Sharing and dissemination of environmental information

Country maturity report: Georgia

Roadmap

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Legal notice

This report was produced by PricewaterhouseCoopers as part of the project for developing a roadmap and identify feasible and practical means for integrating environmental information in national e-governance/open data processes and platforms. This action is done in the context of the ENI SEIS II East project 2016-2020. The report was built in 2018 and updated throughout 2019, including a review in March 2019 after the first regional meeting in Kiev, and a second review after the roundtable in November 2019. The report was reviewed by public authorities in Georgia in December 2019.

This report contains information obtained or derived from a variety of publicly available sources described within the report in more detail and does not intend to be a comprehensive analysis of environmental information, open data and e-government in the country but a collection of the main elements shaping the national environmental information landscape.

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Roadmap

In general, it is recommended that Georgia should focus on some key elements for ensuring coherent and effective open data and environmental information management and for addressing the common challenges presented above. In brief, the focus should be on the following:

- **Policy measures:**
  - *Long-term digital action plan*: an action plan for e-government and open data should be in place. It should ensure scoping, management and funding of the national e-government and open data portals, as well as digital awareness-raising activities for both governmental institutions and the public. In doing so, all available results and good practices acquired from previous activities and projects across the whole economy spectrum should be assessed and put in motion.
  - *General interoperability framework*: the country should have in place an interoperability framework or at least its foundation. This is especially required for building an integrated environmental information system(s) and ensuring the smooth integration/exchange/sharing of environmental data.
  - *Roadmap in the field of open data and environmental information*: this roadmap should contain key objectives for fostering sharing and dissemination of environmental information.
- **Legal measures:**
  - *Enforcement mechanisms* for the regular collection, sharing and dissemination of environmental information and for monitoring implementation.
- **Technical measures:**
  - *E-government, open data and geo-portals*: the country should have effective e-government, open data and environmental portals on which environmental data and information can be shared/disseminated with spatial attributes, and where services can be built.
  - *Implementation of international standards*: standards developed by the EU, the International Organisation for Standardisation (ISO), the World Meteorological Organisation, the Open Geospatial Consortium, the World Wide Web Consortium, the National Institute of Standards and Technology and other international organisations which are responsible for standards development could be adjusted and introduced in the areas of designing an information system, metadata standards and interoperability standards.

Some of these elements are already in place in Georgia (e.g. the Open Data Portal) and other portals containing environmental data and information. Nonetheless, it is advised to look at these aspects from an integrated perspective of environmental information sharing and dissemination and to update them where appropriate. These elements are under continuous development; hence a periodic review is necessary.

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Guidance for the implementation of the roadmap

The roadmap provided in the following section outlines key areas for further development in the field of open data and environmental information. It also provides recommendations and suggested actions for improvement that are organised according to the following SEIS pillars: content, infrastructure and cooperation.

The success and rapid advancement of the country in this challenging domain is strongly dependent on clear prioritisation, multi-disciplinary teamwork and regular monitoring and adjustment of results. Furthermore, as progress is gradually made in one or several areas proposed for consideration, improvements, readjustments or amendments to the roadmap will be needed to keep it relevant and focused on the key priorities of the country.

To support the implementation process of the proposed measures at the national level, it is recommended to start by establishing an interdisciplinary team that would be responsible for driving and overseeing the overall process. The measures should be prioritised and implemented to support and enhance the e-government, open data and environment strategies of the country. Furthermore, this process should not be carried out in isolation. On the contrary, it should also be undertaken by taking into account the extensive experience already gained in this area by other countries and organisations and in the context of broad regional exchange and international collaboration.

The proposed measures are to be implemented by specific bodies at various levels of decision-making and across disciplines. In this respect, the measures are grouped in three major categories, namely: policy, legal and technical measures. These categories are indicated by the colour scheme (provided in the table below). They aim to signal the leading expertise or decision-making level required for the implementation of each measure, while being considered in an interdisciplinary setting.

Table 1. Legend for the colour scheme of the roadmap measures

Colour	Type of measure	Description
	Policy	The measures in this category cover the development of specific strategies and policies and their integration into the overall policy framework at the national level. They include establishing clear and measurable targets as well as monitoring the implementation of the strategies and policies. Furthermore, they imply supervision, coordination and other practical arrangements in terms of interdisciplinary work on open data and e-governance across various areas, including the environment.
	Legal	The measures in this category cover the development and adoption of new or revision of existing legislation followed by the development of secondary legislation, guidelines and methodologies in the area of open data and e-governance across various domains, including the environment. Legal measures include governance set-up, ensuring clear

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Colour	Type of measure	Description
		division of responsibilities and proposing enforcement mechanisms for obligations provided in the legislation.
	Technical	The measures in this category cover the adoption and/or development of technical tools, methodologies and procedures, as well as the introduction and adoption of international standards, where appropriate, at national level. These measures also embrace developing new competences and training specialists to ensure the successful implementation and sustainability of technology initiatives.

It is recommended for Georgia to implement measures proposed in the roadmap after consideration of the latest policy, legal and technology changes happening in the country. The table below suggests a recommended timeframe to implement measures with different priorities assigned. Considering that this domain is very dynamic these suggested time perspectives could be shortened.

Table 2. The recommended timeframe for measures implementation

Priority	Recommended timeframe for the measure implementation
High	In next 1-3 years
Medium	In next 3-5 years
Low	Over next 5 years

Priorities proposed in this roadmap were based on information received and aggregated from 2018 to 2020. Depending on the measure implementation, changes in the policy, legislation or technology the suggested priorities might change. To ensure effective implementation of proposed measures and their relevance regular measure monitoring is essential.

"Open data and e-government good practices for fostering environmental information sharing and dissemination" report

The implementation of the proposed measures in the roadmap is assisted by the Good Practices Report "Open data and e-government good practices for fostering environmental information sharing and dissemination" (in brief, the Good Practices Report). This report is an integral part of the present project and provides relevant examples from other countries and organisations on the practical implementation of the roadmap measures.

The Good Practices Report is organised into two sections – e-government and open data – each part following the SEIS pillars "content", "infrastructure", and "cooperation (network)". In addition to this, the following resources can also be used to support the implementation of the measures proposed in this roadmap:

- Report on the "Promotion of good practices for national environment information systems and tools for data harvesting at EU level";
- Streamlining Environmental Reporting – Action Plan;

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- Open Data Maturity in Europe 2019[1, 2];
- Development of an assessment framework on environmental governance in the EU Member States[3].

Roadmap measures: Content

The measures proposed to Georgia from the perspective of SEIS pillar: Content are presented in the table below.

Table 3. Measures from the perspective of SEIS pillar: Content

	Measure	Priority	Description
	1. Revision of the legal framework to promote and regulate the online accessibility and reuse of public sector information (PSI)	High	Adopt or amend, as needed, the legal acts referring to data management and accessibility related to the environmental domain (monitoring, assessment and reporting, management and control of natural resources, ecosystems and pollution) in accordance with the Aarhus Convention and the Protocol on PRTRs (as appropriate). This can include: • Improving an environmental information system by defining themes, sources (lists, registers, databases, funds, etc.), formats, metadata, licencing and interoperability requirements; • Improving procedures for environmental data collection and exchange in electronic format, and its accessibility as open data; • Improving procedures for managing environmental data flows and regular updating, quality assurance and control, reporting, inter-institutional sharing and exchange, online dissemination and other means of dissemination; • Setting up the public participation procedures for involving the public at large in the design, use and update of the environmental information system(s); considering ways to take on board citizen science and public engagement initiatives; • Streamlining the responsibilities of public authorities at all levels and across sectors to ensure clear competences and coordination; • Reviewing periodically the application of exceptions in the disclosure of environmental information;

[1] https://www.europeandataportal.eu/sites/default/files/open_data_maturity_report_2019.pdf
[2] https://www.europeandataportal.eu/sites/default/files/european_data_portal_-_open_data_goldbook.pdf
[3] "Development of an assessment framework on environmental governance in the EU Member States" under the contract No 07.0203/2017/764990/SER/ENV.E.4 funded by the European Commission, Final report May 2019.

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	Measure	Priority	Description
			• Monitoring the legitimate application of these exceptions and the disclosure of information on emissions in accordance with the Aarhus Convention (in particular, clarifying the practical rules to separate non-confidential information of public importance for its further disclosure[4]). *For guidance, consult the section "Designing an open data legal framework and provision of enforcement mechanism" of the Good Practices Report.* *This measure is closely linked with "Establish a collaborative institutional framework for the implementation of open data" in the Cooperation (network) section.*
	2. Adopt guidelines defining the practical arrangements for environmental information management, sharing and dissemination	High	Adopt technical guidelines setting out the practical arrangements for environmental information management, sharing and dissemination specifying: • The scope of the environmental information system with metadata description and registry; • The environmental data management structure (including data architecture, data stewardship, system administration, data privacy, data security and data quality); • Decision-making procedures for sharing and making available online on relevant portals of non-confidential information and datasets (e.g. websites of public authorities, environmental portals – one web access point for environmental information, geospatial portals, statistical, open data and other portals); • Separation of non-confidential information, as appropriate; • Gradually amending the data quality assurance procedures in line with EU rules.
	3. Develop and adopt an environmental data policy	High	Adoption of an environmental data policy by the authorities in charge of environmental protection to include: • List of varied environmental information available and the scope thereof; • Basic terms of availability and accessibility, including open access and data sharing aspects; • Data holder support for availability and accessibility by third parties;

[4] Requested during the national roundtable

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	Measure	Priority	Description
			• Rights and obligations of data and information holders/providers in terms of maintenance, update, quality assurance and reliability of data and information about their responsibility; • Licencing terms and conditions; • Contact point for access to environmental information. *For an example of data policy, consult the European Environment Agency's website: https://www.eea.europa.eu/legal/eea-data-policy/data-policy*
	4. Develop/update licencing terms and conditions to promote open data access, use and reuse of environmental information using an open licence	High	This measure will involve defining the licencing terms and conditions used on the different portals for publishing and accessing environment data. *At present, there are no official and clear licencing mechanisms for reuse of the data available by public authorities.* *According to the PSI Directive, it is recommended to use open licences as they are available online and provide clear licencing conditions*[5]. *More information about licencing is available in the Good Practices Report in the section "Harmonise licencing terms and conditions of environmental data to promote its public use and reuse".*
	5. Adopt/update interoperability standards for environmental systems	High	Currently, the interoperability of information systems is mostly restricted due to an insufficiently developed legal framework and the lack of interoperability standards. This measure will review the existing standards for exchanging environmental data and information with the aim of standardising these exchanges. Based on the completed inventory, this measure will harmonise the use of standards and develop common guidelines for the automated exchange of environmental data and information. Specifically, these standards will include standards of metadata for data and information exchange between environmental information systems (e.g. interfaces could be built using web services).

[5] Directive (EU) 2019/1024 of the European Parliament and of the Council of 20 June 2019 on open data and the reuse of public sector information https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L1024&from=EN

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	Measure	Priority	Description
			It is important to note that this measure is a prerequisite for building an effective integrated environmental information system. *This measure is closely linked with the measures "Enhance interoperability of geospatial, statistical, health and environmental information systems" and "Establish an electronic registry of public environmental information" in the Infrastructure section.*
	6. Regular collection and timely reporting of environmental data and information in accordance with national and international obligations	High	This measure will: • Ensure the effective implementation of the Aarhus Convention and its decisions and recommendations by the Meeting of the Parties on promoting effective access to information and electronic information tools. • Consider the possibility of ratifying the Protocol on PRTRs; • Identify the practical arrangements for establishing the Pollutant Release and Transfer Register and for its incorporation within the integrated environmental information system(s) by using good international working practices; • Ensure traceability of assessments and indicators by linking them with the available data sources used; • Consider becoming a Party to other UNECE MEAs (e.g. Water Convention LRTAP and related Protocols) to improve environmental governance, monitoring and data management; • Ensure the implementation of other international commitments related to the regular provision of environmental data and information.
	7. Improve and make publicly available the quality assurance/quality control mechanisms behind the published environmental data and information	High	The results and methodology used for quality assurance and quality control of environmental data are to be published in a detailed manner in order to enable public and other stakeholders to assess the reliability of the data. This measure will: • Assess the current quality control mechanisms from the collection of environmental data, to aggregation, manipulation, processing and publication across the whole MDIAR chain[6]; • Publish the current procedures in place and set minimum standards to respect all stages of the data

[6] The monitoring/data/information/assessment/reporting (MDIAR) chain is the flow of data and information from national monitoring to European reporting.

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	Measure	Priority	Description
			flow (data collection, data preparation and control, aggregation and data dissemination); • Complement/amend the legal framework by adding provisions setting up obligations at different levels, regarding the quality control of environmental data, including penalties for non-compliance; • Monitor the implementation of the quality control measures and set up an annual reporting process for the evaluation of the quality of environmental data provided. *At present, quality control is the responsibility of the institution that collects data; however, there is no common quality control process that would ensure a uniform quality control procedure (see Section 3.1.3.3 Quality control of environmental data).* *The examples of criteria for assessing quality control mechanisms are depicted in the document "Promotion of good practices for national environmental information systems and tools for data harvesting at EU level", page 165.* *Examples of standards, mechanisms and measures for quality control are also presented in the Good Practices Report, in the section "Develop and publish quality control mechanisms for environmental data".*
	8. Define/adopt and publish metadata description standards for all environmental data and information in accordance with international standards using a one-stop access point	High	This measure will aim to define metadata standards to facilitate the dissemination/exchange of environmental data and information (including dissemination of environmental reports). As a result, it will be easier for institutions to manage and exchange environmental data, while also making it easier for the public to find information. *Georgia developed its own metadata standard for the publication of open data. It is recommended that the international standards be adopted, as the standard development requires both technical expertise and resources. The adaptation of the standard to the EU standard DCAT-AP would require capturing additional metadata, which would also enable integration with other open data portals in Europe.* *Refer to the Good Practices Report to get more information about metadata standards for open data.* *This measure is closely linked with the measure "Enhance interoperability of geospatial, statistical, health and*

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	Measure	Priority	Description
			environmental information systems" in the Infrastructure section.
	9. Expand collection, prepare and publish environmental data in a machine-readable format	Medium	This measure aims to ensure the publication of environmental data in machine-readable format. Such a measure can be driven by the establishment of the open data legal framework, setting up the obligation to publish, as a rule, all datasets in machine-readable formats, unless data are not available in such a format and requires processing beforehand. To strengthen the open data initiative, Georgia could enhance the amount of data in machine-readable formats, even when the data requires additional processing. It is recommended that the state of the environment assessment report be regularly produced and made available online as an interactive product, preferably indicator-based. *The Good Practices Report provides more details about machine-readable formats in the "Transformation of data published to machine-readable format" section.* *This measure is closely linked with the "Define and publish metadata description standard for all environmental information" measures outlined in the Content section.*
	10. Inventory, re-engineering and publication of public services as e-services	Medium	This measure will define metadata standards and ensure that environmental services are described and accessible through the electronic service portal, in accordance with national standards. For the description of public services, it is recommended that the European Core Vocabularies, such as Core Public Service, Core Person, Core Location and Core Public Organisation, be adapted. This would allow a coherent and standardised description of e-services and improved interoperability to be ensured. *For an example of implementation, consult the Good Practices Report's "Publishing e-services on a dedicated e-service portal" section.*
	11. Perform an open data impact analysis for the use/reuse of environment data	Continuous	This measure will support raising awareness through regular assessment of the impact of the use/reuse of environmental data, as part of the open data impact assessment framework, and will drive further developments. For example, performance can be evaluated against the following criteria: • Number of environmental datasets downloaded and reused; • User feedback received/collected;

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	Measure	Priority	Description
			• Number of applications developed using environmental data and having an impact on the environment (including reuse of environmental data by other sectors, such as transport). *More information about the general open data impact assessment can be found in the Good Practices Report in the "European Data Portal Impact maturity" section. The section provides an example of the European Open Data Portal relevant for this area.* *This measure is closely linked with the "Strengthen the technical capability for environmental monitoring" measure in the infrastructure section.*

In order to facilitate the implementation of the provided measures, the Good Practices Report provides the following examples and recommendations:

- Building a digital strategy which includes the environment (example from Lithuania);
- Building e-services and public information systems according to national and international standards (examples from Estonia and the EU);
- Publishing e-services on a dedicated e-service portal (examples from the Lithuania, Romania and the UK);
- Develop a national strategy for open data and a measure plan to implement it for specific types of information (example from Ireland);
- Adopt an action plan based on the open data strategy and the digital strategy (example from the OGP);
- Adopt an open data policy, and extend it to environmental data (example from the EU);
- Designing an open data legal framework and provision of enforcement mechanisms (example from the EU);
- Definition of metadata description standard for all environmental information (examples from the EU and the UK);
- Transformation of data published to machine-readable format;
- Develop and publish quality control mechanisms for environmental data (example from the European Open Data Portal);
- Adopt/update licencing terms and conditions of environmental data to promote its public use and reuse (example from the European Open Data Portal);
- Evaluate the impact of open data (examples from the European Open Data Portal);
- Improve accessibility and use of available environmental data and information by improving the multilingual aspect of portals (example from the EEA).

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Roadmap measures: Infrastructure

The measures proposed to Georgia from the perspective of SEIS pillar: Infrastructure are presented in the table below.

Table 4. Measures from the perspective of SEIS pillar: Infrastructure

	Measure	Priority	Description
	12. Establish a single and user-friendly web access point for environmental information	High	A single access point could be designed as an entry point for the whole environmental policy domain to support the implementation of Decision VI/1 of the Meeting of the Parties to the Aarhus Convention. The following suggestions could assist in the development of an environmental portal (single web access point for environmental information): • Select a main technological solution, which will be used as a single and user-friendly web access point for environmental information – the technological solution should be chosen based on the most advanced existing environmental information system (e.g. the Environmental Information and Education Centre website, the Air Quality Portal or other currently-used software, which is built on the most up-to-date technology) [7]; • To ensure continuous development, include the main technological solutions to the national environment strategy; • Continue developing a single web access point by integrating additional data sources of environmental information (e.g. a single access point should provide environmental datasets, indicators, links to environmental reports and applications); • Consider migrating existing portals maintained by EIEC to a unified software solution to develop a more comprehensive environment portal and optimise EIEC maintenance efforts; • Provide web services and commonly agreed external application programming interfaces (APIs) to existing portals so institutions can easily share their (structured) data and have the possibility to download

[7] The UK provides a series of good practices for developing a management system for environmental permits. These good practices can be considered when introducing a content management system for the environment, including standards such as (for example) the Eco-management and Audit Scheme (EMAS), EMAS Easy, ISO 14001, Green Dragon and Phases 1 to 5 of British Standard (BS) 8555. Link : https://www.gov.uk/guidance/develop-a-management-system-environmental-permits

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	Measure	Priority	Description
			datasets (e.g. EEA public map services[8], provisions of the INSPIRE Directive); • Implement a uniform tool for checking the quality of metadata provided by data providers; • Publish environmental data in accordance with the rules described in international metadata standards, such as DCAT-AP metadata vocabulary (this measure will also allow automatic synchronisation with other EU open data portals); • Enhance search functionality to allow the user to apply multiple field search and filter options (e.g. file format) to refine a search; combining keywords with classifiers; • Maintain and enhance the portal by including feedback gathering from the public through public consultation organised by ministries and governmental bodies. *Environmental information and data are spread on multiple portals, as shown in this report. It is not clear which website has the latest or correct information published. The portals are also built using different technical solutions, which creates additional difficulties for solution integration and interoperability.* *On the other hand, some of these portals (e.g. air.gov.ge) are GIS-based and well developed. They could be used as a basis to create a single web access point for environmental information.* *More information about single access points can be found in the Good Practices Report in the "Establish a single and user-friendly web access point for environmental information" section (examples from the EU, EEA and Ireland).* *The design of the environmental information system is also widely described in the document "Promotion of good practices for national environmental information systems and tools for data harvesting at EU level".* *This measure is closely linked with the measure "Revision of the legal framework to promote and regulate the online accessibility and reuse of public sector information (PSI)", in the Content section, and measure "Establish a collaborative institutional framework for the implementation of open data", in the Cooperation (network) section.*

[8] https://www.eea.europa.eu/code/gis

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	Measure	Priority	Description
	13. Enhance interoperability of geospatial, statistical, health and environmental information systems	High	This measure will facilitate the implementation of the interoperability standards defined for environmental and other thematic data. This measure will: • Assess the existing compatibility of various information systems with defined interoperability standards, in particular with the geoportal; • Adopt/update and implement standards for metadata and data interoperability in accordance with international standards and good practices; • Develop APIs for external users; • Provide automated mechanisms for sharing time-series data. These actions can also be included in the national interoperability framework. *Refer to the Good Practices Report for more details about the development of interoperability in Lithuania and the EU in the "Establishing an interoperability framework" section.* *This measure is linked with the measure "Develop and/or continue to enhance an integrated system for the management of environmental information in accordance with the Aarhus Convention and the Protocol on PRTRs" from the present roadmap.*
	14. Establish an electronic registry of public environmental information	High	This measure will aim to establish a registry of environmental information and data available in each institution and system (i.e. the metadata management system), as well as data that is publishable taking into consideration the legal framework in place. The registry will be used by public servants to support the continuous development of environmental information systems and the dissemination of environmental information. Particularly, the registry should map the systems, databases, institutions, datasets and reports published. This measure could be coupled with the standardisation of metadata for environmental information and with the development of a single web access point for environmental information, which would be automatically refreshed based on the registry of environmental information. *The inventory of environmental information systems is widely described in the document "Promotion of good practices for national environmental information systems and tools for data harvesting at EU level", in the section "Inventory of the environmental information system".*

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	Measure	Priority	Description
	15. Improve accessibility and usability of available environmental data and information by improving the multilingual aspect	Medium	This measure will provide a full translation into Georgian/ English of public institutions' websites, yearly reports and environmental information metadata. Ensure the translation into Georgian/English of the national state of environment report available on the MEPA website as well as of other relevant products for their increased accessibility and use. *An example of a multilingual portal is the EEA GEMET[9], which provides a thesaurus of environmental terms, currently translated into 37 languages*.
	16. Develop e-services for the environment	Medium	At present, few e-services are available for the environment. This initiative will aim to develop environmental e-services according to the national standards (service passports) service interoperability standards (e.g. e-signature, e-payment). *More information about the description of public services can be found in the Good Practices Report in the section "Building e-services and public information systems according to national and international standards".* *This measure is connected to the measure "Inventory, re-engineering and publication of public services as e-services" from the present roadmap.*
	17. Strengthen the technical capability for environmental monitoring	Continuous	This measure aims to strengthen the technical capability for environmental monitoring to other thematic areas such as water. The gradual provision of modernised monitoring equipment should be planned and gradually ensured. To do so, the following is recommended: • Define monitoring parameters at national and local levels for each thematic area. These objectives should include: ○ Frequency of observations (e.g. hourly, daily, monthly or yearly); ○ Granularity of data gathered (accuracy); ○ Space coverage (taking into consideration the spatial requirements – urban vs rural areas, industrial areas); ○ Quality of data; ○ Compatibility with existing equipment and information systems and, where possible,

[9] https://www.eionet.europa.eu/gemet/en/concept/4438

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	Measure	Priority	Description
			compliance with EU requirements as part of the approximation process. • Conduct critical assessment in relation to the needs of the status and performance capabilities of the current monitoring infrastructure (for each thematic area, starting with priority areas such as, for example, water). This can be achieved through the establishment of a cross-sectional team of experts that could reflect on the existing equipment and provide a complete assessment of the needs aligned with the objectives defined above. • Develop a long-term and realistic national plan for gradual modernisation, taking into consideration all financial possibilities and options; • Follow this process by developing a coherent and stepwise implementation plan to gradually integrate new equipment into the existing system. This point is crucial as a lack of integration of the monitoring process in information systems: 1) renders the exchange of data cumbersome, 2) increases the need for human resources and 3) undermines the quality and availability of data. • Identify potential environmental areas to gradually complement the traditional environmental monitoring system with additional information coming from other sources (e.g. citizen science, earth observation). The acquisition of monitoring equipment requires consequent investments and should be well prioritised, bearing in mind the national needs, a long-term perspective and the approximation of the respective EU legislation. *This measure is linked with the measure "Develop and/or continue to enhance an integrated system for the management of environmental information in accordance with the Aarhus Convention and the Protocol on PRTRs" from the present roadmap.*
	18. Develop and/or continue to enhance an integrated system for the management of environmental information in accordance with the Aarhus	Medium	This measure recommends the development of an integrated environmental management system, which will ensure the coordinated management and exchange of environmental data and information. To do so, this measure recommends: • Making an inventory of all systems used for the management of environmental data and information, in particular that which is not publicly available, at the national level;

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	Measure	Priority	Description

	Convention and the Protocol on PRTRs		• Establishing a pollutant release and transfer register as an integral module of the system.
			• Defining the requirements for an integrated system for environmental information management. In particular, the system should provide functionalities such as:
			  ○ Workflow (e.g. quality management);
			  ○ Environmental data collection;
			  ○ Automatic dissemination and update of open data;
			  ○ Document management;
			  ○ Integration with external systems (statistical, health, open data, transport, energy and land cadastral, etc., as needed);
			  ○ Advanced visualisation tools and capabilities for integration with business intelligence tools;
			• Gradual implementation of the system;
			• Training of potential users and institutions involved on the benefits, functionalities and usability of the integrated system;
			• Regular assessment of the performance and update of the system when needed.
			This measure will foresee the development of an efficient system for integrating various types of environmental information at different levels (sub-national, national) by connecting various existing systems.
			The document "Promotion of good practices for national environmental information systems and tools for data harvesting at EU level" presents guidelines for the development of environmental information systems.
			This measure is linked to the measures "Enhance Interoperability of geospatial, statistical, health and environmental information systems" and "Adopt/update interoperability standards for environmental systems" from the present roadmap.

	19. Develop applications to engage the public in environmental monitoring and protection activities	Low	This measure will aim to develop a series of software applications (e.g. mobile apps) that will expand the potential for e-government to create an "environmental data ecosystem" and enable the public to access, consult and interact with environmental data. For instance, through the apps the public can: • access and consult environmental information in real-time according to their location;

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	Measure	Priority	Description
			• report poaching, and mark and signal polluted areas, etc.; • participate in environmentally friendly events in their neighbourhood; • integrate environmental data they have collected with government apps, where possible; • use crowdsourcing (citizen-generated data) to capture environment monitoring data throughout the territory of Georgia. *This measure is linked with the measures proposed in the Cooperation (network) section in the present roadmap.*

In order to facilitate the implementation of the provided measures, the Good Practices Report provides the following examples and recommendations:

- Establishing an interoperability framework (examples from the EU and Lithuania);
- Building an integrated environmental monitoring system at national level (example from Ukraine);
- Building an Open Data Portal and foster publication of public sector information (examples from Ireland, the Netherlands and Spain);
- Establishing a single and user-friendly web access point for environmental information (examples from Ireland and the EEA);
- Developing infrastructure on the most advanced platforms based on geospatial data and GIS technologies (examples from the EU and Lithuania);
- Providing technological support for sharing environmental data at the regional level.

Roadmap measures: Cooperation (Network)

The measures proposed to Georgia from the perspective of SEIS pillar: Cooperation are presented in the table below.

Table 5. Measures from the perspective of SEIS pillar: Cooperation

	Measure	Priority	Description
	20. Establish a collaborative institutional framework for the implementation of open data	High	This measure will strengthen the necessary institutional framework for managing open data, especially taking into consideration the environmental component. This measure will focus on the need to create strong cooperation between institutions to ensure the exchange, sharing, reuse and publication of public sector information (PSI). An example of an approach to establishing a collaborative institutional framework for open data involves:

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	Measure	Priority	Description
			• Amendment to the existing legal framework or additional secondary new regulations to foresee clear responsibilities of the various actors and ensure the clear division of responsibilities on open data at national and thematic levels (e.g. there should be general rules for governing the open data framework and specific rules for individual environmental data providers on how to organise an open data publishing process internally); • Establishment of a cross-sectoral working group which will assist/support and facilitate in the establishment of the operational mechanisms of collaboration (i.e. processes, procedures and good practices); • Organisation of events/fora/regular dialogues to foster collaboration between national stakeholders and various data users. This measure should also support collaboration in the field of spatial environmental information sharing. It should enhance cooperation between all of Georgia's ministries (including the Ministry of Environmental Protection and Agriculture represented in the NSDI State Commission) to ensure the participation of representatives of ministries, and their subordinated bodies and legal entities in the thematic working groups for spatial data infrastructure development. *The Good Practices Report provides examples of initiatives undertaken in the EU to foster inter-institutional and international cooperation in the field of open data. The open data maturity report 2019 provides criteria to assess the maturity of the institutional framework in a country. The document "Development of an assessment framework on environmental governance in the EU Member States" also provides good practices to establish an institutional framework for environmental governance.* *This measure is linked with the recommendations presented in the Content section of the present roadmap and the targeting of the revision of the legal framework.*
	21. Develop and ensure increased capacity for handling environmental and open data	Medium	Components of this measure cover: • Assessment of the capacities needed (human resources and tools) for managing and making available environmental data and information at national and local levels; • Recruitment of specialised staff and acquisition of necessary tools;

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	Measure	Priority	Description
			• Development and integration of procedures and processes for preparing and disseminating environmental data and information; • Professional development/training plans for civil servants and/or data stewards or data officers working with data. In this regard, it is possible to foresee official training programmes (mandatory) for staff in charge of data handling and to recognise these trainings through certificates. *The document "Development of an assessment framework on environmental governance in the EU Member States" provides multiple examples of initiatives undertaken to build capacity in this area. The section "2. Administrative capacity (environmental inspectorates, police, customs, prosecution services and audit bodies)" focuses strongly on the example of capacity-building in the EU.* *This measure is linked with the measures "Strengthening of technical capacity for environmental monitoring" and "Develop and/or continue to enhance an integrated system for environmental information management in accordance with the Aarhus Convention and the Protocol on PRTRs" of the present roadmap.*
	22. Promote international and regional cooperation to facilitate the implementation of the roadmap	High	This measure aims to support Georgia with international expertise and good practices to assist in the implementation of the present roadmap. To do so, it is recommended that: • Fora and other platforms where experience can be shared be identified; • Contacts with key stakeholders at the regional and international level be established to share experience and good practices; • An inventory of international and regional initiatives be built and their potential assessed. *The Good Practices Report provides examples of initiatives that can be undertaken to implement this measure, in the section "Increasing public administration, public and business awareness over open data and environmental data".*
	23. Raise awareness of open government and open data for the environment among citizens and economic operators	Continuous	This measure will increase the demand for open government and open data by raising awareness and conducting other promotion campaigns at national and local levels. This measure will focus on raising public awareness of the role and impact of environmental information, its

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	Measure	Priority	Description
			accessibility, usability and other related aspects, by pursuing on-going activities and strengthening and expanding them where and when appropriate. Additionally, a series of activities for promoting the use/reuse and sharing of environmental information could be undertaken, such as: • Hackathons; • Fora; • Promotion campaigns; • Development of incubators; • Development of public-private partnerships; • Facilitating dialogue and cooperation between national bodies, NGOs and the academic community. *The Good Practices Report provides examples of initiatives that can be undertaken to implement this measure, in the section "Increasing public administration, citizens and business awareness over open data and environmental data".*

In order to facilitate the implementation of the provided measures, the Good Practices Report provides examples and recommendations on the following topics:

- Increasing awareness and motivation among public institutions over e-government and digital solutions (example from the EU);
- Increasing awareness of e-government among the public and businesses (example from the EU);
- Coordinating open data initiative(s) (example from Ireland);
- Establishing processes and procedures for managing open data (example from Lithuania);
- Increasing public administration, public and business awareness of open data and environmental data (example from Belgium, Cyprus, the EU, Italy and Luxembourg);
- Promoting open data to organisations;
- Collecting user feedback and providing new means of communication between open data providers and users (example from Spain).

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