>Centralized</p>	<p>While not a direct user of any of the IGIF data themes MoF will be very influential in terms of contributing to, and promoting, the 'direct use values' which may be outputs from the SEIA analysis and providing substance to the GDP impacts.</p>
<p>Moldsilva</p> <p>http://www.moldsilva.gov.md/?l=en</p>	<p>Moldsilva</p>	<p>The primary function of the Moldsilva agency is the central administration agency for state policy covering forestry (and hunting). The functions include the development, promotion and implementation of state policy in forestry and hunting, taking into account international trends of socio-economic sustainable development, rural development, rural employment, sustainable forestry, development, forests and wildlife protection, conservation of biodiversity, and forestry research and education.</p>	<p>De-centralized</p>	<p>Should be influential in the use of the SDI (and geospatial information) for the management of the state forests and wildlife management</p> <p>Good capabilities in GIS through ICAS</p>

<p>State Enterprise "Forest Research and Development Institute" (see Moldsilva)</p>	<p>ICAS</p>	<p>ICAS functions include forest management (including disease monitoring), forest research, and forest design.</p> <p>ICAS is responsible for land cover and protected zones (forest fund and State-protected zones of the forest fund) datasets.</p> <p>ICAS is subordinate to Moldsilva</p>	<p>Centralized</p>	<p>Influential and has good capabilities in GIS</p>
<p>Agency for Geology and Mineral Resources http://agrm.gov.md/en/</p>	<p>AGRM</p>	<p>AGRM (part of the Ministry of Agriculture, Regional Development, and Environment) has, as its primary function, the use and protection of the subsoil; the management of mineral resources; regulation and management of mining and quarrying; monitoring of groundwater quality, maintaining a record of mineral reserves (referred to as a cadastre of mineral deposits and reserves), geological exploration, geological research.</p>	<p>Centralized</p>	<p>Influential in the area of Geology and Soils thematic data</p>
<p>S.E. State Road Administration https://www.asd.md/en/</p>	<p>SRA</p>	<p>Responsible for Roads data.</p>	<p>De-centralized</p>	<p>SPA has roads data in digital format and is willing to provide this data to the NSDI via ALRC</p>
<p>SA Apa-Canal Chisinau https://www.acc.md/</p>	<p>ACC</p>	<p>Functions include Water Supply (domestic and industrial) including water capture, water treatment, water pumping, and managing the distribution networks; Public</p>	<p>De-centralized</p>	<p>Influential for utility mapping, asset management, and customer records</p>

		Sewerage including wastewater pumping and treatment; and public services for heating and hot water supply including thermal power plants, production of thermal energy, and electricity production.		
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APPENDIX B: USE CASE INVENTORY

A sample of the use cases is in the table below, the **Geospatial Alignment to Policy Drivers report** provides the detail on the use cases.

	Use Case Description	Qualitative or Quantitative	Priority	Lead Agency	Primary Outcomes
Economic and Urban Planning					
P1	Support to the Moldova 2030 Development Strategy	Qualitative	M	Ministry of Agriculture, Regional Development, and Environment	All investment programs are subject to scrutiny for fitness for purpose and align with and support the National Development Plans. GIS provides evidence to support priority assessment. However, the quality of the data they receive is variable and is not constantly updated. The NSDI program would provide better quality and more complete spatial data.
P2	Improved Urban Planning: through availability of enhance spatial data	Qualitative	M	Ministry of Agriculture, Regional Development, and Environment	Better and more efficient management of urban migration and rural development leading to improved decision making on public infrastructure and service provision. In terms of 3D city models this can assist the assessment of the 'right to light' issue (Healthy environment pillar identified in the 2030 Development Strategy). Access to daylight and sunlight are critical considerations when planning building development. The situation is particularly complex in dense urban areas. 3D modelling can support improved development.
P3	National Statistical Analysis: Census planning, execution and analysis.	Qualitative	VH	National Bureau of Statistics	Population census and statistical analysis using geospatial analysis techniques; improved definition of enumeration districts based on population surveys and analysis linked to address location.
Land Management and Administration					
LR1	Land Registration and Property Valuation	Quantitative	VH	Public Services Agency	Completion of the Land Registration and Property Valuation project. The objective of this (second) WB project is to complete the registration of 95% of all unregistered properties (private and public) through a process of systematic registration. Target end date for this is 2024.

