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## Glossary

The GDDS glossary<sup>1</sup> defines concepts that are referred to throughout this document. It incorporates definitions from the DSSC Glossary (Blueprint version 1.0<sup>2</sup>). Where needed clarification for the purposes of the Green Deal Data Space is shown alongside the DSSC's definition.

## Abbreviations

Term	Description
AEC	Architecture, engineering and construction
AI	Artificial Intelligence
AISBL	Association Internationale Sans But Lucratif
API	Application Programming Interface
BB	Building Block
CDP	Collective Data Provider
CEO	Chief Executive Officer
CINEA	Climate, Infrastructure and Environment Executive Agency
COO	Chief Operating Officer
CO2	Carbon Dioxide
CSA	Coordination and Support Action
CSCS	Cyprus Subsea Consulting and Services
CSRД	Corporate Sustainability Reporting Directive
CSR	Corporate Sustainability Responsibility
CSW	Catalogue Service for the Web
D-MRV	Digital Monitoring Reporting and Verification
DA	Data Act
DAO	Decentralised Autonomous Organisations
DAItOs	Data Altruism Organisations
DG CNECT	Directorate-General for Communications Networks, Content and Technology
DG DEFIS	Directorate-General for Defence Industry and Space
DG ENV	Directorate-General for Environment
DG MARE	Directorate-General for Maritime Affairs and Fisheries
DG RTD	Directorate-General for Research and Innovation
DGA	Data Governance Act
DIAS	Data and Information Access Services
DISP	Data Intermediation Service Provider
DPSIR	Drivers, Pressures, State, Impact, and Responses
DPT	Data Protection Taxonomy
DPV	Data Privacy Vocabulary
DSBA	Data Space Business Alliance
DSSC	Data Space Support Centre
DSV	Data Service Vocabulary

<sup>1</sup> <https://www.greatproject.eu/glossary/>

<sup>2</sup> DSSC Glossary Limited set of data spaces related terms, where each term has a criterion to determine whether or not something is an instance/example of the concept to which the term refers  
<https://dssc.eu/space/BVE/357073697/Introduction> 14/03/2024

<b>EC</b>	European Commission
<b>EDIB</b>	European Data Innovation Board
<b>EDIC</b>	European Digital Infrastructure Consortium
<b>EDITO</b>	European Digital Twin of the Ocean
<b>EEA</b>	European Environmental Agency
<b>EGD</b>	European Green Deal
<b>eIDAS</b>	Electronic identification and trust services for electronic transactions in the internal market
<b>EMFAF</b>	European Maritime, Fisheries and Aquaculture Fund
<b>EMODnet</b>	European Marine Observation and Data Network
<b>EMODPACE</b>	EMODnet Partnership for China and Europe
<b>ERDDAP</b>	Environmental Research Division's Data Access Program
<b>ESD</b>	European Strategy for Data
<b>ESG</b>	Environmental, Social and Governance
<b>ESR</b>	Effort Sharing Regulation
<b>ESRS</b>	European Sustainability Reporting Standards
<b>ETS</b>	Emissions Trading System
<b>EU</b>	European Union
<b>EUROSTAT</b>	Statistical Office of the European Union
<b>FAIR</b>	Findability, Accessibility, Interoperability, and Reusability
<b>GDDS</b>	Green Deal Data Space
<b>GDPR</b>	General Data Protection Regulation
<b>GEOSS</b>	Global Earth Observation System of Systems
<b>GGE</b>	GDDS Governing Entity
<b>GHG</b>	Greenhouse Gases
<b>GOE</b>	GGDS Operating Entity
<b>GREAT</b>	Green Deal Data Space Foundations and Community of Practice
<b>HR</b>	Human Resources
<b>ICES</b>	International Council for the Exploration of the Sea
<b>ICT</b>	Information and Communication Technology
<b>IDSA</b>	International Data Spaces Association
<b>INSPIRE</b>	Infrastructure for Spatial Information in Europe
<b>IOC</b>	Intergovernmental Oceanographic Commission
<b>IODE</b>	International Oceanographic Data and Information Exchange
<b>IP</b>	Intellectual Property
<b>IPR</b>	Intellectual Property Rights
<b>IR</b>	Implementing Rules
<b>ISO</b>	International Organisation for Standardisation
<b>ISO/IEC</b>	International Organisation for Standardisation/International Electrotechnical Commission
<b>IT</b>	Information Technology
<b>JRC</b>	Joint Research Centre
<b>KPI</b>	Key Performance Indicators
<b>LULUFC</b>	Land Use, Land Use Change and Forestry Regulation
<b>MEP</b>	Mechanical, Electrical and Plumbing
<b>MKEG</b>	Marine Knowledge Expert Group
<b>ML</b>	Machine Learning
<b>MS</b>	Member State
<b>MSc</b>	Master of Science

<b>MVP</b>	Minimum Viable Product
<b>NIS</b>	Network and Information Security
<b>NOAA</b>	National Oceanic and Atmospheric Administration
<b>ODIS</b>	Ocean Data and Information System
<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>OGC</b>	Open Geospatial Consortium
<b>OGC:WMS</b>	Open Geospatial Consortium Web Map Service Interface Standard
<b>P2B</b>	Platform-to-Business
<b>PhD</b>	Doctor of Philosophy
<b>PID</b>	Persistent Identifier
<b>PSD2</b>	Payment Services Directive 2
<b>RRF</b>	Recovery and Resilience Fund
<b>SDG</b>	Sustainable Development Goals
<b>SIMPL</b>	Smart Middleware Platform
<b>SME</b>	Small Medium Enterprise
<b>SMS</b>	Service Management System
<b>TEHDAS</b>	Joint Action Towards the European Health Data Space
<b>UN</b>	United Nations
<b>UNESCO</b>	United Nations Educational, Scientific and Cultural Organization
<b>W3C</b>	World Wide Web Consortium
<b>WFS</b>	Web Feature Service
<b>WMTS</b>	Web Map Tile Service

## Executive Summary

Europe has taken bold action to address the environmental and societal challenges of our times. The European Green Deal stands as a key priority of the European Commission, launching a set of ambitious strategic actions with the goal of achieving climate neutrality and net-zero emissions by 2050. To realise these targets, the establishment of a single data market, where data flows seamlessly across sectors and borders in a sovereign manner, is crucial. The European Strategy for Data introduces the launch of the sectoral data spaces and lays a legislative framework for trusted data sharing. The Green Deal Data Space (GDDS), a cross-sectoral data space, touches all economic sectors of society. The challenges associated with designing a data space that spans all sectors, involving multiple stakeholders from diverse scopes, are complex and unprecedented. Given the global nature of the Green Deal, the data space needs to accommodate global, regional, national and European initiatives. The governance of data space will be guided by European values, ensuring maximum reuse of data while duly respecting data sovereignty.

The GREAT project is building a set of pillars to support an implementation roadmap for the GDDS, namely a reference blueprint architecture, a governance framework and an inventory of high priority datasets. These pillars are based on the needs of a Community of Practice that involves contributors aligned with the goals of the European Green Deal.

This document presents the outcomes of the complete GREAT project, outlining a proposal for the governance framework of the GDDS. The activities that have led to this framework include an assessment of the current landscape on data spaces initiatives, requirements gathering from numerous reference use cases and data sharing initiatives, consultations with stakeholders, from the project's advisory board and ethical advisor, and validation of results and alignment with the Data Space Support Centre (DSSC) assets and other sectoral data spaces.

Numerous established data infrastructures and data sharing initiatives within dedicated domains represent important stakeholders for the GDDS and are expected to become key participants in the GDDS when it is deployed. Their significant investments of resources, effort and time must be respected. The governance of the GDDS builds on best practices from these initiatives evaluating how these communities can contribute to the data space based on their needs, value proposition and contributions toward the overarching GDDS objectives.

The GDDS governance requirements proposed in this report define a framework for complying with a complicated regulatory environment, business models for the entities responsible for deploying the GDDS, mechanisms for generation and sharing value among collaborating parties, multi-layer governance involving overlapping sets of stakeholders, all while ensuring trust between participants and guaranteeing sovereign control of data by their holders and rights holders. These requirements frame how the GDDS can be deployed, with implementation through specific legal and organisational structures, priority data content and policies, operational processes and federated technical infrastructure(s).

## Table of Contents

Abbreviations.....	3
Executive Summary.....	6
1. Introduction .....	11
2. Structure and Methodology .....	12
2.1.    Structure .....	12
2.2.    Methodology.....	13
2.2.1.    Definition of Governance .....	13
2.2.2.    Translating Governance Requirements into Implementation – Dimensions of Implementation .....	14
2.3.    Process for Defining the Preliminary GDDS Governance Framework.....	17
3. Business Concept for the Green Deal Data Space .....	19
3.1.    Definition of a Data Space .....	19
3.2.    Taxonomy of Data Space Objectives .....	19
3.3.    The GDDS Landscape .....	21
3.3.1.    Data Pathways and features of the GDDS .....	23
3.4.    Mission, Vision and Objectives of the GDDS.....	27
3.4.1.    Mission .....	27
3.4.2.    Vision .....	29
3.4.3.    Principles and Values.....	29
3.5.    Minimum Viable Product Proposed For the GDDS.....	29
3.5.1.    Trust Framework.....	29
3.5.2.    Business Model(s) and Sustainability.....	30
3.5.3.    Comprehensive Data Availability – One Window.....	31
3.5.4.    Tailored Governed Services .....	32
3.5.5.    Appropriate Legal Entities in Place .....	33
3.5.6.    Multi-Level Interoperability .....	34
3.5.7.    Defined Participation and Roles.....	35
3.5.8.    Support for Use Cases.....	36
4. Legal and Regulatory Context.....	36
4.1.    EU Horizontal Legal and Regulatory Context.....	37
4.1.1.    Tracking Data Categories, Data Lifecycle Stages and Related Compliance Requirements: .....	37
4.1.2.    Collective Data Providers: Data Altruism, Data Cooperatives, etc.:.....	38
4.1.3.    Tracking Data Service Types and Related Compliance Requirements .....	38
4.1.4.    Data Intermediaries .....	39
4.1.5.    Unfair Terms For Business-To-Business Data Sharing .....	39
4.1.6.    Interoperability in Data Spaces and Data Sharing Contracts .....	39

4.1.7. Cybersecurity Required for Personal Data and/or Data About Critical Infrastructure.....	39
4.1.8. Other EU Legal Requirements for Governance .....	40
4.1.9. Linking the Digital and Real Worlds for Legal Certainty .....	40
4.2. Sector-Specific Legislation and Regulation.....	41
4.2.1. Climate mitigation and adaptation.....	43
4.2.2. Circular economy .....	44
4.2.3. Biodiversity.....	44
4.2.4. Pollution .....	45
4.2.5. Sustainability reporting .....	45
4.3. “Choice of Law” Clauses and Member State Legislation and Regulation .....	46
5. GDDS Decisions Made to Ensure Legal Compliance .....	46
5.1. Working with data that may have limits on access or re-use.....	47
5.2. Working with “collective data providers” that represent groups of individual data providers (both natural and legal persons) .....	49
5.3. Providing Services Covered by Related EU Laws and Regulations and Ensuring These Services Comply with Related Requirements .....	50
5.4. Providing Sustainable Data Intermediation Services for the GDDS .....	50
5.5. Identify Standard Terms for B2B Data Sharing that are Not Unfair.....	51
5.6. Interoperability in Data Spaces and Data Sharing Contracts .....	52
5.7. Cybersecurity Required for Personal Data and/or Data About Critical Infrastructure.....	53
5.8. Continued Compliance with other EU and MS Legal Requirements .....	54
5.9. Linking the Digital and Real Worlds for Legal Certainty .....	54
5.10. Complying with the INSPIRE and High Value Datasets regulations.....	57
5.11. Complying with Competition and Anti-Trust Legislation.....	58
5.12. Data Intermediaries to Comply with Requirements set by the Data Governance Act.	58
5.13. Participants to Comply with Requirements set by the Artificial Intelligence Act.	59
6. GDDS Decisions Made to Ensure the GDDS is Strategically Focussed. ....	59
6.1. High Level Strategic Decisions .....	60
6.2. Service Architecture .....	62
6.3. Technical Architecture and Control.....	62
6.4. Governance Architecture .....	65
6.5. Use Cases and Value Creation.....	67
6.6. Operations and Monitoring.....	69
7. Requirements alignment with the DSSC Blueprint.....	72
8. Conclusion and Next Steps.....	75

Appendix 1: Data Space interoperability .....	77
Appendix 2 Business Model Canvas: EMODnet Case Study.....	80
Appendix 3: Business Model Canvas: CO2 DataHub Case Study .....	91
ANNEX 4: Legal and Ethical Assessment Methodology .....	101

## List of Tables

Table 1: Taxonomy of Data Space Objectives .....	19
Table 2: Data Sharing Attributes of Major Categories of Data .....	25
Table 3: Implications of <b>GR1.01</b> : Working with data that may have limits on access or re-use. .....	49
Table 4: Implications of <b>GR1.02</b> : Accepting data from Collective Data Providers (CDPs). ....	49
Table 5: Implications of <b>GR1.03</b> : Establishing a Collective Data Provider (CDP). .....	49
Table 6: Implications of <b>GR1.04</b> : Providing Services Covered by Related EU Laws and Regulations.....	50
Table 7: Implications of <b>GR1.05</b> : Establishing a Regulated Data Intermediary for the GDDS.51	
Table 8: Implications of GR1.06: Identify Standard Terms for B2B Data Sharing that are Not Unfair.....	51
Table 9: Implications of <b>GR1.07</b> : Interoperability in Data Spaces and Data Sharing Contracts .....	52
Table 10: Implications of <b>GR1.08</b> : Implement the GDDS as a secure digital infrastructure.....53	
Table 11: Implications of <b>GR1.09</b> : Complying with other EU and MS Legal Requirements.....54	
Table 12: Implications of <b>GR1.10</b> : Establish Governing Entity; Establish or Identify Operating Entity .....	55
Table 13: Implications of <b>GR1.11</b> : Legally relevant actions within the GDDS will be securely logged.....	56
Table 14: Implications of <b>GR1.12</b> : Legally relevant actions must be performed by digital users bound to real world entities.....	56
Table 15: Implications of <b>GR1.13</b> : GDDS should allow public administrations to comply with INSPIRE.....	57
Table 16: Implications of <b>GR2.05</b> : Roles and Role Definitions.....	61
Table 17: Implications of <b>GR4.01</b> : Governing an Open Architectural Platform.....	63
Table 18 Interoperability aspects of the GDDS objectives .....	79
Table 19: EMODnet Budget Overview .....	89

## List of Figures

Figure 1: The Data Space “Landscape”: Relationship with Ecosystem, Community, Infrastructures and Use Cases.....	21
Figure 2: Policy pathways for establishment of the European Green Deal Data Space .....	23
Figure 3: Multiple Use Cases within the GDDS.....	26
Figure 4: Horizontal EU Legislation Relevant to Data Spaces .....	37
Figure 5 Sectorial legislation from selected GDDS actions.....	42
Figure 6: Relationships among EU Climate Law Initiatives and sectors .....	43
Figure 7 GDDS requirements mapping to DSSC BB .....	74
Figure 8 Data Space Protocol.....	78
Figure 9 EMODnet Data Product Catalogue .....	81

Figure 10 CO2 DataHub Project's Conceptualization of the Built Environment CO2 Data Ecosystem.....	92
Figure 11 CO2 DataHub Project's Conceptualisation of the Built Environment CO2 Data Ecosystem.....	93
Figure 12: CO2 DataHub's Process to Define the Value Proposition .....	96
Figure 13 Cost of Collaboration Membership at KIRA Hub.....	100

## 1. Introduction

Technology and data are increasingly recognised as pivotal forces in addressing one of today's most pressing issues: climate change. Digital transformation offers new possibilities for tracking environmental changes, calling for a European digital industry that focuses on sustainability and integrates data at its core.

The EU often refers to a twin green and digital transition; two main trends that will shape the future of the European Union.

The European Green Deal (EGD)<sup>3</sup>, EU's growth strategy presented back in 2019 introduced a new vision to transform the Union into a modern, resource-efficient and competitive economy and become the first climate neutral continent by 2050. This goal is now also enforced by a legally binding regulation, the Climate Law<sup>4</sup>.

On the digital front, the EU has unveiled the European Strategy for Data<sup>5</sup>, which aims to create a single market for data. To contribute to this goal, the concept of Common European Data Spaces was introduced with a goal to foster an ecosystem (of companies, civil society and individuals) creating new products and services based on more accessible data. This is supported by laws like the Data Governance Act<sup>6</sup> and the Data Act<sup>7</sup>, which help build a trustworthy environment for sharing and using data.

The strategy outlines the creation of: "A Common European Green Deal data space, to use the major potential of data in support of the Green Deal priority actions on climate change, circular economy, zero-pollution, biodiversity, deforestation and compliance assurance".

However, implementation of the EGD vision presents significant challenges due to the vast amount of diverse and distributed data resources from many stakeholders, different sectors, application domains and governance schemes.

The GDDS is expected to solve these problems of fragmentation and inconsistency by supporting sharing of data, across silos and islands, and flexible data processing, respecting the rights of data holders to make decisions about how their data is used, as well as respecting European values.

In the framework of the Preparatory Action of the Green Deal Data Space. The GREAT project aims to contribute to this vision establishing the GDDS foundations and Community of Practice with: (1) the Minimum Viable GDDS for the first implementation phase of the data federation; (2) the reference blueprint of the technical architecture; (3) the governance scheme and (4) implementation roadmap, building on the strong involvement and support of a (5) cross-sectoral pan-European community of practice of data and service providers, users and intermediaries.

By focusing on the three strategic actions (2030 Biodiversity Strategy, Climate Change Adaptation Strategy and Zero Pollution Action Plan), GREAT aims at using the major potential of data to effectively support the Green Deal priority actions.

<sup>3</sup> European Commission, "COMMUNICATION FROM THE COMMISSION The European Green Deal" COM(2019) 640 final <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52019DC0640>

<sup>4</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32021R1119>

<sup>5</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0066>

<sup>6</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022R0868>

<sup>7</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32023R2854>

## 2. Structure and Methodology

This Deliverable builds on the preliminary governance framework presented in D4.1 “Phase 1 Governance Requirements and Endorsed Governance Scheme”. Since that report was prepared, the GREAT project has expanded the scope of reference use cases considered, reached out to pilots and funded projects relevant to the EGD, and expanded consideration of requirements driven by the private sector, particularly in connection with efforts to increase circularity in the European economy. “GREAT Reference Use Cases & Initiatives and relevant stakeholders<sup>8</sup>” presents a “master list” of use cases and relevant stakeholders identified by GREAT and considered in this analysis.

### 2.1. Structure

D4.1 outlined a “generic governance framework” as a starting point since there were few governance models from other sources such as the Data Spaces Support Centre (DSSC). However such models are now available, and this document is now aligned with the Governance Building Blocks identified by the DSSC<sup>9</sup> in v0.5 released in October 2023, as well as with the directions of Blueprint v1.0 from the DSSC (formally released 13 March 2024). This deliverable focusses on the governance requirements of the Green Deal Data Space (GDDS).

Section 2.2 establishes a framework for the presentation, starting with a pragmatic definition of governance and proposing two dimensions of governance.

Chapter 3 frames the discussion of governance in the context of the “business concept” for the GDDS, positioning it in the context of data spaces in general, surrounding ecosystems, embedded use cases, and addressing questions of objectives, principles and purpose, as well as indicative activities planned for the GDDS when it is deployed.

Chapter 4 summarizes key aspects of the current horizontal legal and regulatory framework across the European Union since this framework constrains the governance decisions that can be made in any data space operating in the EU. Chapter 4 also summarizes key aspects of the legal framework for environmental and geospatial data in the EU as well as the European Green Deal specifically.

Chapter 5 identifies decisions that must be made for the GDDS in order to comply with the legal and regulatory framework detailed in chapter 4.

Chapter 6 identifies the specific governance needs and requirements of the GDDS, aligning with best practices captured in the DSSC Blueprint and governance Building Blocks, as well as specific requirements identified by both the GREAT project’s use cases and related Task Forces and the community more broadly. Preliminary directions are given based on input gathered from the Community of Practice; these are summarized in section 3.5. These decisions should be revisited formally as part of the GDDS deployment effort, possibly following the “Co-Creation” methodology under development by the DSSC.

Chapter 7 presents a mapping of the GDDS governance requirements into the DSSC Technology and Governance Building Blocks.

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<sup>8</sup>[https://www.greatproject.eu/wp-content/uploads/2024/03/GREAT\\_RUCIs-relevant-stakeholders\\_Annex\\_v3-1.pdf](https://www.greatproject.eu/wp-content/uploads/2024/03/GREAT_RUCIs-relevant-stakeholders_Annex_v3-1.pdf)

<sup>9</sup><https://dssc.eu/space/BBE/178421761/Building+Blocks+%7C+Version+0.5+%7C+September+2023>

The prior version of this report (D4.1<sup>10</sup>) called-out and numbered preliminary governance requirements, the current report has realigned requirements against the DSSC's Building Blocks (BBs), but this numbering is changed in the current document. The new numbering can be used track governance requirements through implementation and operationalisation in companion deliverables of the GREAT project, as well as subsequent deployment efforts.

Chapter 8 presents key conclusions, recommendations, and next steps for consideration by the community.

## 2.2. Methodology

This section establishes a framework for the presentation of governance requirements, starting with a pragmatic definition of governance and proposing two dimensions of governance.

### 2.2.1. Definition of Governance

As presented above, the Data Spaces Support Centre (DSSC) defines a “data space” as “*a distributed system defined by a governance framework that enables secure and trustworthy data transactions between participants while supporting trust and data sovereignty. A data space is implemented by one or more infrastructures and enables one or more use cases*”. The governance framework of any data space is therefore an essential characteristic of that data space, positively or negatively affecting the range of data that might be made available, what can be done with it, and with whom it can be shared or exchanged. For the GDDS, the needs and requirements of the relevant “participants” – i.e. the community of practice for the European Green Deal – are identified and addressed through the governance framework proposed here for the GDDS.

Neither “governance” or “data space governance” are defined by the DSSC. The DSSC defines “data space governance framework” as “*the structured set of principles, processes, and practices that guide and regulate the governance, management and operations within a data space to ensure effective and responsible leadership, control, and oversight. It defines the functionalities the data space provides and the associated data space roles, including the data space governance authority and participants*”. One “explanatory comment” mentions “*the responsibilities covered in the governance framework include assigning the governance authority and formalising the decision-making powers of participants*”.

GovLabs notes that “governance is about decision-making”<sup>11</sup> and adapts an OECD definition<sup>12</sup> of governance as “*the range of political, institutional and administrative rules, practices and (formal and informal) processes through which and how decisions are taken and implemented; decision-makers are held accountable in the development and management of [...] resources and the delivery of [...] services; and, last but not least, stakeholders articulate their interests and have their concerns considered.*” Both [11] and [12] recognize that governance and related governance frameworks must operate over multiple layers and possibly through a “governance continuum”. [11] highlights that governance “emphasises networks of decision-making across multiple levels.”

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<sup>10</sup>[https://www.greatproject.eu/wp-content/uploads/2023/10/D4.1-v1.0-Phase-1-Governance-Requirements-and-Endorsed-Governance-Scheme\\_web.pdf](https://www.greatproject.eu/wp-content/uploads/2023/10/D4.1-v1.0-Phase-1-Governance-Requirements-and-Endorsed-Governance-Scheme_web.pdf)

<sup>11</sup> Fritzenkötter, J., Hohoff, L., Pierri, P., Verhulst, S.G., Young, A., and Zacharzewski, A., ‘Governing the Environment-Related Data Space’. *TheGovLab*, 2022, <https://files.thegovlab.org/erdgovernance.pdf>.

<sup>12</sup> OECD. (2011). Water governance in OECD countries: A multi-level approach (OECD studies on water). Paris: OECD Publishing. <http://dx.doi.org/10.1787/9789264119284-en>

Considering these and other views of governance (and government) as they can be applied to political entities (nations, states), commercial entities, as well as digital entities such as "digital platforms" and "data spaces", the GREAT project propose the following definition:

"Governance is the process for making decisions about an entity:

- Choosing the questions that must be decided, such as the mission and objectives of the entity, the problems to be solved, and the needs to be addressed.
- Agreeing on the "scope" and "boundaries" of the entity, both initially and over time.
- Ensuring compliance of the entity with applicable laws and regulations.
- Deciding who should be involved in decision-making, including both the actual decision process (including activities like voting, etc.), as well as consultation about each decision.
- Decisions include those about the creation of the entity, such as its form and the relationships between and among outside parties with the entity, as well as who should participate in both decision making and governance and in the operation of the entity.
- Managing the decision-making process, recording both results and details about how these results were decided, such as who was consulted.
- Communicating about the governance process -- identifying who is involved, what decisions are being considered, what decisions have been made.
- Tracking the decisions made, monitoring compliance with these decisions, enforcing those decisions consistent with processes (which have also been decided through the governance process).
- Measuring and reviewing the performance of the entity against agreed objectives."

This definition is consistent with the ideas about governance offered by SITRA<sup>13</sup>, Data Sharing Coalition<sup>14</sup>, the IDSA Rulebook v2.0<sup>15</sup>, and OpenDEI's "Design Principles for Data Spaces"<sup>16</sup>. [16] introduces the concept of "soft infrastructure": "*the suite of agreements that enable a data space to function – this is the governance and glue that enable a system of systems to successfully operate*".

### 2.2.2. Translating Governance Requirements into Implementation – Dimensions of Implementation

Governance involves the translation of the objectives of the problems to be solved by and/or the needs to be addressed by an entity into decisions about how to meet those objectives, legally, organizationally, and/or technologically<sup>17</sup>. The European Strategy for Data[5] describes data spaces as data ecosystems with shared legal, operation, functional agreements and technical standards, so such categories for implementation are appropriate.

To illustrate, for a government, governance involves ongoing identification of problems or needs, decisions about how to address those needs, implementation of the agreed response through various means (regulation, taxation, financial and human support programs, legislation), and measurement of its effectiveness (sometimes through election of different leaders). Governments themselves are often formed as part of a governance process, with

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<sup>13</sup> SITRA, Rulebook for a Fair Data Economy, 2022, <https://www.sitra.fi/en/publications/rulebook-for-a-fair-data-economy>

<sup>14</sup> <https://datasharingcoalition.eu/our-approach-and-tools/>

<sup>15</sup> IDSA Rulebook v2 <https://docs.internationaldataspaces.org/ids-knowledgebase/v/idsa-rulebook/front-matter/readme>

<sup>16</sup> Nagel, L. and Lycklama, D. (Eds), 'Design Principles for Data Spaces'. International Data Spaces Association, 2021, doi:10.5281/zenodo.5244997

<sup>17</sup> EUHubs4Data: [Evaluation and recommendations on the legal conditions for trading data in a complex ecosystem https://cordis.europa.eu/project/id/951771/results](https://cordis.europa.eu/project/id/951771/results)

decisions about the form of government, the different “organs” of governance, and their relationships, decided through a collective process and documented in a “constitution”.

For a corporation, governance ensures the organisation is working toward agreed objectives (including profit for a for-profit corporation), using the agreed strategy, while complying with both internal policies and external rules. Initial governance decisions relate to establishing the rights of shareholders (or members), voting procedures, the respective roles of the board/executive council vs. members and vs. executive management, etc., all of which are documented in the corporation’s charter or articles of incorporation and accompanying by-laws. Most for-profit corporations delegate operational and implementation questions to management in order to preserve flexibility, focussing governance activities on supervision of management, reviews of strategy and performance and resolution of stakeholder disputes.

For a data space, governance involves the initial identification of stakeholder problems and needs, decisions about how to meet those needs (e.g., with legal agreements, operational processes, and/or technology), followed by implementation and performance monitoring. For a technically oriented undertaking like a data space, there are strong parallels between “governance processes” and “requirements analysis”.

Governance requirements identified for the GDDS, particularly in Chapter 5 and 6, will be highlighted and numbered to allow them to be tracked through various mechanisms. Their translation into both technical and operational requirements is highlighted through cross references to the DSSC’s Technical Building Blocks, to possible future building blocks for operational activities, as well as to outputs of the GREAT project, specifically D3.2 Technical Blueprint for technical requirements and D6.2 Implementation Roadmap for operational requirements.

### **2.2.2.1. Stages of Governance – The Lifecycle Dimension of Governance**

Governance has a lifecycle, as highlighted by the proposed definition of governance, as well as by several observers<sup>18 19</sup>. This analysis uses the following four stages of governance:

1. **Formation:** Governance starts with agreement among a group of initial stakeholders (“founders”) that an “entity” should be created to address a common need and progressively translating that initial agreement into the concrete formation of the entity and its associated governance. This process starts as a “co-creation”<sup>20</sup> effort among those stakeholders, sharing and exploring common needs and solutions. According to the DSSC, this exploratory step is followed by “Preparatory” and “Implementation” steps, where initial results of co-creation are translated into a concrete governance framework through the application of various Governance Building Blocks, addressing initial decisions about how the entity should be designed and operated.
2. **Operation and Monitoring:** After formation, the entity begins to operate, requiring operational activities, and is expected to fulfil its mission, requiring monitoring and enforcement activities, as well as continuous improvement and innovation.

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<sup>18</sup> Lis, Dominik & Otto, Boris. (2021). Towards a Taxonomy of Ecosystem Data Governance. 10.24251/HICSS.2021.733.

<sup>19</sup> ISO/IEC 38500:2015 <https://www.iso.org/standard/62816.html>

<sup>20</sup> The DSSC has recently defined a new asset – “Co-Creation” -- to be developed and offered to data space creators to guide this stage of activity, which maps to the “exploratory” stage of data space development.

3. **Sustainability:** To be complete, the governance lifecycle should consider the steps needed to ensure the entity's sustainability and persistence, or possible merger, combination or termination.

In many cases, decisions taken at the Formation stage drive corresponding requirements for operations as well as monitoring in support of both enforcement and continuous improvement. These operations and monitoring requirements are detailed in connection with a few Formation requirements, but in many cases, these are clear and are not presented explicitly.

#### **2.2.2.2. Layers of Governance – the Context Dimension of Governance**

The governance framework for a data space has multiple layers. This layered approach has been proposed by several analyses, including Torre-Bastida, et al<sup>21</sup> and the DSSC<sup>22</sup>.

This analysis maps governance requirements onto four layers, as follows:

- **Ecosystem Governance Layer:** This layer addresses the good governance of the community of practice and related digital infrastructures surrounding the GDDS and related data spaces (such as agriculture). The focus of Ecosystem governance is to identify common goals and create common understanding of terms and concepts in support of interoperability at all levels.
  - Ecosystem Governance can include standardisation and transparency efforts, for example registries of metadata standards and data models that might be used in many data spaces, vocabularies of data types and service types that assist with regulatory compliance, as well as registries of data spaces themselves and possibly their participants to assist users navigating an evolving landscape of initiatives.
  - Ecosystem Governance also includes the “soft infrastructure” required to enable interoperability between different infrastructures<sup>23</sup> that may participate in the GDDS. While this is specific to the GDDS, it is broader than the Data Space Governance Layer described next, since it would not directly bind participants to specific rules, but it enables organisations to work together through shared principles and use of best practices.
- **Data Space Governance Layer:** This layer is the focus of this document, enabling and supporting “data transactions” as well as the “development of new products and services, scientific research or civil society initiatives” contemplated by both the Data Governance Act (DGA) [6] and the Data Act (DA) [7].
  - Decisions-made in the Data Space Governance Layer define many of the entities that are needed to implement and operate the GDDS, including the governing entity, possible operating entity, as well as one or more legal Data Intermediaries (as defined in the DGA).

<sup>21</sup> Torre-Bastida, A.I., Gil, G., Miñón, R., Díaz-de-Arcaya, J. (2022). Technological Perspective of Data Governance in Data Space Ecosystems. In: Curry, E., Scerri, S., Tuikka, T. (eds) Data Spaces. Springer, Cham. <https://doi.org/10.1007/978-3-030-98636-04>

<sup>22</sup> <https://dssc.eu/space/BBE/178421909/Organisational+and+Business+building+blocks>

<sup>23</sup> While the DSSC defines a data space as “an infrastructure that enables data exchange transactions...”, the DSSC does not define “infrastructure” and does not specify that the infrastructure required for a data space must be “digital”. In fact, a traditional library, with printed books, shelves organised by category, and a card catalogue by subject, is every bit as much a “data sharing infrastructure” as any digital infrastructure. “Data exchange transactions” have been executed and recorded with writing or printing on paper for centuries. Thinking about how “analogue infrastructures” can be used to implement data exchange transactions can offer insights into the principles required for governance at different levels.

- The Data Space Governance Layer captures the processes required to implement data sovereignty. These processes translate information provided by data holders and data rights holders, including the subjects of personal data, which are described in the Participant Governance layer (see below), into the safe and approved access and use of that data.
- **Use Case Governance Layer:** Use Cases are entities implemented within a data space, allowing subsets of participants, data and services to work together to create value, which can be shared in-kind or monetized, within the Use Case or more broadly. The governance of a Use Case incorporates the governance decisions made for its “parent” Data Space but also allows Use Case-specific decisions to be made, which might be more restrictive (e.g. restricting access to data only to the participants in the Use Case) or less restrictive (e.g. relaxing requirements on data providers to provide persistent identifiers or to align with certain metadata standards with which the data provider may not be able to comply).
- **Participant Governance Layer:** This layer defines the decisions required to manage the onboarding of participants into the GDDS in one or more specific roles, to monitor participant activity in the GDDS and ensure compliance with the policies of the GDDS.
  - This layer establishes the roles that will be defined in the GDDS and the rules and policies that apply to participants acting in each role.
  - This layer specifies how data holders and data rights holders, including the subjects of personal data, can describe potential access and use for each item of data, enabling not only data sovereignty, but also compliance with a growing list of relevant legislation. This layer will also enable algorithmic data governance, in which data access and use policies are defined and implemented in a fully automated fashion. Achieving this level of automation will require participants to their data access and use policies in detail so that they will be both machine readable and machine actionable.
  - This layer will decide how one or more collective data providers (such as data cooperatives and data altruism organizations) can participate in the GDDS, and particularly whether a “catch all” collective data provider should be established to participate in the GDDS.
  - This layer also specifies how service providers and/or infrastructure providers will be held accountable for the security, privacy and confidentiality of any data from the GDDS that is processed or stored by these services or infrastructure.

Some analyses of governance present the governance structure that might be agreed by participants in broad initiatives such as Gaia-X or the International Data Spaces Association as a separate layer. These insights into governance have been incorporated into the framework above.

### 2.3. Process for Defining the Preliminary GDDS Governance Framework

While the DSSC's Governance Building Blocks help to frame the decisions that need to be made, the DSSC does not describe a process for this decision-making. The GREAT project has addressed this task using the following approach:

1. Develop an understanding of the actors, potential participants and key objectives of the Green Deal Community of Practice. This community, and the use cases that drive their objectives, are described in [8].

2. Understand the framework of horizontal and sectoral EU law and regulation that applies to this community and to potential data space participants in general. This framework is described in Chapter 4.
3. Make preliminary decisions about the scope and strategy of the GDDS, given the understanding developed in steps 1 and 2. These decisions are addressed in Chapter 5.
4. Based on the strategic choices described in Chapter 5, use the eight Governance Building Blocks defined by the DSSC to address specific aspects of the governance framework. Translate these governance decisions into technical decisions (using the Technical Building Blocks defined by the DSSC) and/or operational decisions. These decisions are presented in Chapter 6.

This process should be updated and repeated as an initial part of any deployment of the GDDS, and most of these steps must involve the broader Green Deal Community of Practice so that the resulting governance framework will be accepted by that community.

### 3. Business Concept for the Green Deal Data Space

Like other common European data spaces, the initial value proposition for the Green Deal Data Space (GDDS) is to create a common platform to find, access and use the wide range of data, from a wide range of providers, both public and private, relevant to the European Green Deal priority actions, as well as to environmental stewardship and sustainability more broadly.

#### 3.1. Definition of a Data Space

The DSSC's Glossary<sup>24</sup> (Blueprint v1.0) defines a "data space" as "*a distributed system defined by a governance framework that enables secure and trustworthy data transactions between participants while supporting trust and data sovereignty. A data space is implemented by one or more infrastructures and enables one or more use cases*" [bold emphasis from DSSC]. This definition focusses on enabling data transactions, but the reference to "use cases" also links to a concept from the DSSC that specifically links value creation to use cases.

The EU's Data Governance Act (DGA) [6] and Data Act (DA) [7] define a data space as a "*purpose- or sector-specific or cross-sectoral interoperable frameworks of common standards and practices to share or jointly process data for, inter alia, the development of new products and services, scientific research or civil society initiatives*" [bold emphasis by the authors]. This highlights that data spaces are expected to have a broader purpose than simply enabling data transactions.

#### 3.2. Taxonomy of Data Space Objectives

The objectives to be achieved by a Data Space are key to its design and governance. The GREAT project developed a taxonomy of data space objectives, illustrating the potential cumulative value they might create (see Table 1):

Table 1: Taxonomy of Data Space Objectives

Objective Level	Description
<b>Level 0:</b> <b>Presence of Many Parties, Relevant Parties</b>	A well identified Community of Practice with Participants that have a good understanding of their role and commitment towards the data space is in place.
<b>Level 1:</b> <b>Level 0 + Broad Sovereign Information Resource</b>	Relevant data and services from possibly diverse sources are available with easy search, browse, access, use, consistent metadata and interoperable with each other. Data sovereignty including access and usage conditions is respected throughout the data space. Data is packaged as "data products" to support these objectives.
<b>Level 2:</b> <b>Level 1 + Quality</b>	Data is labelled to specify the quality processes it has been subject to, which may include indicators such as accuracy, precision, defined collection procedures, mechanisms for review and quality control, errata and retraction, fitness for different purposes, spatio-temporal consistency and sustainability or reliability of the data in the future and accessibility over time. Separately data can

<sup>24</sup><https://dssc.eu/space/Glossary/176554052/2.+Core+Concepts>

	be verified by trusted parties, following documented procedures and protocols, with different levels of assurance.
<b>Level 3: Level 2 + Analysis</b>	Various analytical tools are available, not just to transform grids, subset or visualise on individual datasets, but to bring different data across domains together to allow insights, enabling data integration and data fusion capabilities. Quality information is incorporated into the resulting product(s) so that analytical results have their own quality indicators.
<b>Level 4: Level 3 + Actionable Insights</b>	Analysis, or even data without analysis, can be targeted to a user's needs (e.g., "give me data as well as forecasts and risk assessment about my farm, about all my corporate locations, about my house"). This can include alerts if the situation changes, or new data shows a new trend.
<b>Level 5: Level 4 + Aggregation/Analysis of impact</b>	Data can be aggregated across sectors, jurisdictions, etc.; impact of actions taken in the past can be analysed, impact of current actions can be modelled. Overall assessments are updated as new data arrives.
<b>Level 6: Level 5 + Performance Monitoring</b>	Forecast impacts of various actions can be developed, and then new observations can be compared against the forecast.
<b>Level 7: Level 6 + Target Setting</b>	To support some use cases, particularly policy development use cases, different scenarios need to be modelled, forecasts produced, and then performance assessed against targets. As new data arrives, forecasts are updated, target status is updated and alerted

The features of Level 2 (and by inclusion, Levels 0 and 1) are described in more detail below.

The higher levels of this taxonomy align both with the DSSC's concept of Use Cases enabling value creation and with the DGA's and DA's vision of data spaces enabling more than just data sharing and data transactions. The analyses, insights, etc. created at each level could be packaged as "public good" outputs or as services or products delivered or "resold" by new or existing downstream businesses. Participants, including data and service providers as well as consumers of those resources, can participate in specific use cases supported by the data space, targeting objectives at different levels and sharing in the value created through a variety of business models.

This taxonomy aligns with the European Environmental Agency's DPSIR<sup>25</sup> framework (looking into Drivers, Pressures, State, Impact, and Responses): The DPSIR framework highlights the need for clear and specific information on several factors in an interlinked socio-economic and ecological system.

<sup>25</sup> <https://www.eea.europa.eu/help/glossary/eea-glossary/dpsir>

It helps define what is known about:

- Driving forces; and their resulting environmental
- Pressures; on environmental and socio-economic
- States, including the
- Impact resulting from these pressures, and
- the subsequent societal Responses.

Driving forces could be any kind of human activity causing environmental degradation. The results are pressures such as emissions or waste. These in turn alter the environmental state (physical, chemical and biological) and ‘impacts’ on ecosystems, human health and functions, eventually leading to political ‘responses’ (prioritisation, target setting, laws).

This taxonomy also supports the range of functions required for e.g., the digital monitoring, reporting and verification (D-MRV) system<sup>26</sup> contemplated to underpin future carbon markets under the goals of the Paris Agreement.

### 3.3. The GDDS Landscape

As noted above, the DSSC’s Glossary defines a “data space” as “*a distributed system defined by a governance framework ... . A data space is implemented by one or more infrastructures ...*”. This definition suggests a model of the relationship among different entities, illustrated in Figure 1:

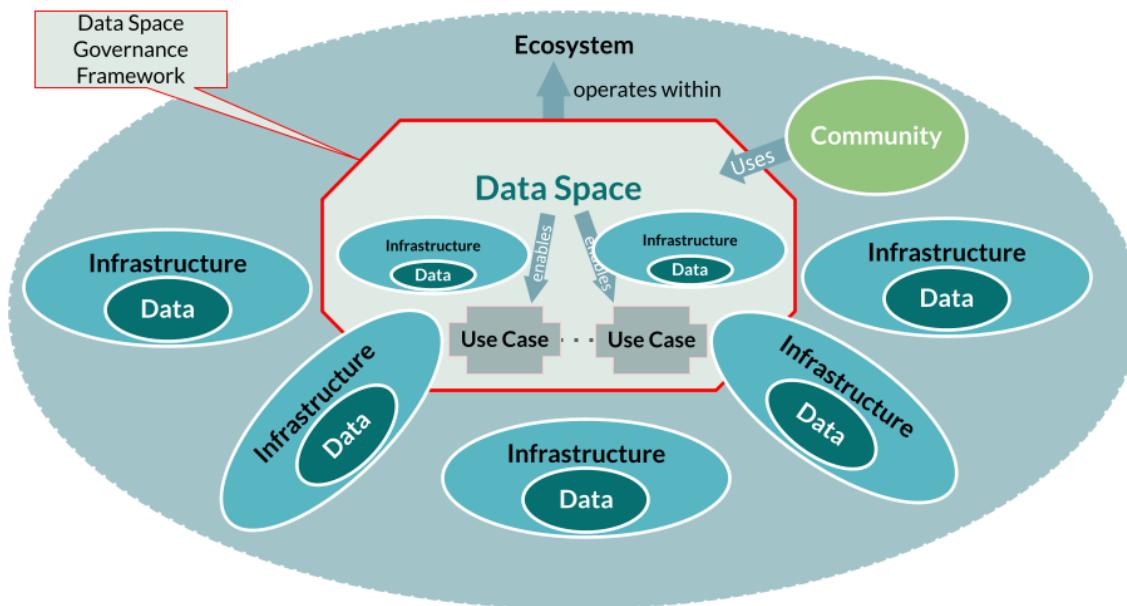


Figure 1: The Data Space “Landscape”: Relationship with Ecosystem, Community, Infrastructures and Use Cases

Note the following aspects of this model:

- The Data Space Governance Framework defines what is “inside” the Data Space, and what is “outside”.

<sup>26</sup>World Bank. 2022. Digital Monitoring, Reporting, and Verification Systems and Their Application in Future Carbon Markets. © Washington, DC: World Bank. <http://hdl.handle.net/10986/37622> License: [CC BY 3.0 IGO](#).

- An “Ecosystem” surrounds the Data Space and in most cases includes the existing collections of data, data infrastructures and a related community of practice. Unlike the Data Space, this Ecosystem does not have clear boundaries or defined governance.
- When the Data Space is created, some infrastructures will participate in its implementation and will include some of their infrastructure under the governance of the data space. For example, “participating” infrastructures could include technology such as connectors or agents to make their data available to the Data Space. Even for participating infrastructures, the data usually remains outside the Data Space.
- Other infrastructures may continue to operate completely outside the Data Space. The data held by each infrastructure remains outside the Data Space. Non-participating infrastructures typically make their data available through APIs.
- The Data Space can establish its own infrastructure(s) to provide certain services and store data inside the data space. This data can include operational data such as membership registries, catalogue metadata, as well as value-added services such as repositories for data for which there are no other storage options, or specialized services such as data analytics, federated learning, etc.
- Use Cases can be created within the Data Space to enable “the development of new products and services, scientific research or civil society initiatives”<sup>27</sup>, operating with rules and policies that are consistent with the overarching Governance Framework of the Data Space, while possibly varying them in ways that enable the Use Case to function. Use Cases are intended to create value, which might be shared in-kind and/or monetized, among contributors to the Use Case and/or the broader Data Space.

This model can be used to understand the landscape surrounding the GDDS. While the creation and deployment of the GDDS is the subject of a funding call described in the Digital Europe Work Programme 2024-2025<sup>28</sup>, the GDDS will be created within an existing **Global Digital Ecosystem for the Environment**, comprising many well-established digital infrastructures, in Europe and beyond, already operating and providing access to valuable data relevant to the European Green Deal, operated by and used by a global community of practice. The design and deployment of the GDDS must involve this existing **Global Community of Practice for the Environment** as a key stakeholder group. This Ecosystem and Community of Practice, including several key infrastructures, are described in [8]

Similarly, the GDDS is only one of more than a dozen common European data spaces now being deployed in a range of domain areas. The GDDS will not be set up to compete with any of these data spaces, and instead it is expected that all data spaces will cooperate and complement one another, specifically through the sharing of data between data spaces subject to the application of their respective governance frameworks and access and use policies. Like the GDDS, each of these data spaces will be deployed in the context of its own surrounding digital ecosystem and community of practice. Collectively, all these data spaces will operate within a common **Data Space Ecosystem** and **Data Space Community of Practice**. The various data spaces under development and their related ecosystems are outlined in the EC’s “Second Staff Working Document on data spaces” (DG CNECT, 2024)<sup>29</sup>.

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<sup>27</sup> From the definition of a data space in the DGA [6] and DA [7]

<sup>28</sup>[https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/digital/wp-call/2024/call-fiche\\_digital-2024-cloud-ai-06\\_en.pdf](https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/digital/wp-call/2024/call-fiche_digital-2024-cloud-ai-06_en.pdf)

<sup>29</sup> <https://digital-strategy.ec.europa.eu/en/library/second-staff-working-document-data-spaces>

It would be possible to design and implement a specific data infrastructure to support multiple data spaces as “tenants”. This is a common architectural approach for many software-as-a-service capabilities. It would be important for such a technical system to be configured to accommodate the governance requirements specified at all levels of the governance framework, and to allow the different tenant data spaces to be configured as specifically required by their specific governance frameworks and corresponding data ecosystems.

However, this single infrastructure approach is unlikely to develop in the GDDS, where many relevant infrastructures are already in operation. To include these infrastructures into the GDDS, a distributed technical architecture is required, which allows independent infrastructures to comply with common specifications and interact using agreed interfaces and protocols. These independent infrastructures must be configurable to implement the required governance framework of the GDDS. When the GDDS community of practice and founding members make the governance decisions required to achieve the objectives of this community, technical choices must be made that will accommodate those governance decisions, rather than the other way around.

### 3.3.1. Data Pathways and features of the GDDS

The European Commission’s Joint Research Centre (JRC) analysed<sup>30</sup> the legal foundation of the Green Deal Data Space. The JRC identified six potential policy pathways, each incorporating a growing number of categories of data as well as relevant horizontal EU legislation. Figure 2 (from [30]) illustrates these pathways.

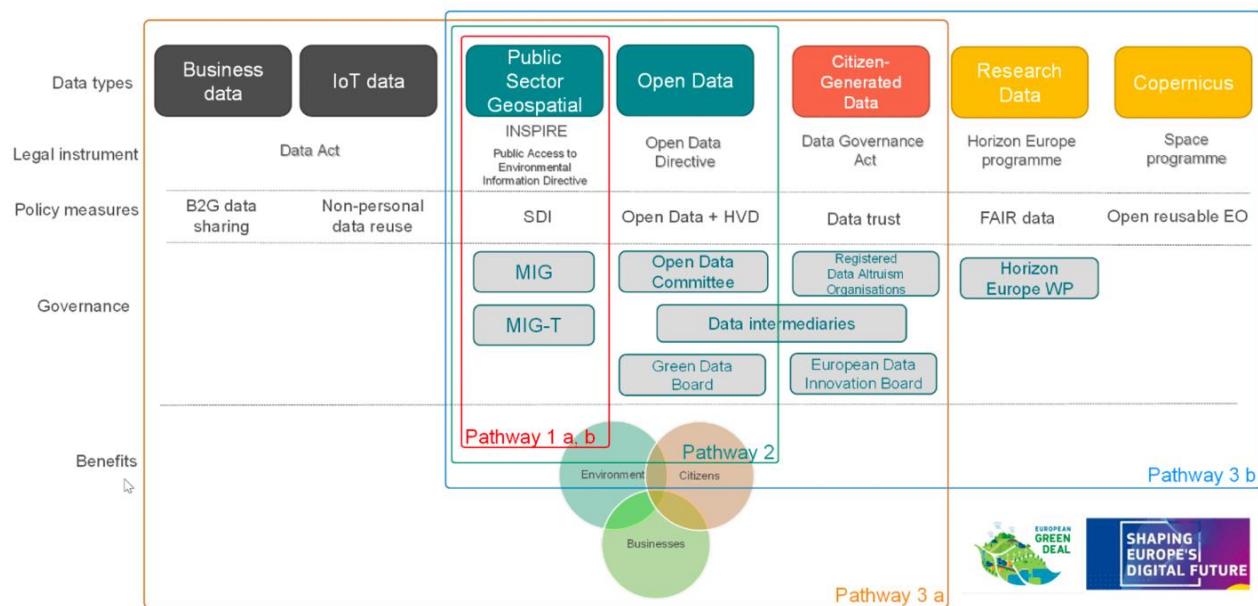


Figure 2: Policy pathways for establishment of the European Green Deal Data Space

Pathway 4 is not pictured (it is the union of Pathways 3a and 3b) but is the most ambitious, integrating all five of the pathways and achieving the EC’s objective of seamless data sharing regardless of data source, while respecting the principle of data sovereignty [16]. The JRC concludes that “this pathway might turn out to be overly complex and too ambitious.” However, addressing the challenges addressed by the European Green Deal will benefit from

<sup>30</sup> Kotsev, A., Escriu Paradell, J. and Minghini, M., Beyond INSPIRE. Perspectives on the legal foundation of the European Green Deal Data Space, European Commission, 2023.

<https://publications.jrc.ec.europa.eu/repository/handle/JRC133958>

harnessing data from across all the data categories depicted, so Pathway 4 is embedded in the long-term vision for the GDDS, despite its complexity. An ambitious, fit-for-purpose GDDS will enable, enhance and catalyse the effective and efficient achievement of (and monitoring of progress towards) the European Green Deal.

The broader Ecosystem in which the GDDS will operate has several important characteristics that may distinguish it from other digital ecosystems:

- It is diverse. Members of the community of practice range from individuals (citizens) to profit-making and non-profit organisations, to governments and non-governmental organisations, and many more.
- There are numerous existing data providers and some existing data management services and sharing initiatives in this domain, with varying mandates and funding.
- Its scope ranges from local to global. The problems addressed by the European Green Deal are not limited to Europe – Europe must work with other regions, nations, and peoples around the world, understanding the effect of external events and aligning action at the appropriate level, with a global perspective.
- It is multi-sectoral. The problems addressed by the European Green Deal touch every sector of the economy and human activity – sometimes with opposing effects that require trade-offs.
- Within Europe, the European Green Deal policy objectives to be supported by the Digital Ecosystem are very broad, as is the related regulatory framework.
- The GDDS should enable a growing data economy making Europe a competitive industry in the race to sustainability.
- Data provides critical science-based evidence, supporting arguments for real action with real consequences for people, so the data must be high quality, its analysis must be reliable and trustworthy, and the results must be reproducible and verifiable.
- The focus is not just on “pooling data”, but on improving human well-being and the well-being of the planet in the face of imminent visible and invisible threats, requiring actionable insights, measurable results, and clear accountability, against the policy objectives set forth by the European Green Deal, as well as by other international frameworks endorsed by the EU, such as the SDGs of the UN Agenda 2030.
- Data sharing approaches and cultural behaviours to data differ widely within the ecosystem among nations, cultures, and data types. Open science and open data practices are difficult to balance against data used for a competitive advantage. Data sharing practices from operational agencies differ from those at research/academic centres. Technology adoption in industry moves at a different pace than its counterparts, driven mostly by short return of investments.
- There will be (and are) healthy debates about the right actions to take, so respect for all participants is critical.

This diversity of stakeholders and requirements makes the planning and design of a Green Deal Data Space challenging. Broad participation in initial consultation and eventual governance will be important to establish the data space as a trustworthy and legitimate initiative on which key actors will rely.

Two mechanisms can help the GDDS address the diversity of stakeholders, expectations and requirements found across the Green Deal Community of Practice:

1. Developing a common standard for describing policies for access to and the use of data from different sectors.

2. Creating mechanisms -- “Use Cases” -- that allow subsets of actors and participants to work together in an environment of trust to find synergies, reach common understanding and eventually to create shared value.

### 3.3.1.1. Finding a Common Standard for Access and Use

Today there are numerous data sharing initiatives in various sectors of the economy. Most of these efforts focus on data from a limited range of sources, with similar characteristics or attributes.

- Data sharing initiatives for research data are the most visible of these efforts, but in general they concentrate on open data and handle sensitive or confidential data only on an exception basis, rather than through embedded access and use control mechanisms.
- Over the last few years, initiatives such as International Data Spaces Association (IDSA)<sup>31</sup> and Gaia-X<sup>32</sup> have worked with the business community to create frameworks and tools to allow business and industry to share confidential data with their business partners, while maintaining control (“sovereignty”) over how that data would be accessed and used.
- Sharing sensitive data, particularly personal health data, has been the subject of recent efforts such as the “Joint Action Towards the European Health Data Space – TEHDAS”<sup>33</sup> and the “Healthy Cloud” project<sup>34</sup>, as well as the European Health Data Space6 now in development.

Table 2 attempts to summarise the key attributes of data sharing for these three categories of data. Existing data sharing initiatives are mostly designed to accommodate the attributes of data sharing specific to one category of data.

*Table 2: Data Sharing Attributes of Major Categories of Data*

Attributes	Categories of Data		
	Research, Open Data	Personal / Sensitive	Commercial / Confidential
Security	Not specified	✓	✓
Known Parties	Anonymous Access OK	Strong assurance	Strong assurance
Visibility	Open; 1:Many or 1:Any	Sovereignty, GDPR; 1:1 or 1:Few	Sovereignty; 1:1 or 1:Few Data Act → 1:Few or 1:Many
Findability	✓	Five Safes <sup>8</sup>	Sovereignty, within the limits set by Data Act
Accessibility	✓		
Interoperability	increasing		
(Re)usability	✓		
Quality Fit for Purpose	Peer Review	Ethics Review, GDPR	Opportunistic, tempered by AI Act?
Purpose Objectives	Advancement of Knowledge	MUST be defined up front	Solve my problem, Competitive advantage

<sup>31</sup> <https://internationaldataspaces.org/>

<sup>32</sup> <https://gaia-x.eu/>

<sup>33</sup> <https://tehdas.eu/>

<sup>34</sup> <https://healthycloud.eu/>

The challenge for most common European data spaces is to design mechanisms for data sharing that will accommodate different categories of data in a robust and scalable manner.

### 3.3.1.2. Use Cases Enabling Increasing Trust and Data Maturity

“Use cases” with more limited access and “sandbox” like characteristics may be better able to help their participants reach their objectives, and key actors will be more likely to participate in an environment with a more focused scope and narrowed participation. Achieving these results across a single, all-purpose – and unfamiliar -- data space may be difficult<sup>35</sup>.

For example, separate use cases might be established to tackle marine-related challenges in the Baltic Sea, Mediterranean Sea, and the North Sea and English Channel (see Figure 3). Some data would be common across all three use cases, for example provided by the European Marine & Data Network (EMODnet, a long-term EU data service and initiative)<sup>36</sup>, complemented by data from local authorities, as well as locally active organisations such as offshore wind turbine operators, fishing companies, transport operators, etc. The same analytical tools and measurement frameworks could be employed in all three use cases to foster collaboration and alignment on results. Similar governance structures would be put in place for each use case, but each use case would involve different sets of actors in these governance structures. This approach avoids data silos by ensuring initial compatibility of governance and technology among the different use cases. Trust can be developed within the individual use cases, enabling harmonisation and possible merger of the different use cases into a single use case and eventually into the broader GDDS.

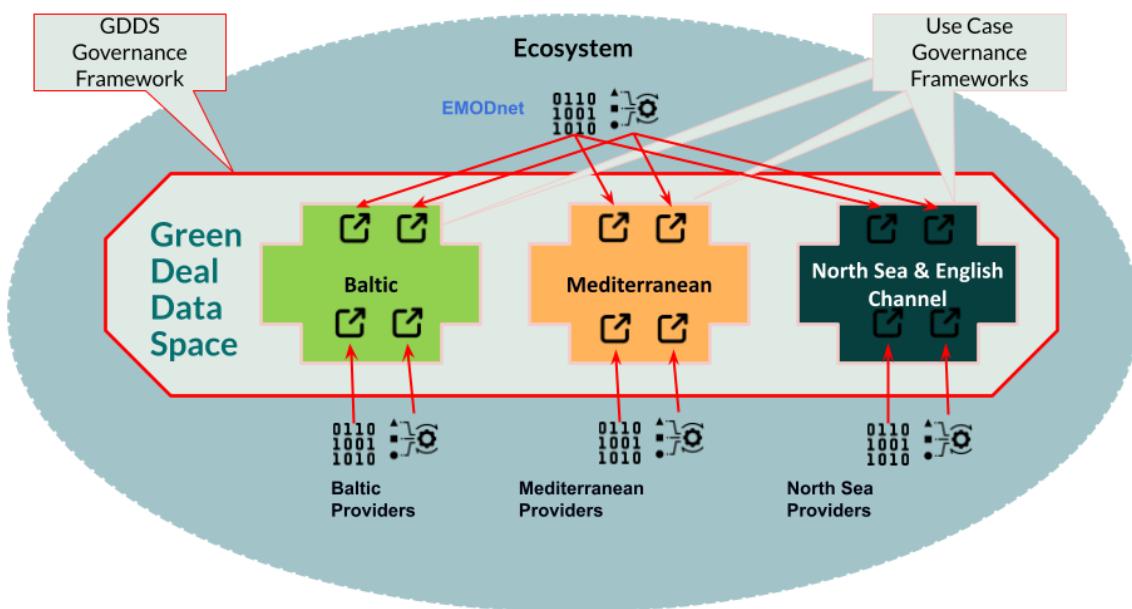


Figure 3: Multiple Use Cases within the GDDS

This approach mirrors the progressive alignment achieved by research data infrastructures in many scientific disciplines, which has in some cases required several decades of effort. Making

<sup>35</sup> Fritzenkötter, J., Hohoff, L., Pierri, P., Verhulst, S.G., Young, A., and Zacharzewski, A., ‘Governing the Environment-Related Data Space’. *TheGovLab*, 2022, <https://files.thegovlab.org/erdgovernance.pdf>. Fritzenkötter et al. highlight the same diversity of interests and stakeholders, as well as the challenge of finding a productive balance among them.

<sup>36</sup> <https://emodnet.ec.europa.eu/en>

data interoperable can take time – usually requiring new coding, data and metadata standards to be applied, as well as modifications to existing technical infrastructure to enable technical interoperation. However, even when the data involved is open and FAIR, this alignment can still take time because expanding the “circle of trust” from a single discipline to a broader community is an incremental human process that requires time<sup>37</sup>.

### 3.4. Mission, Vision and Objectives of the GDDS

Reflecting the landscape and expectations for a GDDS, the following Mission, Vision and Objectives are proposed for the GDDS. These will be refined and reaffirmed in the initial stages of the expected deployment.

#### 3.4.1. Mission

Based on context and landscape presented above, the broad mission of the GDDS will be to:

- Target the achievement of European Green Deal (EGD) priority actions, any use cases addressing the targets of the EGD, and the growth of the circular economy (the “GDDS Target”)
- Make data from the public sector and research more accessible and exploitable in support of the GDDS Target
- Seamlessly connect existing but fragmented digital infrastructures providing data or services relevant to the GDDS Target
- Include growing amounts of results from digital twins including Destination Earth, as well as other data sources relevant to the GDDS Target
- Provide a secure environment that holders of sensitive data, particularly citizens and private sector actors, can rely upon for sharing and exchanging data relevant to the GDDS Target
- Enable/facilitate implementation of current and new legislation and regulations related to the GDDS Target
- Help enhance provided data to be more Findable, Accessible, Interoperable and Re-usable (FAIR), with clear indications of quality and fitness for different purposes
- Provide a foundation for data-driven value creation within use cases or more broadly through the data economy by downstream data-driven businesses
- Help find or identify data gaps required to achieve the GDDS Target, especially data required by data-driven businesses
- Support and monitor the fair transition towards climate neutrality, including ensuring a fair and effective green and digital transition that leaves no one behind.

Specific targets will be as follows (all assuming deployment will start in early 2025):

- 2025:
  - The GDDS Community of Practice will be formed, with Participants that have a good understanding of their role and possible commitment towards the Data Space. The Community of Practice includes key data and service providers, as well as participating data infrastructures, and representatives of key user communities and use case champions.
  - The GDDS Governance Framework will be finalized in consultation with the Community of Practice, and it has been documented in constitutive agreements, contract templates and other governance documentation.

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<sup>37</sup> Interviews by the authors with representatives of three significant research data infrastructures, SeaDataNet <https://www.seadatanet.org>, IS-ENES <https://is.enes.org/index.html>, GBIF <https://www.gbif.org>.

- Level 2 Technology Implementation Plan has been defined, reflecting evaluation of available compliant technologies, as well as consideration of interoperability with other relevant data spaces and existing data infrastructures.
- A preliminary catalogue of data and services has been developed, subject to formal participation and other agreements with providers.
- Use Case development plans are ready for implementation in 2025, aligned with interest levels of use case partners/champions, as well as with EGD strategic actions, UN SDGs.
- Early 2026
  - The GDDS Governing entity and Data Intermediary service provider have been established or identified by early 2026. Optionally the GDDS Operating entity and data altruism organisation have also been established or identified. (See section 3.5.5 for more discussion of these entities.)
  - Trust framework, including trusted entities and means of processing verifiable credentials, has been established both for the GDDS, as well as, as much as possible, for the broader Data Space Ecosystem by early 2026.
  - Key data holders/providers are prepared for participation in the GDDS by early 2026.
  - The GDDS will deliver Level 2 capabilities in a minimum viable product (MVP) by mid-2026, subject to capabilities available from production-grade technical platforms. (See section 3.5 for a summary description of the GDDS MVP.)
  - Operators, enablers, organizing entities, data intermediaries, etc. are in place and working using the Level 2 Technology Framework and compliant tools, by the end of 2026.

Over time, the GDDS will increase its capabilities:

- The GDDS overall will reach the following objective levels:
  - Level 3 by 2027
  - Level 5 by 2029
  - Level 7 by 2031
- In the presence of MVP, Level 3 will enrich the GDDS with analytical capabilities and transformational tools for exploitation by use cases.
- Some use cases may implement higher level functionality earlier, and the GDDS would support these efforts as innovation pilots
- Data Providers, Service Providers, and specific data coverage will increase progressively
- Usage will increase overall, and specifically through active Use Cases and network effects.
- Maturing Use Cases transition to the broader data space, and new Use Cases are added over time.
- The GDDS will work to integrate with other Data Spaces and to form integrated Data Spaces. Sister data spaces will engage in cross-fertilization, harmonisation, and possible merge/consolidation.
- GDDS will be governed by established Governance authorities represented by stakeholders of interest and a self-sustainable infrastructure that enables a number of actors to realise business incentives, values and eventually return of investment.

### 3.4.2. Vision

To complement the mission objectives an overarching long-term vision sets the overall direction and goals of the GDDS.

- The GDDS Community is strong and self-sustaining and spans the global north and south.
- GDDS insights are driving positive environmental action around the world.
- The GDDS has synergistic business models that are self-sustaining through capture of value generated.
- Links with data spaces in other sectors are in place and busy, with data being provided and consumed (respecting data sovereignty) in both directions.

### 3.4.3. Principles and Values

The GDDS will respect the following principles in all its activities by:

- Enabling seamless data sharing by stakeholders who wish to contribute to the European Green Deal objectives
- Building on existing data sharing initiatives from all scopes (local, regional, national, European, global) where communities are already established.
- Promoting and enabling FAIR data principles
- Ensuring data sovereignty in all data sharing transactions
- Offering transparent, open and clear rules for the governance of and participation in the GDDS and for ethical use of the data
- Adhering to European values including security, privacy preservation, trust and fair competition
- Offering a flexible design capable of adapting to the technical and governance evolution.
- Promoting collaboration, digital, scientific, and entrepreneurial innovation
- Abiding by the EU Do No Significant Harm principle according to the EU taxonomy for sustainable activities.

More generally, the GDDS will as much as possible respect the values of openness, pluralism, and inclusivity in all stages of its activities.

## 3.5. Minimum Viable Product Proposed For the GDDS

At Level 2 of the Taxonomy of Objectives presented in Table 1, the Minimum Viable Product (MVP) of the GDDS is more than just a “better catalogue”. This section explores the MVP capabilities in some detail, although these are further addressed throughout the other main deliverables<sup>38</sup> of Phase 2 of the GREAT project:

- D3.2: Phase 2 Technical Blueprint
- D5.2: Phase 2 data sets
- D6.2: Phase 2 Implementation Roadmap.

### 3.5.1. Trust Framework

A fundamental aspect of a data space is ensuring data sovereignty, which is a central theme of the European Data Strategy. As defined in the DSSC glossary, data sovereignty is “*the ability of individuals, organizations, and governments to maintain control over their data and exercise their rights concerning its collection, storage, sharing, and use by others.*”

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<sup>38</sup> <https://www.greatproject.eu/great-project-resources/public-deliverables/>

The GDDS will allow data providers to maintain sovereignty over the data they hold, by linking digital data space participants with their legal counterparts in the real world through a clear Trust Framework, working within well-defined contractual frameworks that govern data transactions and create enforceable obligations on data recipients, and supported by state-of-the-art technical mechanisms for controlling the visibility, access and use of the data itself.

The GDDS will establish a Trust Framework, underpinning data sovereignty, as well as trust in the data itself and in participants, including data service providers, technology providers, infrastructure providers. The GDDS will include:

- Governance Rules for Identifying Trusted Entities: This includes rules to identify providers issuing credentials, authorization attributes, and claims for verifiable data, ensuring the trustworthiness of entities within the data space.
- Governance Rules for Onboarding Trusted Data Providers: These rules should be transparent, outlining criteria for onboarding entities into the data space. Additionally, a registry of providers should be maintained to facilitate collaboration and networking effects.
- Governance Rules for Verification of Trusted Data Sources: Clear guidelines should be established for verifying the trustworthiness of data sources within the data space.
- Technical Means for Credential Verification: The framework should provide technical mechanisms to verify credentials of any type against trusted claims when presented.
- Technical Means for Ensuring Compliance with Access and Usage Conditions: It should also incorporate technical measures to ensure that access and usage conditions specified by the right holders are respected.

### **3.5.2. Business Model(s) and Sustainability**

The GDDS will implement sustainable business model(s) for the entities it creates (see section 3.5.6), as well as enabling and contributing to the sustainability of all participants, both individually and through their interactions and collaboration in the GDDS. This requires definition of value propositions on multiple levels (roles, transaction types, use case types, etc.) as well as at the level of the GDDS overall.

Across the many possible business models for data-driven businesses that are possible and that have been implemented successfully in many sectors, value generation – and revenues – are usually captured through specific value creation mechanisms such as

- membership and participation fees (sign up, subscriptions),
- listing fees,
- sponsorship and advertising,
- transaction fees (fixed or set proportionally in some fashion), and
- contingent fees (paid on success – for example “click through” charges, “fulfilment” models, or, in the “data value chain” context, fees paid on successful generation of value-added insights).

The key building blocks of any business model were first identified by Alexander Osterwalder and Yves Pigneur<sup>39</sup> and codified<sup>40</sup> in the now-widely used “business model canvas,” allowing the pros and cons of different business models to be identified and compared. The GREAT

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<sup>39</sup> OSTERWALDER, A., PIGNEUR, Y., TUCCI, C. (2005), Clarifying Business Models: Origins, Present, and Future of the Concept, Communications of the Association for Information Systems, 16(1), 1-25.

<sup>40</sup> OSTERWALDER, A., PIGNEUR, Y. (2010), Business Model Generation: A Handbook For Visionaries, Game Changers, And Challengers, New York, Wiley.

project has applied this methodology to two use cases of interest (EMODNet and the CO2 DataHub, see Appendices 2 and 3) to preliminarily identify value creation mechanisms present in the green deal ecosystem. These preliminary analyses show that, by contrast with established data-driven businesses in e.g. the travel or e-commerce sectors, value creation mechanisms in the green deal ecosystem are not yet mature, and potential strategies will require further development and exploration prior to implementation.

The GDDS will be deployed with a clear approach to identify and implement sustainability mechanisms (“ways to generate revenue”) for its governing entity, operating entity, and data intermediary, as well as the data altruism organisation if found to be necessary, as well as the services and use cases enabled by each of these entities.

In the initial phase of the deployment, costs and value associated with each value proposition will be evaluated. This evaluation will identify value generating activities and allow calibration of related fees that might be associated with each activity. Potential fees and value generation mechanisms will be tracked for each role, transaction type, use case type, as well as for the GDDS legal entities enabling each mechanism.

Potential fees will be implemented in the next phase of deployment, using a combination of “real” and “virtual” accounting.

By the end of the deployment, participant experience will be collected to inform a community-based process to formalize the financial structure of the business models of the created entities, and the financial arrangements possible for operation of the GDDS in production (post-deployment).

It is expected that by the conclusion of the deployment, ongoing costs to be borne by each of these entities can be estimated accurately, and corresponding business models can be developed that can be agreed by participating stakeholders and initiated before the initial deployment funding is exhausted.

Note that certain services of the identified Data Intermediaries, based on the Data Governance Act, would have to plan for continuity of their services in the event the Data Intermediary can no longer perform the services. This aspect must be addressed for Data Intermediaries and should also be addressed for any other entities to be established in connection with the GDDS.

### **3.5.3. Comprehensive Data Availability – One Window**

The GDDS will assemble a comprehensive catalogue of data, from a wide range of providers, both public and private, relevant to the European Green Deal priority actions, notably actions required to support the development of a circular economy, as well as to environmental stewardship and sustainability.

The GREAT project has identified [see D5.2] over 100 specific datasets, and over 400 specific data services, of relevance to many of the use cases considered as references for the project and documented in [8]. Datasets refer to specific collections of data and include observations, model outputs or statistical datasets. Data services have broader scope, incorporating greater volumes of data, accessible through programming interfaces, rather than direct access to data files for example through downloads or “data dumps”. Data services include e.g. Copernicus services<sup>41</sup> or INSPIRE portal<sup>42</sup>.

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<sup>41</sup> <https://www.copernicus.eu/en/copernicus-services>

<sup>42</sup> <https://inspire-geoportal.ec.europa.eu>

This inventory includes the “High Value Datasets” defined by D5.2 “EGD Prioritised Data Sets and Gaps”, as well as data from the following sources:

- Copernicus services, Copernicus Data Space Ecosystem, and WekEO, the EU Copernicus DIAS reference service for environmental data.
- Destination Earth
- Data covered by the INSPIRE directive.
- Data from the EC’s Joint Research Centre Data Catalogue, European Environmental Agency (EEA) Datahub, and EUROSTAT
- Global Earth Observation System of Systems (GEOSS)
- EMODnet.

Of particular importance are “Essential Variable” data in five environmentally critical fields (climate, ocean, biodiversity, geodiversity, agriculture), for which experts have developed standardised, accurate and continuous measurement frameworks. To date 168 Essential Variables have been defined<sup>43</sup>, and the identification and standardization of additional essential variables by relevant experts continues.

An additional target for the GDDS’ comprehensive data offerings are the relevant registries (e.g. of textile producing organisations) being created by Member States in their implementation of a growing list of EU regulations implementing the principles of the Circular Economy.

The GDDS will also provide links to relevant reference data sets, such as vocabularies, biological taxonomies/species names, chemical databases, etc. that are relevant to other Green Deal related data resources.

The inventory of existing data resources developed by GREAT will continue during deployment and beyond, reflecting the growing needs of stakeholders and demands by actors in the data economy. For example, based on recent and proposed legislation, the GDDS will look to include data sources such as the EEA’s Forest Information System for Europe (FISE), member state registers of textile producers, due diligence reports submitted in compliance with the Deforestation regulation, etc.

For all identified priority data, during early stages of the deployment process, the GDDS will work to identify reliable data sources and work with appropriate data providers to join the GDDS as a provider and provide the desired data in a way that respects the provider’s data sovereignty and economic interests. For data providers of open data, this dialogue will clarify the benefits (value proposition) of legacy infrastructures actively participating in the GDDS.

### 3.5.4. Tailored Governed Services

The blueprint architecture [D3.2] presents a set of functional components to be implemented in the GDDS as a set of services. Section 4.10 of the Blueprint provides an analysis of a representative set of governance processes that exemplifies the relationship between governance processes and the impact that they have on technical components. E.g. the establishment of Trusted Entities, standards, or the governance processes for each of the individual components. Technical capabilities of the governance requirements are highlighted over Chapters 5 and 6 when applicable. Equally the adoption of specific technology solutions during the implementation phase for each of the services may bring additional governance requirements. E.g. the adoption for blockchain solution to implement elements of the trust

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<sup>43</sup> <https://www.earthdata.nasa.gov/learn/backgrounders/essential-variables>

framework including smart contracts may require full decentralised organisational governance or DAO (Decentralised Autonomous Organisations).

The GDDS will offer several layers of services to ensure users can effectively use the GDDS to achieve their own objectives and create products and services of value to industry, government and the general public.

**Core Services:** These include Registry of Data Sources, Data Catalogue, Status Checker, PID Provider and PID Resolver, Identity management, Trust and Claim Verification, Access and Use Policy Implementation, including negotiation of data contracts, as well as logging of data transactions and other legally relevant events.

**Facilitator Services:** These include Dataset Transformer (allowing interoperability and harmonisation of datasets complying with different metadata standards), Data Mover (for data exchange), Metadata enhancer (enriching metadata provided by Data Providers to increase findability and usability), as well as a range of services addressing the need for access, through the GDDS, to compatible computational resources (Computing Infrastructure Registry, Computing Infrastructure Catalogue, and Data Processing Enabler).

**Ancillary Services** that facilitate data transactions: Data Preparation, Encryption, Anonymization, subsetting of geospatial data, scanning for copyrighted material, creation of synthetic versions of data for safe assessment by data consumers. Anonymization Services will only be offered if they can be relied upon to convert “personal” data to non-personal data that is not subject to the GDPR. Otherwise, data providers should take responsibility for the provision of anonymized data that is not covered by GDPR.

**Value-Added Services:** Aggregation, Fusion, Analysis, AI/ML, Forecasting, Monitoring, Trend evaluation, Target setting and tracking, alerting, dashboarding.

### 3.5.5. Appropriate Legal Entities in Place

The GDDS will identify legal entities to perform several key, but distinct, roles:

- **Governing entity:** Responsible for governance of the GDDS, which in turn is implemented through the governance of the governing entity itself. Members, or “shareholders”, of the governing entity participate in decision making as defined by the governance rules of that entity. The governing entity either directly manages the operations of the GDDS or contracts with an operating entity and/or one or more service providers to do so, and then supervises those operations to ensure the GDDS’ objectives are met.
- **Operating entity:** The governing entity may decide to form a separate operating entity, or contract with another entity, to conduct the affairs of the GDDS, reporting to the governing entity. Certain other services may be contracted from other providers as decided by the operating entity.
- **Data intermediary:** As discussed in chapter 4, it is expected that certain data transactions in the GDDS will represent a “commercial relationship” between the data provider and data consumer (which has been interpreted to represent an economic relationship), requiring any such transactions to be facilitated by a Data Intermediary, as defined by the Data Governance Act, which in turn must be a legal entity complying with a number of requirements. To avoid any uncertainty, the GDDS will either establish such a Data Intermediary or contract for such services with a suitable provider.

- **Data Altruism Organisations (DAltOs):** Also, as discussed in chapter 4, the altruistic supply of environmentally related data from individuals is expected to play a significant role in the GDDS. To facilitate that provision, the GDDS will consider pro-actively establishing a DAItOs to fulfil this requirement, if other DAItOs are not available to perform this function.

### 3.5.6. Multi-Level Interoperability

The GDDS will enable interoperability at multiple levels:

**Legal:** The governance principles of the GDDS will be recorded in a “constitutive agreement,” model contracts for data transactions and other agreements that establish a transparent legal basis for interactions between participants and with the GDDS. The GDDS, working with the DSSC and European Data Interoperability Board (EDIB), will monitor new legal and regulatory requirements, both across the EU and within Member States, to ensure continued compliance and enforceability of all agreements.

**Organisational:** The governance principles of the GDDS will be translated into documented procedures for onboarding, monitoring and enforcement, discussed in more detail in chapter 6, supported by relevant technical measures, described more fully in GREAT's Phase 2 Technical Blueprint (Deliverable 3.2).

To enable organisational interoperability, data will be packaged by data providers as “data products” which incorporate all the rules and procedures set by the data provider for the visibility, access and use of that data. This packaging ensures that each participant in the data space can decide, using information attached to each data product, about what can and cannot be done with the data contained in the data product.

**Semantic:** Data providers will be encouraged to adopt internationally recognized standards for data formats, models, vocabularies and APIs. At the same time, the GDDS will have resources to create or adopt transformation services that will help providers, that are not yet ready to adopt these, or other common, standards, to still participate in the GDDS in an interoperable way. Governance processes will allow stakeholders to participate in decisions about which standards will be adopted directly or supported indirectly through transformation services. Recommendations are expected to be like those identified in the “Report from AHG10 Input to EU Data Spaces”<sup>44</sup>. Similar technical standards are also identified in [D3.2].

**Technical:** The GDDS' technical foundation is expected to be the Smart Middleware Platform (SIMPL) although this is still under development. In the initial stages of GDDS deployment, SIMPL, as it may be available in production, will be evaluated against the Technical Blueprint, along with other candidate technologies. This process will define the technical roadmap for the GDDS.

Additionally, the GDDS will require compliance with documented technical requirements for any infrastructures used to deliver services within the context of the GDDS. Technical interoperability with sectorial Data Spaces is also expected via SIMPL platform.

- For example, the contracted operating entity may choose to operate a catalogue service for the entire GDDS, delivered using specific software and deployed on specific hardware. If any of the data contained in the catalogue are defined legally, or by their

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<sup>44</sup> [https://committee.iso.org/files/live/users/fh/aj/aj/tc211contributor%40iso.org/files/EU/ISO-TC211\\_N5971.pdf](https://committee.iso.org/files/live/users/fh/aj/aj/tc211contributor%40iso.org/files/EU/ISO-TC211_N5971.pdf)

rights holders, to require the use of secure IT infrastructure<sup>45</sup>, then the software and hardware chosen by the operating entity must be verified to be suitably secure, along with related operating procedures of the operating entity.

- Services, including data analytics services, may need to comply with similar technical requirements if the data being analysed might trigger such requirements.
- Even in a fully distributed architecture, where each data provider and/or data consumer interacts through an “agent”, such as Eclipse Data Connector or the planned SIMPL Agent, those agents would represent infrastructure that would need to be onboarded to the GDDS and certified for compliance with the relevant technical requirements. This would ensure, for example, that sensitive data being transferred securely to an approved data consumer would also be securely handled by the receiving agent. (Once received at the receiving agent, the Data Provider would have to rely on its contractual agreement with the Data Consumer, as well as any technical capabilities the consumer might be using.)

These requirements are presented in this report as governance requirements, to be complemented by technical requirements in GREAT’s Phase 2 Technical Blueprint (Deliverable 3.2). Appendix 1 explores interoperability in greater detail.

### 3.5.7. Defined Participation and Roles

A legal or natural person participating in the GDDS, except for anonymous users, will need to register with the GDDS and apply to become a Participant in the data space in one or more defined roles, e.g. Data Provider, Data Consumer, Service Provider, Infrastructure Operator. Once accepted in these roles, the Participant would be bound by the relevant governance agreements, including contract frameworks related to the chosen role(s).

Anonymous users would be able to view the contents of the GDDS through catalogue services, specifically being able to search for data according to the metadata and data product attributes authorised for anonymous searches. Access to open data (e.g. High Value Datasets provided by public sector bodies<sup>46</sup>) would be possible for anonymous users, but access to non-open data or to any services, much less use, would require users to register and identify themselves, as well as agreeing to the relevant agreements.

To improve interoperability across data spaces and across communities of practice, the GDDS will align with the roles defined by the DSSC, including but not limited to:

- Data space enabler: A data space participant that provides a (technical or non-technical) service enabling data transactions for the transaction participants while not directly participating in that transaction itself. Examples of enabling services include identity provisioning, vocabulary provisioning, interconnecting, clearing, etc.
- Data rights holder: A transaction participant that has the legal right to use, grant access to or share certain data.
- Data provider: A transaction participant that, in the context of a specific data transaction, technically provides data to the data receivers that have a right or duty (granted by the data rights holder) to access and/or receive that data.
- Data receiver: A transaction participant to whom data is, or is to be, technically supplied by a data provider in the context of a specific data transaction.

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<sup>45</sup> E.g. personal data, data about critical infrastructure such as power generation and transmission.

<sup>46</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32023R0138&from=EN>

- Data user: A transaction participant that has been granted (lawful) access and the right to use data as the result of a specific data transaction. Also known as data rights receiver.
- Data intermediary: A data space enabler that (technically and legally) connects one or more data space participants to the data space, thereby enabling them to establish relationships and execute data transactions with other participants in the data space.

In addition, the GDDS will need Service Provider and/or Infrastructure Provider roles. These roles have specific obligations in connection with ensuring the security, privacy and confidentiality of any data processed or held by them.

Finally, the relationship between the GDDS and infrastructures that choose not to formally participate in the GDDS, e.g. as a data provider, needs to be recognized.

### 3.5.8. Support for Use Cases

The GDDS will support a range of Use Case capabilities that will allow Use Case participants to generate valuable products and services, possibly for limited use within the Use Case, as well as to create controlled access “sandboxes” that will allow participants to gain familiarity with the GDDS and progressively improve the quality and completeness of their data offerings so that they can be made more widely available in the data space.

Use Cases have been identified by the Data Space Support Centre (DSSC) as the principal vehicle for collaborative value creation in data spaces.

GREAT's own work with the Green Deal Community of Practice has highlighted the interest of many data holders to participate in specific applications, while at the same time hesitation of these same data holders to expose their data more widely. Hesitant data providers would appreciate more direct control on visibility, access and use.

## 4. Legal and Regulatory Context

For any data spaces based in the European Union (EU), EU and Member State legislation and regulation establishes the legal framework for those data spaces. Figure 4<sup>47</sup> identifies the range of horizontal EU legislation that applies to data spaces and data space initiatives.

It includes EU requirements for any “digital platform” initiative (such as the Digital Markets Act and Digital Services Act), as well as in force and proposed legislation targeting “data sharing” and “data transactions,” including the General Data Protection Regulation (GDPR), covering personal data, the Data Act, covering non-personal data, possible regulatory roles such as the European Data Innovation Board (EDIB) and several other instruments and roles. These legal requirements translate into specific requirements that must be implemented in the governance framework to be compliant with relevant legislation.

The next section organises requirements for governance flowing from two categories of legal and regulatory instruments: horizontal across the EU, and Member State specific. Legal requirements that are specific to the Green Deal are addressed in the following section.

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<sup>47</sup> Figure provided by the DSSC Legal Expert Team

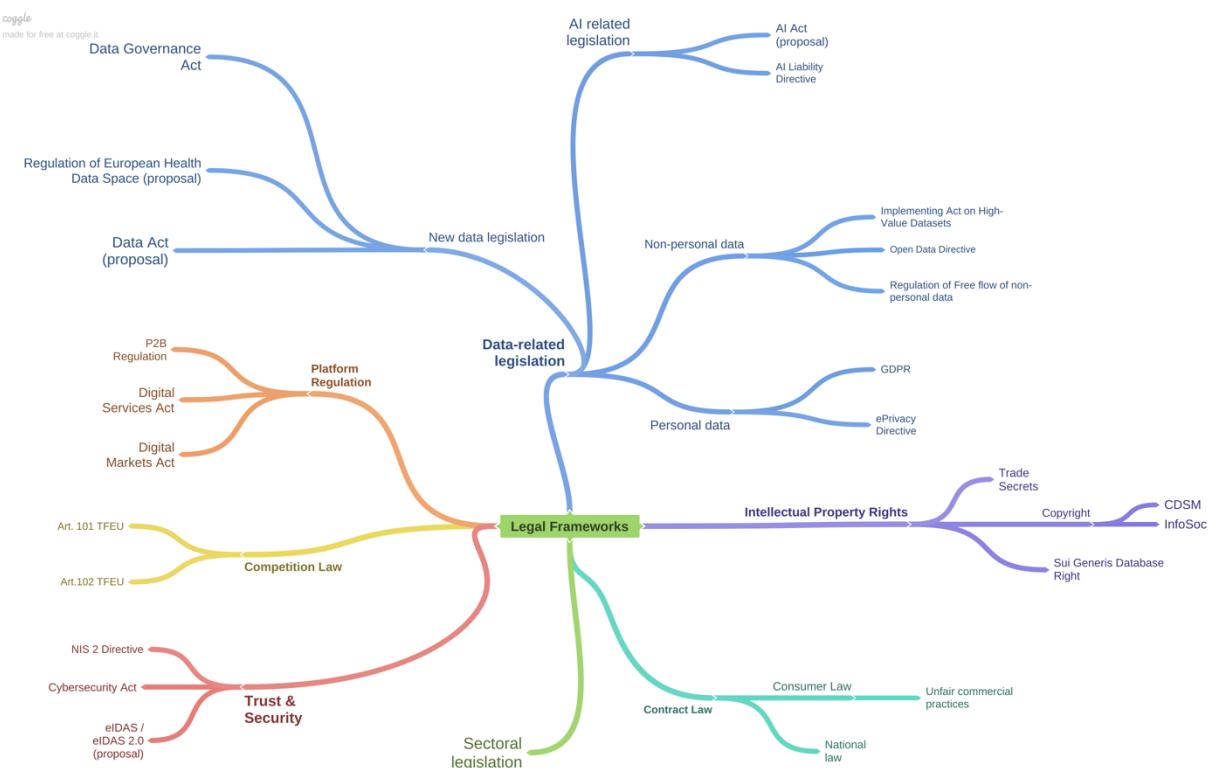


Figure 4: Horizontal EU Legislation Relevant to Data Spaces

#### 4.1. EU Horizontal Legal and Regulatory Context

The GREAT project's "White Paper on EU Horizontal Legal and Regulatory Context for Data Spaces"<sup>48</sup> presents a review of several "horizontal" EU laws and regulation (see Figure 4 above for an illustration) of relevance to data space governance. It addresses specific questions about the Data Governance Act, Data Act amongst other directives of relevance. Here, we summarise how these analyses translate into requirements for the GDDS Governance Framework.

##### 4.1.1. Tracking Data Categories, Data Lifecycle Stages and Related Compliance Requirements:

Several EU laws and regulations place obligations on entities working with certain categories of data. For example, the GDPR imposes requirements on processors of personal data. The NIS Directive establishes IT security requirements on entities working with several categories of sensitive data. In general, these laws and regulations define various "elements that trigger certain regulatory compliance"<sup>49</sup> requirements, which the DSSC refers to as "triggers". Transparent declaration of requirements for processing, including access and use, are required to ensure compliance with relevant legislation.

Prior to the latest suite of new legislation, the primary instrument affecting data governance was the GDPR. Some infrastructures<sup>50</sup> have used the W3C's Data Privacy Vocabulary<sup>51</sup> to

<sup>48</sup>[https://www.greatproject.eu/wp-content/uploads/2024/03/D4.1-White-Paper-EU-Legal-Requirements\\_webversion.pdf](https://www.greatproject.eu/wp-content/uploads/2024/03/D4.1-White-Paper-EU-Legal-Requirements_webversion.pdf)

<sup>49</sup> Data Spaces Support Centre, Blueprint v1.0 (forthcoming), "Regulatory Compliance" Building Block.

<sup>50</sup> Hernandez, J., McKenna, L., Brennan, R. (2022). TIKD: A Trusted Integrated Knowledge Dataspace for Sensitive Data Sharing and Collaboration. In: Curry, E., Scerri, S., Tuikka, T. (eds) Data Spaces . Springer, Cham. [https://doi.org/10.1007/978-3-030-98636-0\\_13](https://doi.org/10.1007/978-3-030-98636-0_13)

<sup>51</sup> <https://w3c.github.io/dpv/dpv>

annotate and track personal data inside their infrastructure. This consistent information enabled infrastructures to comply with the GDPR. For example, the DPV captures the purpose for which the personal data was collected, the legal basis for that collection, and whatever mechanisms might be available for requesting consent from the data subject for any other uses proposed for the data. This information in turn determined what could be done with the data, and which processes would be executed.

New legislation flowing from the EU Strategy for Data, such as the Data Governance Act and Data Act, as well as older legislation such as the NIS Directive, identify similar, but different, compliance requirements related to several other categories of data. This includes data held by public sector bodies that may not be made public because it contains confidential information, Internet-of-Things data, data used to train AI models, data about critical infrastructure, etc. This legislation also defines different compliance requirements at different stages in the lifecycle of data, including storage and processing, visibility, findability, accessibility, interoperability, and re-use.

If the GDDS will exclusively refer to and work with data that is 100% open, without any restrictions on re-use, the identified requirements do not apply. However, if the GDDS might include data with any limits on access or re-use, it will need consistent mechanisms for tracking the status of data of each category across its lifecycle. These mechanisms could affect all aspects of GDDS implementation, from business model to legal framework, to operations, to functional requirements and technology.

#### **4.1.2. Collective Data Providers: Data Altruism, Data Cooperatives, etc.:**

The Data Governance Act defines both Data Altruism Organisations and Data Cooperatives. As defined, Data Altruism Organisations are not treated as Data Intermediaries, while Data Cooperatives represent a form of Data Intermediary. Data Altruism Organisations, MS-recognized data altruism organisations and Data Cooperatives all share attributes with a range of data governance models that have been identified in the literature, including “data sharing pools”, “data cooperatives”, “public data trusts” and “personal data intermediaries”<sup>52</sup>. These various kinds of entities might all take on the roles of data provider, data holder and data rights holder, acting on behalf of groups of data subjects and/or non-personal data holders. It is unclear whether the forms defined by the Data Governance Act offer benefits over other forms of collective data holder. In addition to direct responsibility for acting on requests for access and use of data in their custody, these organisations might also act as stakeholders in governance, representing, for example, the interests of citizens generating data of relevance to the Green Deal and other broad data sharing initiatives of interest to the general public.

#### **4.1.3. Tracking Data Service Types and Related Compliance Requirements**

The Data Governance Act distinguishes three kinds of services: data intermediation services performed by Data Intermediaries, other services that may be performed by Data Intermediaries, and services that should not be bundled by Data Intermediaries with Data Intermediation Services. The Artificial Intelligence (AI) Act (proposed)<sup>53</sup> will also place requirements on services for training and using advanced analytics capabilities. To manage compliance of these services with the relevant legislation, a taxonomy of different service

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<sup>52</sup> E.g., Micheli, M., Ponti, M., Craglia, M., & Berti Suman, A. (2020). Emerging models of data governance in the age of datafication. *Big Data & Society*, 7(2). <https://doi.org/10.1177/2053951720948087>

<sup>53</sup> <https://www.consilium.europa.eu/en/press/press-releases/2022/12/06/artificial-intelligence-act-council-calls-for-promoting-safe-ai-that-respects-fundamental-rights>

types should be created, and rules extracted from the legislation to guide practical operation of the data space.

Note that the AI Act places additional requirements on AI systems, which “means a machine-based system that is designed to operate with varying levels of autonomy and that can, for explicit or implicit objectives, generate outputs such as predictions, recommendations, or decisions, that influence physical or virtual environments”. Various value-added services, such as data analytics and data fusion systems might easily be categorised as AI systems with this definition, and some might be categorised as “high risk” AI systems, requiring additional requirements and protective measures. These requirements should be captured in this action.

#### **4.1.4. Data Intermediaries**

The Data Governance Act presents several requirements for Data Intermediaries and Data Intermediation Service Providers (see [52]). In some circumstances, it may be difficult to translate the DGA’s requirements into clear recommendations on those situations where Data Intermediary treatment is appropriate and those that might avoid this treatment. There is also confusion between the DGA’s apparent limitations on offers of value-added services and the possible integration of such services, and some interpretations of the role of a generic “data intermediary” that could help in generating high value datasets, integrating data from multiple sources, and creating value-added data products that nevertheless respect data sovereignty. These different interpretations are identified by the JRC<sup>54</sup> and by the DSSC (which defines “data space intermediary” as a superset of the legally defined “data intermediary”). [52] identifies a range of questions where advice and interpretation of the DGA are needed.

#### **4.1.5. Unfair Terms For Business-To-Business Data Sharing**

Article 13 of the Data Act prohibits the “unilateral” imposition of “unfair terms” for data sharing. While *prima facie* reasonable, this Article may limit the ability of data space initiatives to establish standard terms and conditions for participants, for example, through a standard Constitutive Agreement.

#### **4.1.6. Interoperability in Data Spaces and Data Sharing Contracts**

Article 33 of the Data Act establishes requirements for data providers regarding transparent annotation of their data to facilitate finding, accessing and using that data, declaration of related interoperability standards (such as data structures, vocabularies, etc.), automated data access mechanisms and interoperable data sharing contracts.

#### **4.1.7. Cybersecurity Required for Personal Data and/or Data About Critical Infrastructure**

If data sharing infrastructure might refer to and work with data that is either “personal”, as defined by the GDPR, or related to “critical infrastructure”, as defined by the NIS Directive, the data sharing infrastructure must be designed and operated to ensure the legally required levels of cybersecurity for the data. These mechanisms could affect all aspects of infrastructure implementation, from business model to legal framework, to operations, to functional requirements and technology.

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<sup>54</sup> Kotsev, A., Escriu Paradell, J. and Minghini, M., Beyond INSPIRE. Perspectives on the legal foundation of the European Green Deal Data Space, European Commission, 2023.  
<https://publications.jrc.ec.europa.eu/repository/handle/JRC133958>

GREAT's White Paper on IT Governance<sup>55</sup> explores best practices for operating secure IT facilities that cover additional requirements for operations, compliance, and performance improvement.

#### **4.1.8. Other EU Legal Requirements for Governance**

Our analysis has not considered the full range of horizontal legislation identified in Figure 4, including:

- Digital Markets Act
- Digital Services Act
- Artificial Intelligence Act
- Platform-to-Business Regulation (P2B)
- Geo-blocking Regulation
- Copyright Directive
- Database Directive
- Antitrust and Competition Laws
- EU Consumer Protection Directive
- Payment Services Directive 2 (PSD2)
- e-Commerce Directive.

Each of these laws may contain requirements that must be addressed in the GDDS' governance framework.

#### **4.1.9. Linking the Digital and Real Worlds for Legal Certainty**

Activities within a digital platform or infrastructure are not automatically translated into actions in the real world. To ensure legal accountability, the GDDS must ensure that actions taken by users on its infrastructure(s) can be represented as actions taken in the real world, by legal or natural persons, working with assets they provide or control and providing these assets or other valuable services to other legal or natural persons with access to the GDDS.

To maintain this linkage, the GDDS governance framework must include the following requirements:

- Actions using the GDDS that are relevant to either horizontal or sectoral EU or Member State laws or regulation must be recorded.
- Each such action must identify the user who took the action and the related assets or services affected by the action.
- As an involved party in many actions with legal relevance, the GDDS itself must have a clear legal identity. Actions involving the GDDS may relate to governance or to operations, so the GDDS requires one legal entity capable of acting in both capacities, or separate entities acting in each capacity.
- Actions can include agreement to the “Accession Agreement” that allows users to participate in the GDDS in a certain role, agreement to specific instances (even if digitally documented) of data transaction contracts, end user license agreements, acceptable use policies, consents to the use of personal data, etc.
- User identification must link the digital identification with a legal or natural person. This is sometimes referred to as “binding identification”. The strength or assurance level of this linkage is covered by several technical standards and policies, such as the eIDAS and eIDAS2 regulations.

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<sup>55</sup><https://www.greatproject.eu/wp-content/uploads/2024/03/D4.1-White-Paper-IT-Governancewebversion.pdf>

- When a digital user signs any “digital agreement”, the natural or legal person linked to that digital user must be aware that they are then bound by the agreement in the real world and may be subject to any sanctions or penalties defined by that agreement or by applicable laws and regulation.

## 4.2. Sector-Specific Legislation and Regulation

The launch of the European Green Deal (EGD) as one of the policy priorities under von der Leyen Commission established a framework for a set of strategic and legislative actions to make Europe a climate-neutral continent by 2050. The set of initiatives adopted or planned for (158) in the EGD can be found on the European’s Parliament’s Legislative Train Schedule<sup>56</sup>. D6.1’s Annexes 1, 2 and 3 introduce the targets defined by each of the strategic actions on Climate Adaptation, Biodiversity and Zero Pollution<sup>57</sup>.

The GREAT project has studied use cases and existing data sharing initiatives (see [8]) in the context of the strategic actions, identifying those that would fulfil data requirements relevant for a specific area. This section describes a summary of key legislative and strategic actions that have driven the requirements and use cases during the selection phase and prioritisation criteria. Figure 5 displays a summary of sectorial legislation in the focus areas of GREAT.

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<sup>56</sup> <https://www.europarl.europa.eu/legislative-train/theme-a-european-green-deal>

<sup>57</sup> <https://www.greatproject.eu/wp-content/uploads/2023/11/D6.1-Roadmap.v1.0-2-3.pdf>

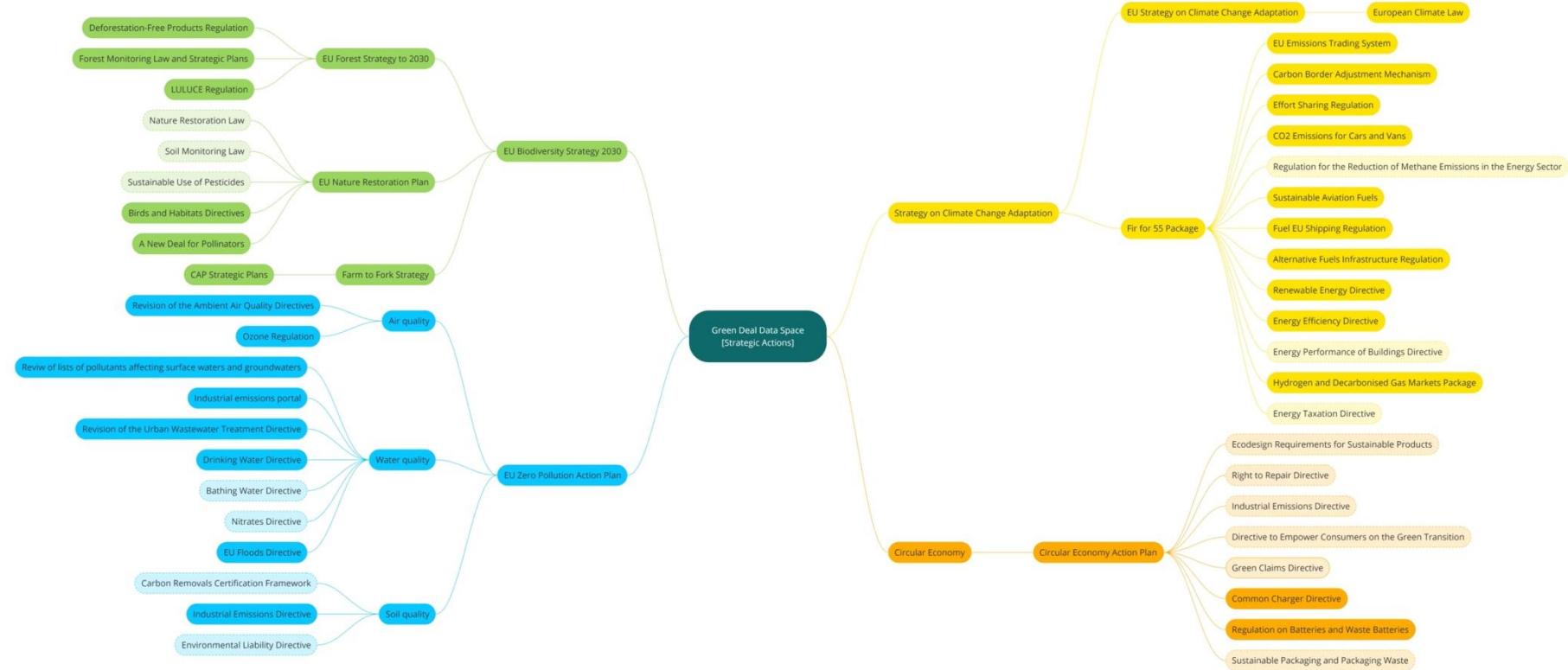


Figure 5 Sectorial legislation from selected GDDS actions

#### 4.2.1. Climate mitigation and adaptation

The European Climate Law was adopted in June 2021 becoming the legally binding action to i) achieve climate neutrality by 2050 and ii) set the target of at least 55% net reduction in greenhouse gas emissions by 2030 compared to 1990 levels. To achieve these objectives the commission launched the Fit for 55 package which consists of a set interlinked proposals to revise existing EU climate and energy laws and propose new ones<sup>58</sup>.

The proposals target:

- Reductions from the sectors identified in the Emissions Trading System (ETS) Directive: e.g. power generation, manufacturing, aviation.
- Reductions from the sectors identified in the Effort Sharing Regulation (ESR): e.g. buildings, road transport, agriculture, waste and small industries.
- Increase of carbon removals from sectors identified Land Use, Land Use Change and Forestry Regulation (LULUCF)

Figure 6(source [58]) illustrates the relationships among these initiatives.

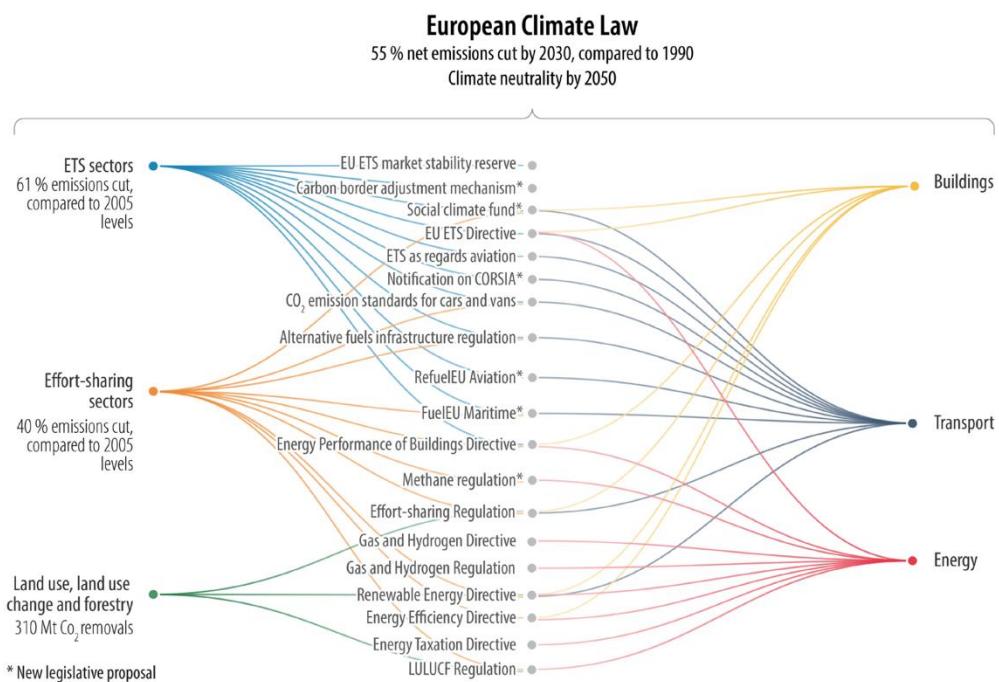


Figure 6: Relationships among EU Climate Law Initiatives and sectors

To support and complement the goals of the EU climate law, the non-legislative EU strategy on adaptation to climate change<sup>59</sup> was launch in Feb 2021 setting the context for legislative and non-legislative measures to support adaptation effort. The strategy "aims to reinforce the adaptive capacity of the EU and the world and minimise vulnerability to the impacts of climate change, in line with the Paris Agreement and the proposal for the European Climate Law". Part of the strategic actions include improving the knowledge and availability of data<sup>60</sup>, supporting policy development and accelerating the rollout of adaptation solutions.

<sup>58</sup> [https://www.europarl.europa.eu/RegData/etudes/BRIE/2022/733513/EPRS\\_BRI\(2022\)733513\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2022/733513/EPRS_BRI(2022)733513_EN.pdf)

<sup>59</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2021%3A82%3AFIN>

<sup>60</sup> <https://climate-adapt.eea.europa.eu>

#### 4.2.2. Circular economy

The Circular Economy Action Plan<sup>61</sup>, adopted in March 2020, promotes the sustainable use of resources, especially in resource-intensive sectors with high environmental impact, such as electronics and ICT, batteries and vehicles, packaging, plastics, textiles, construction and buildings, food water and nutrients. The action plan presents a set of measures to:

- Design sustainable products ensuring circularity in the production process for key product value chains
- Empower consumers and public buyers
- Reducing waste
- Making circularity work for people, region and cities

The action plan proposes a set of legislative actions including Ecodesign for Sustainable Products<sup>62</sup>, empowering consumers in the green transition<sup>63</sup>, right to repair<sup>64</sup>, and green claims<sup>65</sup> directive and a new regulatory framework for batteries<sup>66</sup>.

The circular action plan is an integral part of the Green Deal industrial plan<sup>67</sup> presented in February 2023, aiming to enhance the competitiveness of Europe's net-zero industry to scale up of the EU's manufacturing capacity for the net-zero technologies and products. It is based on four pillars: a predictable and simplified regulatory environment, speeding up access to finance, enhancing skills, and open trade for resilient supply chains.

#### 4.2.3. Biodiversity

The Biodiversity Strategy for 2030<sup>68</sup> was adopted in 2020. It establishes the plans and directions to protect nature and reverse the degradation of ecosystems.

Key strategies and action plans in biodiversity include the Forest Strategy for 2030<sup>69</sup>, the Soil Strategy for 2030<sup>70</sup>, the EU Pollinators initiative<sup>71</sup> and the Action Plan: Protecting and restoring marine ecosystems for sustainable and resilient fisheries<sup>72</sup>.

New legislative proposals include:

- Proposal for a Nature Restoration Law<sup>73</sup>: includes binding targets to restore at least 20% of the EU's land and sea areas by 2030, and ultimately all ecosystems in need of restoration by 2050. Indicators to improve biodiversity in agricultural ecosystems, will track progress towards the targets: the grassland butterfly index; the share of agricultural land with high-diversity landscape features; the stock of organic carbon in cropland mineral soil and the common farmland bird index.
- Proposal for a Directive on Soil Monitoring Law (July 2023)<sup>74</sup>

<sup>61</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583933814386&uri=COM:2020:98:FIN>

<sup>62</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A0142%3AFIN>

<sup>63</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52022PC0143>

<sup>64</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52023PC0155>

<sup>65</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2023%3A0166%3AFIN>

<sup>66</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52020PC0798>

<sup>67</sup> [https://ec.europa.eu/commission/presscorner/detail/en/ip\\_23\\_510](https://ec.europa.eu/commission/presscorner/detail/en/ip_23_510)

<sup>68</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1590574123338&uri=CELEX:52020DC0380>

<sup>69</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021DC0572>

<sup>70</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021DC0699>

<sup>71</sup> <https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52018DC0395>

<sup>72</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52023DC0102>

<sup>73</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022PC0304>

<sup>74</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023PC0416>

- Proposal for a regulation on a Forest Monitoring Law (Nov 2023)<sup>75</sup>: Allows for better monitoring of forests, making them more resilient to wildfires, droughts, and pests.

The proposals will support implementation of other key legislations such as the Deforestation Regulation<sup>76</sup>, EU Carbon Removal Certification Framework<sup>77</sup>, Habitats and Birds Directive<sup>78</sup>, and Land Use, Land Use Change and Forestry Regulation<sup>79</sup>.

#### 4.2.4. Pollution

The Commission adopted a Zero Pollution Action Plan<sup>80</sup> for air, water, and soil with the ambition of a toxic-free environment for 2050. The targets established for 2030 aimed to accelerate the reduction of pollution and the impact to human health and natural ecosystems.

A revision for the Industrial Emissions Directive<sup>81</sup> was proposed in April 2022 to enable reductions of harmful emission from industrial installations e.g. for extraction of industrial minerals and metals, large-scale production of batteries and large livestock farms.

The Commission (October 2022) proposed stronger rules and revisions of the Ambient Air Quality Directive<sup>82</sup>, Urban Waste Water Treatment Directive<sup>83</sup> and updated lists of water pollutants to be controlled in surface waters and ground waters<sup>84</sup>.

#### 4.2.5. Sustainability reporting

Monitoring and reporting sustainable activities play a pivotal role in Europe. Economic growth and activities must align closely with the objectives of the Green Deal, ensuring they actively contribute to combating climate change, preserving biodiversity, and fostering a circular economy. Reporting regulations address transparency and accountability of sustainable economic activities including:

EU Taxonomy Regulation<sup>85</sup>, in force since July 2020, establishes a classification system for environmentally sustainable economic activities, providing criteria for determining whether an economic activity is environmentally sustainable. Delegated and implementing acts<sup>86</sup> specify what companies need to do to comply with the regulation e.g. via a technical screening criterion.

Article 9 of the regulation establishes six climate and environmental objectives: 1) Climate change mitigation, 2) climate change adaptation, 3) sustainable use and protection of water and marine resources, 4) transition to a circular economy, 5) pollution prevention and control and 6) protection and restoration of biodiversity and ecosystems.

The conditions to qualify as a sustainable economic activity are: 1) making a substantial contribution to at least one environmental objective, 2) do no significant harm to any of the

<sup>75</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2023:728:FIN>

<sup>76</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32023R1115>

<sup>77</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52022PC0672>

<sup>78</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02009L0147-20190626>

<sup>79</sup> <https://eur-lex.europa.eu/eli/reg/2018/841/oj>

<sup>80</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2021:400:FIN>

<sup>81</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02010L0075-20110106>

<sup>82</sup> [https://environment.ec.europa.eu/publications/revision-eu-ambient-air-quality-legislation\\_en](https://environment.ec.europa.eu/publications/revision-eu-ambient-air-quality-legislation_en)

<sup>83</sup> [https://environment.ec.europa.eu/publications/proposal-revised-urban-wastewater-treatment-directive\\_en](https://environment.ec.europa.eu/publications/proposal-revised-urban-wastewater-treatment-directive_en)

<sup>84</sup> [https://environment.ec.europa.eu/publications/proposal-amending-water-directives\\_en](https://environment.ec.europa.eu/publications/proposal-amending-water-directives_en)

<sup>85</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32020R0852>

<sup>86</sup> [https://finance.ec.europa.eu/regulation-and-supervision/financial-services-legislation/implementing-and-delegated-acts/taxonomy-regulation\\_en](https://finance.ec.europa.eu/regulation-and-supervision/financial-services-legislation/implementing-and-delegated-acts/taxonomy-regulation_en)

other five objectives, 3) comply with minimum safeguards and 4) comply with the applicable technical screening criteria.

Corporate Sustainability Reporting Directive<sup>87</sup> (CSRD) applicable to large public interest companies since January 2024, builds on the Non-Financial Reporting Directive<sup>88</sup> expanding rules to comply to environmental, social and governance (ESG) reporting. Listed SMEs will also have to comply.

CSRD mandates that companies must report using the European Sustainability Reporting<sup>89</sup> standards (ESRS), and they will have to include in their reports which activities are covered by the EU Taxonomy.

#### **4.3. "Choice of Law" Clauses and Member State Legislation and Regulation**

As discussed in [48], whether explicit or not, “data transactions” enabled by a data space are covered by the laws and regulations of one or more Member States. This could be through the “choice of law” clause of specific data exchange agreements between two parties, through the law selected to govern the data space in which such a data transaction occurs, through legal claims of one or more affected parties, and possibly through enforcement efforts by one or more Member States. These different mechanisms of jurisdiction are possible simultaneously – providing a “choice of law” clause in a specific data exchange agreement does not prevent other mechanisms being applied or other jurisdictions becoming involved.

Each Member State decides how EU Directives are implemented (“transposed”) at the national level, and those laws may be supplemented or modified by national laws and regulations. Even EU Regulations, which establish consistent rules across all Member States, can specify “derogations” to Member States to accommodate their existing legislation or practices. For example, the GDPR applies to all organisations that process personal data about EU citizens, regardless of where the organisation is based. However, the GDPR also allows for some flexibility in how it is implemented, which has led to variations in how it is applied between Member States. The GDPR allows Member States to introduce their own specific rules on data processing in certain areas, such as health, employment, and research, which can lead to differences in how the GDPR is applied in these sectors. In the health sector in particular, personal data must be handled very differently, depending not only on the applicable jurisdictions, but also the specific type of health data in question (e.g., genetic, biometric, etc.)<sup>90</sup>.

## **5. GDDS Decisions Made to Ensure Legal Compliance**

Decisions made to ensure legal compliance are fundamental to many choices that must be made during the implementation and operation of the GDDS. Sections in this chapter are phrased as “triggers” as described in section 4.1.1 above.

For simplicity, only the full governance choices related to the first legal compliance decision (whether to work with data that may have limits on access or re-use) are presented. These choices illustrate the choices that must be documented for each major decision. After the first

<sup>87</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32022L2464>

<sup>88</sup> <https://eur-lex.europa.eu/eli/dir/2014/95/oj>

<sup>89</sup> [https://ec.europa.eu/commission/presscorner/detail/en/qanda\\_23\\_4043](https://ec.europa.eu/commission/presscorner/detail/en/qanda_23_4043)

<sup>90</sup> Kiseleva, A. and De Hert, P., ‘Creating a European Health Data Space. Obstacles in Four Key Legal Areas’. *European Pharmaceutical Law Review*, Vol. 5, No 1, 2021, pp. 21–36, doi:10.2139/ssrn.3846781.

decision (section 5.1), tables are presented for some but not all decisions illustrating the related choices that must be made.

### **5.1. Working with data that may have limits on access or re-use.**

A key compliance decision relates to the scope of data to be included in the GDDS:

**GR1.01: The GDDS will be designed to work with data that includes limits on access or re-use, including requirements for compensation of different kinds, and will establish legal, technical and operational measures to ensure compliance with the corresponding laws and regulation.**

Numerous actions and decisions flow from this decision:

**GR1.01.01/Ecosystem Formation:** Exploit efforts to create a comprehensive “Data Protection” taxonomy (DPT) and vocabulary, reflecting all “triggers” identified in the DSSC’s Regulatory Compliance Building Block, or take steps to create such a taxonomy for the GDDS’ use. This Taxonomy should identify the necessary processes for working with each category of data, at each stage of its lifecycle. This Taxonomy should also enable definition of different forms of compensation to the data provider, including free, monetized access (through various mechanisms), exchanged for defined intangible benefits (e.g. a certificate of publication), exchanged in-kind for other data (to be negotiated). This Taxonomy should also incorporate and build on analyses of existing data exchange contracts and license terms<sup>91</sup>.

These efforts should be undertaken in the “Ecosystem” layer of governance, since they could benefit multiple data spaces. A common taxonomy would improve interoperability between data spaces, and the involvement of multiple data spaces would improve the efficiency and quality of this effort.

**GR1.01.02/GDDS Formation/Governance/O<sup>92</sup>: Participation Management BB:** Using agreed governance processes, the GDDS governing entity formally decides that participating service or infrastructure providers must confirm with the specified Data Protection Taxonomy. This becomes a “rule of participation” for service or infrastructure providers that might receive data in data transactions enabled by the GDDS. Procedures for non-compliance are also agreed, including the possibility of service or infrastructure providers being suspended from the data space, or marked as non-compliant.

**GR1.01.03/GDDS Formation/Governance/O: Participation Management BB:** Using agreed governance processes, the GDDS governing entity formally decides that participating data providers must confirm with the specified Data Protection Taxonomy. This becomes a “rule of participation” for data providers that might provide data in data transactions enabled by the GDDS. Procedures for non-compliance are also agreed, including the possibility of data being removed, the data provider being suspended from the data space, or marked as non-compliant.

**GR1.01.03** is an important requirement. If data providers incorrectly declare the relevant “data protection triggers” related to each item of data, other participants will not know how to comply with the relevant laws and regulations, and illegal/non-compliant treatment is possible.

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<sup>91</sup> “B.1 Report on collected model contract terms”, Support Centre for Data Sharing, DG CNECT, SMART 2018/2019, 26 July 2019.

<sup>92</sup> The “O” before the Building Block (“BB”) title indicates it is a Business and Organisational Building Block.

It must be the responsibility of each data provider to properly identify these requirements using the agreed Data Protection Taxonomy. If there is any uncertainty about relevant protection requirements, the data provider should not offer the data for access and use in the GDDS.

Except for open data, uncertainty about these requirements is common among potential data providers, so operational capabilities for support, training and outreach are required (see **GR1.01.04** below). If the Data Protection Taxonomy is in use across the broader Ecosystem, this activity could be enabled by efforts available at the Ecosystem layer.

**GR1.01.04/Ecosystem or GDDS Operation/Operations/Training-Support-Outreach:** *Provide training support and outreach to potential data providers in the proper use of the Data Protection Taxonomy in defining Access and Use Policies for their data.*

**GR1.01.05/GDDS Formation/Governance/O: Contractual Framework BB:** *Incorporate the approved Data Protection Taxonomy, particularly any requirements set by the Data Governance Act or related delegated acts or standards, into the GDDS contractual framework.*

**GR1.01.06/GDDS Formation/Technical/T<sup>93</sup>: Access & Use Policy BB:** *Incorporate the approved Data Protection Taxonomy into the specifications for infrastructures being used to implement the GDDS.*

**GR1.01.07/GDDS Operation/Operations/Participant Onboarding:** *Assess compliance of potentially participating service or infrastructure providers to confirm that the approved Data Protection Taxonomy has been implemented by the technical infrastructures to be included in the GDDS.*

**GR1.01.08/GDDS Monitoring/Operations/Participant Compliance Reporting:** *Compliance with requirements by category is tracked, reported, and aggregated. Audits of compliance are conducted, and non-compliance is addressed through agreed procedures (see **GR1.01.02** and **GR1.01.03**).*

**GR1.01.09/GDDS Sustainability/Operations/Continuous Improvement:** *Opportunities for improvement in each of the activities described above are identified, prioritized and implemented by appropriate governance and/or operating bodies.*

**GR1.01.10/GDDS Sustainability/Operations/Monitoring Changes to Legal Requirements:** *The GDDS must monitor legislative changes, including delegated acts and standards adopted or under consideration through the work of European standardization organizations and European Data Interoperability Board (EDIB), and update the Data Protection Taxonomy as needed to ensure continued compliance.*

This compliance decision creates ten specific requirements affecting the design and operation of the GDDS.

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<sup>93</sup> The “T” before the Building Block (“BB”) title indicates it is a Technical Building Block.

These are captured in Table 3:

*Table 3: Implications of GR1.01: Working with data that may have limits on access or re-use.*

Stage of Lifecycle: Governance Layer:	Formation	Operation	Monitoring	Sustainability
Ecosystem	<b>GR1.01.01</b> (create a DPT)	<b>GR1.01.04</b> (Support)		<b>GR1.01.09</b> (continuous improvement) <b>GR1.01.10</b> (adapting to new standards and requirements)
Data Space	<b>GR1.01.05</b> (O: Contractual Framework BB), <b>GR1.01.06</b> (T: Access & Use Policies BB)			
Use Case				
Participant	<b>GR1.01.02</b> (infrastructure rules), <b>GR1.01.03</b> (data provider rules) (O: Participation Mgmt BB)	<b>GR1.01.07</b> (onboarding)	<b>GR1.01.08</b> (compliance)	

## 5.2. Working with “collective data providers” that represent groups of individual data providers (both natural and legal persons)

Another compliance decision relates to whether the GDDS will accept data provided by collective data providers (CDPs), and whether the GDDS should establish such a CDP to meet the needs of the community. Since citizen-generated data is explicitly expected to be part of the GDDS, the first decision is straightforward, although specific mechanisms will be needed to work with different types of CDP. The second decision should be re-evaluated during deployment, through co-creation efforts involving the Community.

**GR1.02: The GDDS will be designed to work with data provided by CDPs, whether defined as Data Intermediaries by the DGA or not, and will establish appropriate legal, technical and operational measures to onboard such CDPs and to include data they provide.**

Specific requirements related to GR1.02 are illustrated in Table 4:

*Table 4: Implications of GR1.02: Accepting data from Collective Data Providers (CDPs).*

Stage of Lifecycle: Governance Layer:	Formation	Operation	Monitoring	Sustainability
Ecosystem	Document requirements associated with specific types of CDP	Support best practices		Continuous improvement
Data Space	O: Contractual Framework BB, T: Access & Use Policies BB			
Use Case				
Participant	O: Participation Mgmt BB: CDP rules	Onboarding	Compliance	

**GR1.03: The GDDS will establish a collective data provider (CDP) to meet the needs of the community.**

Specific requirements related to GR1.03 are illustrated in Table 5:

*Table 5: Implications of GR1.03: Establishing a Collective Data Provider (CDP).*

Stage of Lifecycle: Governance Layer:	Formation	Operation	Monitoring	Sustainability
<b>Ecosystem</b>				
<b>Data Space</b>	Select form of collective data provider needed to meet the needs of the community. Establish chosen form. Launch (O: Org. Form & Gov. Authority BB)	Operate collective data provider	Monitor operations of collective data provider	Sustain operation, or terminate if not needed by community
<b>Use Case</b>				
<b>Participant</b>				

### 5.3. Providing Services Covered by Related EU Laws and Regulations and Ensuring These Services Comply with Related Requirements

The Data Governance Act distinguishes three kinds of services: data intermediation services performed by Data Intermediaries, other services that may be performed by Data Intermediaries, and services that should not be bundled by Data Intermediaries with Data Intermediation Services. The Artificial Intelligence (AI) Act also places requirements on services for training AI models and using advanced analytics capabilities. The GDDS will include services covered by these categories, in some cases more than one, so it must establish a coherent mechanism to ensure coherent and compliant presentation and use of such services within the GDDS.

**GR1.04: The GDDS will create a Data Service Vocabulary (and taxonomy) (DSV) to label services covered by the Data Governance Act, AI Act, and any other acts defining regulated data services and will use this DSV to ensure those services comply with related requirements.**

Specific requirements related to **GR1.04** are like those required for **GR1.01**, and are illustrated in Table 6:

Table 6: Implications of GR1.04: Providing Services Covered by Related EU Laws and Regulations

Stage of Lifecycle: Governance Layer:	Formation	Operation	Monitoring	Sustainability
<b>Ecosystem</b>	Create a DSV	Support		Continuous improvement
<b>Data Space</b>	O: Contractual Framework BB T: Access & Use Policies BB			
<b>Use Case</b>				
<b>Participant</b>	Service provider rules (O: Participation Mgmt BB)	Onboarding	Compliance	

### 5.4. Providing Sustainable Data Intermediation Services for the GDDS

It is likely that some or all of the data transactions expected in the GDDS will need to be provided by a regulated Data Intermediation Service Provider (DISP), as defined by the Data Governance Act. The GDDS should arrange at least one regulated provider for this service, possibly through establishment of a GDDS-specific DISP.

**GR1.05: Decide how regulated Data Intermediation Services can be provided in the GDDS, either through external providers and/or by establishing its own DISP. If establishing its**

*own, the GDDS must define the business model of its DISP, possibly exploiting specific features of the GDDS, possibly making the GDDS-DISP the exclusive DISP for GDDS, to ensure sustainability.*

Specific requirements related to **GR1.05** are illustrated in Table 7:

Table 7: Implications of GR1.05: Establishing a Regulated Data Intermediary for the GDDS

Stage of Lifecycle: Governance Layer:	Formation	Operation	Monitoring	Sustainability
Ecosystem	Assess best practices for DISPs, available options, and possible business models.			
Data Space	Arrange for external DISPs to participate in the GDDS. (O: Data Space Intermediary BB); Develop business model for GDDS-DISP. Decide whether to create. Establish the regulated data intermediary and register as required. (O: Business Model Development BB)	Operate DISP	Monitor compliance of external DISPs. Monitor operations of DISP.	Sustain operation, or terminate if not viable or needed by community
Use Case				
Participant	Data Intermediary rules (O: Participation Mgmt BB)	Onboarding	Compliance	

## 5.5. Identify Standard Terms for B2B Data Sharing that are Not Unfair

Article 13 of the Data Act may limit the ability of data space initiatives to establish standard terms and conditions for participants, for example, through a standard Constitutive Agreement.

**GR1.06: Identify standard terms and conditions, and related operational and governance procedures, required to allow standard agreements, e.g. through Constitutive and Accession Agreements, to be used to govern participation in the GDDS.**

Specific requirements related to **GR1.06** are illustrated in Table 8:

Table 8: Implications of GR1.06: Identify Standard Terms for B2B Data Sharing that are Not Unfair

Stage of Lifecycle: Governance Layer:	Formation	Operation	Monitoring	Sustainability
Ecosystem	Assess best practices for standard terms, known terms and conditions that trigger "unfair" treatment.	Monitor evolution in legal interpretation, case law, etc.		
Data Space	Develop standard governance agreements that do not trigger B2B unfairness (O: Contractual Framework BB)		Monitor complaints by participants of unfairness	Modify agreements as needed.
Use Case				

<b>Participant</b>	Accession Agreements (O: Participation Mgmt BB)	Onboarding	Compliance	
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## 5.6. Interoperability in Data Spaces and Data Sharing Contracts

The Data Act [7, Article 33] establishes several requirements for data providers regarding transparent annotation of their data to facilitate finding, accessing and using that data, declaration of related interoperability standards (such as data structures, vocabularies, etc.), automated data access mechanisms and interoperable data sharing contracts.

**GR1.07: The GDDS will be designed to comply with the requirements of the Data Act, Article 33, including any requirements resulting from delegated acts or definition of standards.**

Annotation to facilitate access and use is addressed in Requirement **GR1.01** above. Specific aspects of this requirement are pointed out here:

**GR1.07.01:** *The GDDS will require annotation of each data product with machine-readable “self-descriptions” or metadata regarding its content, data structures, formats, vocabularies, classification schemes, taxonomies, code lists as well as information about the technical means to access the data (such as through APIs).*

**GR1.07.02:** *The GDDS will require annotation of each data product with machine-readable “self-descriptions” or metadata regarding its collection methodology, quality and uncertainty. Objective quality indicators will be used to describe “quality”.*

The Metadata Enhancer service, described in [D3.2] and section 6.2 below, can be used, for example within specific Use Cases, to define composite measures of “fitness for purpose” from the required objective quality indicators. Section 6.2 also describes data validation/verification services that can independently verify specific data in the GDDS.

Use Cases may choose to use different interoperability standards within the scope of the Use Case. These standards could be both less and more specific than those chosen for the GDDS overall.

Specific requirements related to **GR1.07** are illustrated in Table 9:

Table 9: Implications of GR1.07: Interoperability in Data Spaces and Data Sharing Contracts

Stage of Lifecycle: Governance Layer:	Formation	Operation	Monitoring	Sustainability
<b>Ecosystem</b>	Identify common interoperability standards, Metadata and Fitness for Purpose for the GDDS ecosystem (O: Data Product Development BB; T: Data Models BB; T: Data, services & offerings description BB)	Support		Adapt to evolving standards
<b>Data Space</b>	Identify common interoperability standards, Metadata and Fitness for Purpose for the GDDS itself	Onboarding	Compliance	Continuous improvement

	(O: Data Product Development T: Data Models BB; T: Data, services & offerings description BB)			
<b>Use Case</b>	Identify common interoperability standards, Metadata and Fitness for Purpose for each Use Case (O: Data Product Development T: Data Models BB; T: Data, services & offerings description BB)	Onboarding	Compliance	
<b>Participant</b>	Data provider rules (O: Participation Mgmt BB)	Onboarding	Compliance	Continuous improvement

## 5.7. Cybersecurity Required for Personal Data and/or Data About Critical Infrastructure

Since the GDDS must be designed to enable it to refer to and work with data that is either “personal”, as defined by the GDPR, or related to “critical infrastructure”, as defined by the NIS Directive, the GDDS must be designed and operated to ensure the legally required levels of cybersecurity for the data. This requirement affects all aspects of GDDS implementation, from business model to legal framework, to operations, to functional requirements and technology.

**GR1.08: The GDDS will work with data that legally requires the use of secure digital infrastructure, so the GDDS (or those segments of it where sensitive data will be held and processed) must be designed as a secure digital infrastructure meeting the EU's legal requirements.**

Specific requirements related to **GR1.08** are illustrated in Table 10:

Table 10: Implications of GR1.08: Implement the GDDS as a secure digital infrastructure.

Stage of Lifecycle: Governance Layer:	Formation	Operation	Monitoring	Sustainability
<b>Ecosystem</b>	Document best practices for secure digital infrastructure. Define required security, or possibly different security levels, to be implemented across interoperable infrastructures.	Support		Adaptation & improvement New Technology Assessment
<b>Data Space</b>	O: Contractual Framework BB T: Identity & Attestation Mgmt BB T: Trust Framework BB	Integrate technology components to ensure system-level security	Overall Risk Assessments	
<b>Use Case</b>				
<b>Participant</b>	Infrastructure Rules (O: Participation Mgmt BB) Certification/Verification	Onboarding	Re-evaluation Compliance	

The GREAT project's "White Paper on IT Governance" [55] provides guidance on best practices to fulfil this requirement.

### 5.8. Continued Compliance with other EU and MS Legal Requirements

The requirements above respond to a limited number of relevant EU laws and regulation. In addition, there is a broad range of Member State-specific laws and regulation that have not been assessed by GREAT and that may translate into requirements on the design and operation of the GDDS.

**GR1.09: The GDDS will monitor the range of horizontal legal and regulatory requirements that apply throughout the EU and within specific Member States to ensure that the GDDS is designed and operated to enable compliance, and to assist Participants in maintaining their own compliance.**

Specific requirements related to **GR1.09** are illustrated in Table 11:

Table 11: Implications of GR1.09: Complying with other EU and MS Legal Requirements

Stage of Lifecycle: Governance Layer:	Formation	Operation	Monitoring	Sustainability
Ecosystem	Establish a baseline analysis of all relevant EU and MS laws and regulations applicable to data spaces. Translate these into recommended requirements to be met by all data spaces.	Monitor legal changes, update the baseline analysis, report new or changed requirements.		
Data Space	Implement additional requirements identified in the baseline analysis, probably involving: O: Regulatory Compliance BB; O: Contractual Framework BB; Other Organisational and Technical BBs as appropriate.		Overall Risk Assessments	
Use Case				
Participant	O: Participation Mgmt BB	Onboarding	Compliance	

### 5.9. Linking the Digital and Real Worlds for Legal Certainty

To establish and maintain this linkage, the GDDS governance framework includes a number of related requirements:

The GDDS needs to establish its own legal existence:

**GR1.10: The GDDS will establish a legal governing entity, and either establish its own legal operating entity or contract with a provider of such services to act on its behalf.**

Specific requirements related to **GR1.10** are illustrated in Table 12:

Table 12: Implications of GR1.10: Establish Governing Entity; Establish or Identify Operating Entity

Stage of Lifecycle: Governance Layer:	Formation	Operation	Monitoring	Sustainability
<b>Ecosystem</b>	Assess best practice recommendations regarding suitable forms of entity (e.g. an EDIC, AISBL in Belgium, European Association, etc.), and optimum jurisdictions in which to establish such entities. Translate these into recommended requirements to be met by all data spaces.	Monitor legal changes, update best practice recommendations, report new or changed requirements.		
<b>Data Space</b>	Choose a preferred form of governing entity; take the steps necessary to establish this entity; (O: Organisational form & Governance Authority BB) Identify possible operating entities who could be contracted by the GDDS; Decide whether to outsource or establish a GDDS operating entity; either conclude an outsourcing contract or take steps necessary to establish an operating entity; (O: Organisational form & Governance Authority BB)  (also O: Regulatory Compliance BB; O: Contractual Framework B)	(Ongoing structure and operations of the governing and operating entities are addressed in requirements below.)		
<b>Use Case</b>				
<b>Participant</b>				

Actions using the GDDS that are relevant to either horizontal or sectoral EU or Member State laws or regulation must be recorded, identifying the user who took the action, the related assets or services affected by the action, and any other involved parties.

Actions can include agreement to the “Accession Agreement” that allows users to participate in the GDDS in a certain role, agreement to specific instances (even if digitally documented) of data transaction contracts, end user license agreements, acceptable use policies, consents to the use of personal data, etc.

When a digital user signs any “digital agreement”, the natural or legal person linked to that digital user must be aware that they are then bound by the agreement in the real world and may be subject to any sanctions or penalties defined by that agreement or by applicable laws and regulation.

**GR1.11:** *All legally relevant digital actions taken within the GDDS must be logged to ensure they are supported by corresponding legal agreements. Logs will identify involved users and entities (including the GDDS in either its governance or operating capacities), assets and services. Logs will only be used to support legal and regulatory compliance and will be kept secure and confidential since they contain personal and confidential information.*

Specific requirements related to **GR1.11** are illustrated in Table 13:

Table 13: Implications of GR1.11: Legally relevant actions within the GDDS will be securely logged.

Stage of Lifecycle: Governance Layer:	Formation	Operation	Monitoring	Sustainability
Ecosystem	Best practices for legally relevant transaction logging are developed.			
Data Space	Transaction types to be logged are defined and agreed. (O: Regulatory Compliance BB, O: Contractual Framework BB). Logging systems are implemented including access rules (O: Data Space Intermediary BB).	Logging systems are operated.		
Use Case				
Participant	Participants agree to logging and consent to storage of relevant information (O: Participation Mgmt BB)			

User identification must link their digital identification with a legal or natural person. This is sometimes referred to as “binding identification”. The strength or assurance level of this linkage is covered by several technical standards and policies, such as the eIDAS and eIDAS2 regulations.

**GR1.12:** *Any GDDS User engaging in legally relevant activity on the GDDS platform must be identified with digital identification that binds to the user's identity in the real world, for both natural and legal persons.*

Specific requirements related to **GR1.12** are illustrated in Table 14:

Table 14: Implications of GR1.12: Legally relevant actions must be performed by digital users bound to real world entities.

Stage of Lifecycle: Governance Layer:	Formation	Operation	Monitoring	Sustainability
Ecosystem	Common and interoperable identity and attestation management			

	schemes (e.g. utilizing eIDAS or eIDAS2) will be accepted across the ecosystem. (T: Identity and Attestation Management BB)			
<b>Data Space</b>	Strong assurance authentication systems are established for GDDS (O: Data Space Intermediary BB; T: Identity and Attestation Management BB).			
<b>Use Case</b>				
<b>Participant</b>	Participants agree to provide identification that is bound to real-world identities (O: Participation Mgmt BB)			

These three requirements together should enable regulatory compliance and legal accountability for the GDDS.

### 5.10. Complying with the INSPIRE and High Value Datasets regulations.

Requirements are highlighted here for the INSPIRE and the High Value Datasets regulations discussed in [48]. These regulations are being evaluated as part of the “GreenData4All” initiative<sup>94</sup>, so the specifics of this requirement should be updated to reflect any new regulations.

**GR1.13: The design and operation of the GDDS should allow public administrations that provide data to the GDDS to comply with the INSPIRE Implementing Rules (IR)<sup>95</sup> for geospatial datasets.**

Specific requirements related to GR1.13 are illustrated in Table 15:

Table 15: Implications of GR1.13: GDDS should allow public administrations to comply with INSPIRE.

Stage of Lifecycle: Governance Layer:	Formation	Operation	Monitoring	Sustainability
<b>Ecosystem</b>				
<b>Data Space</b>	O: Data Space Intermediary BB (including ancillary services such as data preparation and transformation); T: Data Models BB; T: Data, services & offerings descriptions; T: Value added services BB (including catalogues, aggregation services)			

<sup>94</sup>[https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13170-GreenData4All-updated-rules-on-geospatial-environmental-data-and-access-to-environmental-information\\_en](https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13170-GreenData4All-updated-rules-on-geospatial-environmental-data-and-access-to-environmental-information_en)

<sup>95</sup> <https://inspire.ec.europa.eu/inspire-implementing-rules/51763>

Use Case				
Participant				

### 5.11. Complying with Competition and Anti-Trust Legislation

The Data Governance Act defines specific requirements for Data Intermediaries to take actions to prevent anti-competitive behaviours, applying “*in situations where data sharing enables undertakings to become aware of market strategies of their actual or potential competitors. Competitively sensitive information typically includes information on customer data, future prices, production costs, quantities, turnovers, sales or capacities*” [6, Recitals 37 and 60]. These obligations are not limited to Data Intermediaries and apply to the GDDS broadly, especially the GDDS Governing Entity and GDDS Operating Entity, if established.

Fulfilling this obligation requires the GDDS to have data about the legal entities using the GDDS, collected with consent either in connection with specific data transactions and/or at the time each participant is onboarded to the GDDS. For example, the parties to a data transaction should report whether their data transaction represents the sharing of “competitively sensitive information” between two competing organisations. Similarly, at the time of onboarding, a legal entity should identify the economic sectors (e.g. using NACE v2 codes) to assist the GDDS in monitoring potential anti-competitive activity.

**GR1.14:** *The GDDS will collect data with consent, from legal entities participating in the GDDS, with the purpose of monitoring data transactions and other activity to guard against the use of the GDDS for anti-competitive behaviour, and the GDDS will operate monitoring activities designed to identify such potentially anti-competitive behaviours.*

### 5.12. Data Intermediaries to Comply with Requirements set by the Data Governance Act.

The Data Governance Act defines several requirements for Data Intermediaries, including taking actions to prevent anti-competitive behaviours, and providing the “highest level of security” in its operations. These requirements for Data Intermediaries are addressed by Requirements **GR1.08** and **GR1.14** above, but other requirements must be respected.

For example, the DGA requires that, “*in the event of [the Data Intermediary’s] insolvency, the [Data Intermediary] shall ensure a reasonable continuity of its services and, where data is stored, shall allow data holders and data users to retrieve their data and allow data subjects to exercise their rights*” [48]. In this case, the GDDS, as an initial deployment task, will consult with experts to determine whether continuity required under all circumstances or only where the Data Intermediary is storing data on behalf of Data Providers, how long such continuity is required, and whether it is acceptable to arrange for another entity to take over either the data intermediation service or just the data storage service. The results of this consultation will be reflected in decisions about whether to establish a specific Data Intermediary for the GDDS, and the confirmed requirements will be included in the business planning for such an intermediary. If other Data Intermediaries will be used in the GDDS, the GDDS will ascertain that this requirement is fulfilled by each such Data Intermediary.

**GR1.15:** *The GDDS will apply at least the requirements of the Data Governance Act in acceptance of any regulated Data Intermediaries as Participants in the GDDS.*

### 5.13. Participants to Comply with Requirements set by the Artificial Intelligence Act.

While the requirements set by the Artificial Intelligence Act remain subjective and possibly unclear, the GDDS needs to proactively collect data from Data Providers, Data Consumers and participants in any data transaction to document the collective compliance with the AI Act as it may be interpreted in practice in the future.

**GR1.16: The GDDS will require Participants to acknowledge an AI Act “Code of Conduct” in connection with their application to become a Participant in the GDDS.**

**GR1.17: The GDDS will require parties to any data transaction to complete a “self assessment checklist” to document compliance with the AI Act, as it might apply to the data transaction. In the early stages of deployment, the GDDS will review the criteria for requiring completion of such a checklist and as much as possible limit its requirement to “at risk” data transactions.**

## 6. GDDS Decisions Made to Ensure the GDDS is Strategically Focussed.

This chapter lists the decisions that need to be made to ensure the GDDS has a strong strategic focus. These decisions align with the business concept described in chapter 3, specifically section 3.5, which is based on insights gained from GREAT’s stakeholder forum and detailed examination of ten Reference Use Cases, as well as other contributions [8]. These strategic directions must be reconsidered as an early part of any actual deployment effort, developing consensus around the GDDS’s direction with the broad community of practice of the European Green Deal.

These decisions are grouped into six categories:

1. **High Level Strategic Decisions, including Mission and Objectives.**
2. **Service Architecture.**
3. **Technical Architecture and Control.** What is the architecture of the platform? Is it centralised, federated, distributed? How does the architecture map to governance, to responsibility and accountability?
4. **Governance Architecture.** What is the shape of GDDS governance? What entities must be established, what governance and advisory bodies are needed, what agreements or operating procedures must be created?
5. **Use Cases and Value Creation.** How is value created in the GDDS, and for whom? The business model for the GDDS (specifically the various entities to be established) is described in section 3.5.2. This business model will support the separate business models of users of and participants in the GDDS.
6. **Operations and Monitoring.**

In most cases, initial governance decisions do not translate into specific operational requirements, so operations and monitoring requirements are consolidated in section 6.6.

## 6.1. High Level Strategic Decisions

Determine the high level scope and ambition of the GDDS.

**GR2.01: GDDS Leadership:** *The GDDS implementation and deployment will be led by the consortium awarded the deployment call that is part of the Digital Europe Work Programme. This consortium will be responsible for building consensus with the European Green Deal Community of Practice on initial strategic directions, and then taking steps to implement and operationalize the GDDS.*

**GR2.02: Landscape Design:** *The GDDS initial mission is to bring together the fragmented infrastructures in operation across the European Green Deal “ecosystem”. For this reason, the GDDS must be designed flexibly to make it easy for existing infrastructures, data providers and use case participants to participate in the GDDS itself. This flexibility applies to governance, technical, and operational aspects.*

The European Green Deal ecosystem is described in [8]. Flexibility is needed to accommodate wide variation in objectives, resources, stakeholders, governance constraints, relationships with external initiatives, etc.

**GR2.03: Mission and Objectives:** *Section 3.5 presents a detailed, but at the same time, broad mission statement for the GDDS. The GDDS initially targets delivery of “Level 2” capabilities from the taxonomy of objectives (Table 1), with the progressive increase in capabilities in subsequent years.*

**GR2.04: Principles, Values:** *Section 3.5 presents initial Principles and Values for the GDDS, to be confirmed early in the deployment phase.*

**GR2.05: Roles:** *Initial roles and role definitions will follow best practices set by the DSSC. Examples are presented in Section 3.5. Additional roles include service and/or infrastructure provider, to allow several requirements related to EU laws and regulations to be implemented, as well as “members” (of governance processes).*

For example, the responsibilities and performance expectations for data providers might include:<sup>96</sup>

- Data providers shall represent either a natural person, with verifiable credentials, a legal entity, an EU represented institution, project or an accredited international collaboration with representation in Europe.
- Data providers shall comply with legal and ethical requirements ensuring that they have the legal right to share the data and that they do not infringe any copyrights, patents, or other intellectual property rights. Transparent and ethical data handling are essential.
- Making the “provided” data accessible through the GDDS with some level of commitment, ranging from long term to best efforts. It is the data provider’s responsibility to store the data being made available unless separate repository/storage services are arranged.
- Possibly limiting the ability of data providers to list only their metadata in the GDDS, while requiring users to access the provider’s own platform to access the data itself.

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<sup>96</sup> See [13] BO.4.2 Data governance; TS.3.5 Data governance solution; TS.4.2 Data location and availability.

- Providing the necessary “metadata” information to provide semantic interoperability, to allow the data to be used effectively, to describe the level of data quality and quality assurance processes their data and services have been subject to, and to describe the policies that govern access and use of that data. This includes specifying Terms and Conditions/Licensing terms of access and usage.
- Preparing the data for access and use consistent with the selected access and use policies. E.g., if data is provided without restriction, ensure the data does not include any sensitive data, including anonymization of any personal or similar data that could “poison” the data. Possibly splitting data into smaller datasets that would allow easier access to less sensitive portions of the data.
- If access and/or use of the data requires negotiation of the terms and conditions of that access, define the process for this negotiation. Make sure proper resources are provided to support timely negotiation for access and use, regardless of whether the processes are automated or manual.
- Provide access to data via machine readable APIs.
- Provide sufficient infrastructure and systems capable of handling the expected data volumes and provide agreed data in a timely manner.
- Implement appropriate security measures to protect the data from unauthorised access, tampering or breaches while in transit and storage.
- If changes to the data or its metadata are planned, including the applicable access and use policies, as well as data structures, systems, or interfaces being used, communicating these changes in advance to varying degrees and through different mechanisms, with the most advance notice provided to data licensees/recipients and other “concerned” participants in the data platform.
- If data will no longer be made available through the platform, what options will be available for archival access, or alternative access through other platforms?

Specific requirements related to **GR2.05** are illustrated in Table 16:

*Table 16: Implications of GR2.05: Roles and Role Definitions.*

Stage of Lifecycle: Governance Layer:	Formation	Operation	Monitoring	Sustainability
<b>Ecosystem</b>	Define roles similarly across ecosystem to enable interoperability.			
<b>Data Space</b>	Define contractual framework for different roles (O: Contractual Framework BB)	Support & Training		Continuous Improvement Satisfaction Trends/Growth
<b>Use Case</b>				
<b>Participant</b>	For each role, define related eligibility requirements, functions, rights, responsibilities, obligations, and performance expectations (O: Participation Mgmt BB)	Onboarding Change management	Performance Measurement Reporting Compliance Enforcement	

## 6.2. Service Architecture

Specify the services that will be offered in the GDDS.

**GR3.01: Intermediation/ Marketplace/ Catalogues:** *Provide services needed to enable data transactions, including negotiation and recording of data contract terms and conditions. Supervise services categorized as data intermediation services, monitor performance and compliance.*

**GR3.02: Ancillary Services:** *Data Preparation, Encryption, Anonymization, Transformation. Provide services that make intermediation easier/more likely. Examples: data preparation, repository, format conversion, compliance assessment*

Anonymization Services should only be offered if they can be relied upon to convert “personal” data to non-personal data that is not subject to the GDPR. Otherwise, data providers should take responsibility for the provision of anonymized data that is not covered by GDPR.

**GR3.03: Enrichment, Aggregation, Fusion, Analysis, AI/ML, Metadata Enhancement, Data Certification/Verification.** *Provide services needed or valuable AFTER data is shared. Supervise onboarding of value-added services, monitor usage, performance (value created), principles (value sharing), compliance. Review rules for access to data results by contributors. Possibly set up rules against bundling of "interesting" private sector data with costly data fusion services. Review services with respect to principles/values.*

**GR3.04: Forecasting, Monitoring, Trend evaluation, Target setting and tracking, alerting, dashboarding.** *Provide services needed to enable higher levels of "Objectives".*

**GR3.05: Services to Order or Request Data from “Data as a Service” Services.**

**GR3.06: Data Exchange Services**

**GR3.07: Provide Logging and Usage Accounting, including tracking of legally relevant actions.** *Decide how performance and compliance of data transactions will be monitored and governed. Get agreement on the scope of monitoring and transaction logging, and the ability to track user actions for accounting and compliance. Collect permissions for personal data processing.*

## 6.3. Technical Architecture and Control

As an “infrastructure” designed to enable “data transactions” between “ecosystem parties”, decisions must be made about the design and implementation of the GDDS as a data platform. The scope of technical architecture includes software, software development, internal and external interfaces and standards, as well as a range of “boundary resources” that range from standard documentation and training to more elaborate mechanisms for outreach to and support of technical personnel (working “inside” the data platform as well as with and for various participants such as data providers and consumers).

Control refers to the ongoing governance of the technical architecture, including technical planning, roadmap maintenance, change management and technical innovation more generally. Technical change should be purposeful – consistent with the objectives of the data space and its stakeholders – and support achievement of progressively higher objectives (see Table 1).

Deliverable 3.2 Technical Blueprint [D3.2] addresses specifics of the technology initially planned for the GDDS (the initial technical decisions). The GDDS is expected to adopt the Smart Middleware Platform (SIMPL) when it becomes available later in 2024, so the capabilities of SIMPL represent an important factor in these architectural decisions.

Two “strategic” technical decisions are the following:

**GR4.01: The GDDS Architecture will be based on principles of openness and modularity, to encourage engagement with stakeholders and hopefully their contribution to the success and enrichment of that Architecture.**

Specific requirements related to **GR4.01** are illustrated in Table 17:

Table 17: Implications of GR4.01: Governing an Open Architectural Platform.

Stage of Lifecycle: Governance Layer:	Formation	Operation	Monitoring	Sustainability
<b>Ecosystem</b>				
<b>Data Space</b>	Develop and approve an Intellectual Property Policy, identifying situations where IP might be created, the roles that might be involved in its creation, and the IP rights that may be available to involved participants based on their role(s). The IP Policy will also define the process for declaring existing IP that might be made available to the platform, for reporting newly created IP and the participants involved in its creation (O: Contractual Framework BB)	Manage the IP declaration and reporting process, the identification of new IP and corresponding IP rights that have been agreed	Monitor and report the overall flow of IP in the platform, including the effectiveness of the process for reporting new IP and defining new IP rights	Continuous Improvement
<b>Use Case</b>				
<b>Participant</b>				

For example, analysis capabilities might be offered using free open-source software, with open-source licences from the original developers. Data space participants could “adapt” the algorithms for new hardware or software environments or with additional language support, but the original developer must be given the rights to this adaptation. Conversely, participants can “extend” the capabilities and functions of the software, in which case the extending developer and the original developer will share the IPR in the extended version of the software.

**GR4.02: The GDDS will support federated and trusted architectural model considering central components for dedicated services, such as catalogue, marketplace or clearinghouse services. Adoption for a fully distributed and trustless architectural approach will be considered as the ecosystem scales up.**

GDDS infrastructure shall provide and federate access to multiple distributed data sources. For both architectural approaches, the GDDS organising entity will delegate required services to one or more providers, defining the scope of each service, selecting one or more competent providers for each service, and managing the services provided through the service management system.

Adoption of distributed, trustless approaches is likely to be both driven and held back by the interest levels and familiarity of users in these approaches. This evolution, and the overall evolution of the GDDS Architectural Plan will be supervised by the GDDS Architecture Committee described below.

***GR4.03: Managing the GDDS Architectural Plan. A GDDS Architecture Committee will manage the evolution of the GDDS' modular architecture, including the following activities:***

Definitions of the scope, functions, and interfaces of each logical component in the GDDS Architecture. This includes components responsible for identity, authentication and authorisation of users, policy engines implementing access & use policies and data contract negotiation, catalogues, connectors and related registries.

Managing/tracking new requirements not yet available from the GDDS Architecture.

Managing/tracking the roadmaps, backlogs, feature evolution of logical components in use in the GDDS Architecture.

Scan of new technologies and systems that might deliver specific logical capabilities.

Evaluation of new technologies.

Creating and managing the roadmap for the GDDS Architecture overall, including integration or development of new technologies. The roadmap should include the targeted objectives, how requirements are addressed, well defined timelines and how to measure progress of implementation.

Supervise development, maintenance, and improvement of boundary resources.

Requirement **GR1.07** requires that all data available through the GDDS should comply with identified data standards, models, and vocabularies. This requirement is complemented by the following:

***GR4.04: A GDDS Interoperability Committee will identify domain specific community standards where they are already established, consider, and consult the community on new or changed standards, decide on their adoption by the GDDS, and supervise implementation of changes by the data space and by the involved providers. (Maps to T: Data Models BB)***

Selected standards will also influence the selection and prioritisation of transformation services developed and offered for use through the GDDS (see section 6.2 above).

Requirement **GR1.08** established the need for secure digital infrastructures. This requirement is complemented by the following:

***GR4.05: Managing requirements for establishing secure digital infrastructures. A GDDS Cybersecurity Committee will establish and maintain standards that the GDDS will apply in determining whether infrastructures are suitably secure to comply with relevant regulation.***

**GR4.06: GDDS Cybersecurity: the GDDS Cybersecurity Committee will supervise a GDDS Security Incident Response Team, which will apply best practices in cybersecurity across the collective infrastructures making up the GDDS, including responding to security incidents and vulnerabilities.**

Requirement **01.12** establishes the need for trusted identities for any user engaging in legally relevant activities (such as digitally signing a digital contract). This requirement is complemented by the following:

**GR4.07: Managing the GDDS Trust Framework. A GDDS Trust Management Committee will manage the identification of Trust Anchors as well as Claims Vocabularies recognized by the GDDS. (Maps to T: Trust Framework BB.)**

Ideally Trust Anchors and Claims Vocabularies would be aligned throughout the ecosystem surrounding the GDDS, supporting increased interoperability and trust.

The services of the GDDS must be managed to ensure it operates effectively, meeting or exceeding the expectations of “customers” and meeting overall objectives<sup>97</sup>:

**GR4.08: Service Management Process: A service management system (SMS) (such as FitSM<sup>98</sup>) will be selected at the formation stage, and the defined SMS processes and capabilities will be operated to ensure effective service delivery, such as incident and problem management and risk identification, management, and mitigation.**

#### 6.4. Governance Architecture

In parallel with the design of the GDDS’ technical architecture, specific governance mechanisms must be designed to ensure that the GDDS supports the needs and objectives of its stakeholders, fulfils its agreed mission and vision, and remains relevant, effective, and sustainable.

**GR5.01: The following GDDS Entities require governance architectures: Governing Entity, and if established by the GDDS, one or more of the following: Operating Entity, Regulated Data Intermediary, and Collective Data Provider.**

Initially the GDDS will be led by the consortium awarded the grant to deploy the GDDS (see Requirement **GR2.01**). Establishment of the Governing Entity and transition of governance responsibility to that entity will be arranged over the course of the initial deployment award.

The requirements listed below specify the governance architecture for just the GDDS Governing Entity. The requirements are presented in the sequence in which they must be addressed to establish a new, properly governed entity.

**GR5.02: Establish the Governing Entity, including its own governance structure. This requirement involves multiple sub-steps, described below.**

1. Co-creation process with stakeholders to agree on strategy and initial governance steps

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<sup>97</sup> See [13] Bo.4.3 Risk management

<sup>98</sup> [www.fitsm.eu](http://www.fitsm.eu)

2. Decide on form and jurisdiction of GDDS Governing Entity (GGE) (See Requirement **01.10**)
3. Initial Founders are identified and volunteer to create the GGE
4. Create Founders' agreements, Constitutive Agreement, other required documents
5. Incorporate GGE in selected jurisdiction, with Founders as Initial Members
6. Full Member Onboarding: Initial Members are joined by a broader group of members onboarded through an agreed process.
7. Initial Meeting of General Assembly, which ratifies Constitutive Agreement, By-Laws etc.
8. Form GGE Boards and Advisory Bodies and Processes, including electing board members
9. Choose Executives and Management to operate GDDS, decide to form a GDDS operating entity (GOE), or outsource operations.
10. Formation of Operational Committees and Advisory Bodies and Processes
11. Pre-and-post launch outreach/communications to stakeholders.

Similar steps must be taken for other entities, such as the Operating Entity and Data Intermediary discussed above. For the Data Intermediary there is an additional step (between numbers 9 and 10 above) to register the new entity with the competent authority for data intermediaries in the relevant jurisdiction.

Details of specific steps are called out in the following specific requirements.

**GR5.02.02: Member Eligibility:** *The Community of Practice should agree on rule for member eligibility during the Co-Creation Process. It is planned that any organisation or individual with an interest in the GDDS may join as a member. A membership fee may be charged, which may scale in amount depending on the size of the organisation. Eligibility rules may be modified, with the approval of a supermajority of members.*

**GR5.02.02: Implement Member Management Processes:** *Similarly, during the Co-Creation Process, stakeholders must define Membership rules of participation, onboarding process, management of member rolls and audits of compliance with rules of participation.*

**GR5.02.04: Governance Agreements.** *Based on best practices and the selected form and jurisdiction of the Governing Entity, as well as the community consensus about high level strategic decisions and directions, develop legal agreements for the entity's establishment.*

**GR5.02.07: General Assembly:** *includes all Members of an Entity. The General Assembly elects some members of the Governing Board, approves annual financial reports, and approves changes to the formative agreements of the entity (such as the Constitutive Agreement and/or By-Laws of a legal entity). Subgroups of Members (e.g. researchers, regular citizens) can elect members to representative groups that provide advice to the Board. Depending on the decision to be made, different decision-making processes will be*

*required, such as majority or supermajority voting, advance notice of matters coming up for a vote, quorum requirements.*

**GR5.02.08 Board:** *The initial governing board will reflect the business model of the GDDS, in rough proportion to its sources of revenue, including Member elected board members proportional to membership fees, funder-nominated board members in proportion to external funding, and other board members in proportion to other sources of income. A minimum of 20% of board seats will be reserved for individuals based on their experience in governance of similar activities or expertise in topics of strategic importance to the GDDS. Other board seats may be reserved for representatives of selected groups, such as citizen-based environmental groups or the research community.*

**GR5.02.09: Board:** *has authority to review and approve all aspects of the GDDS' operation, except where those powers are held by the General Assembly. The board has the responsibility to make operational arrangements for the GDDS, but typically delegates many of those responsibilities and authorities to an executive manager or to a separate contracted Operating Entity, whose plans and performance the board then supervises. All the topics itemised in this deliverable require decision-making by the GDDS Board. The Board will have one or more advisory boards to provide input on issues of relevance to them. In addition, the Board would likely have committees and advisors in the areas of user requirements, scientific research, public policy, legal affairs, and risk, and possibly cybersecurity.*

**GR5.02.09: Executives and management/Operating Entity:** *While executives, and management more broadly, are not involved in governance, their jobs begin where governance ends, so interactions between management and governance processes should be tracked transparently. Governance actions assigned to management are tracked and reported, along with results. Management will report to governance bodies about performance of the entity and is held accountable for those results.*

The GREAT project's "White Paper Governance of Multi-Stakeholder Organisations"<sup>99</sup> provides guidance on best practices to implement responsive governance schemes for organisations such as the GDDS. Three examples of data provider governance are presented in the GREAT project's "White Paper Existing Data Provider Governance Schemes"<sup>100</sup>.

## 6.5. Use Cases and Value Creation

There are many types of data-driven business models, each varying one or more of the following factors:

1. Degree to which the data is "productised": Fully "productised" data is recommended by the Data Space Support Centre (its Blueprint includes a building block on "Data Product Development"), but even rudimentary data (for example a .CSV file, without any accompanying metadata), can be useful and valuable in the right circumstances.
2. Use of external certification or verification services. Data can be enhanced through the addition of "reputational" claims that verify or certify specific information.

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<sup>99</sup>[https://www.greatproject.eu/wp-content/uploads/2024/03/D4.1-White-Paper-Governance-of-Multi-Stakeholder-Organisations\\_webversion.pdf](https://www.greatproject.eu/wp-content/uploads/2024/03/D4.1-White-Paper-Governance-of-Multi-Stakeholder-Organisations_webversion.pdf)

<sup>100</sup>[https://www.greatproject.eu/wp-content/uploads/2024/03/D4.1-White-Paper-Existing-Data-Provider-Governance-Schemes\\_webversion.pdf](https://www.greatproject.eu/wp-content/uploads/2024/03/D4.1-White-Paper-Existing-Data-Provider-Governance-Schemes_webversion.pdf)

3. Shape of the value chain:
  - a. 1 to many (marketplace) value chains are the usual focus of data spaces.
  - b. 1 to few (closed group) value chains are more common, arising from a desire for trust in, and control by, a smaller group, as well as desire to create “club goods”<sup>101</sup> that are only available to the smaller group.
  - c. 1 to 1 value chains are common. Such 1 to 1 value chains are like messaging services and may not require all the services and functionality of a data space (e.g. there is no need for catalogues or other discovery services).
4. Form of compensation
  - a. Monetisation
  - b. Compliance and Reputational benefits
  - c. Receipt of other data or knowledge.

The governance requirements identified above enable implementation of some of these business model choices:

- Data productization is encouraged by requirement GR1.07, as well as others in this report.
- External certification and verification services are contemplated by requirement GR2.03.
- The full 1-to-many, marketplace value chain is directly enabled by the Catalogue services described in Core Services (GR2.01).
- Forms of compensation are addressed in the Data Protection Taxonomy required in GR1.01. This requirement includes specification of acceptable compensation.

To enable the full range of possible business model types, support for “1-to-few” and “1-to-1” value chains is also required. This is addressed in the following:

***GR6.01: The GDDS will enable definition of limited-access “Use Cases” within the GDDS, supporting “1-to-few” and “1-to-1” value chains. Each Use Case will be defined by a Use Case Leader (a Participant taking this role) with “administrative privileges” for the Use Case, including granting of such privileges to other Use Case Participants.***

Within the GDDS each Use Case implements a distinct business model, including mechanisms for value creation and sharing among its participants.

- For each Use Case, the Use Case Leader and other invited Participants will collectively identify the specific actors needed and desired, and the specific resources needed and desired, to implement the intended business model.
- Actors are specific participants that need to be involved, either for specific Use Cases, or overall. Needed actors are usually required to perform specific roles in each Use Case. Desired actors represent possible participants which, if they were to take advantage of the Use Case, their participation would signify high impact of the infrastructure.
- Actors that control data or services required by one or more Use Cases in turn must be identified as being needed for the infrastructure.
- Resources: Depending on the objectives of the infrastructure, various resources (data, services) may be needed/required for success, while other resources would be

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<sup>101</sup> The potential value of club goods in connection with environmentally-related data is discussed in Fritzenkotter, et al. “Club goods” are defined at [https://en.wikipedia.org/wiki/Club\\_good](https://en.wikipedia.org/wiki/Club_good).

desirable and might improve the user experience. What data sources are required? What services are required?

**GR6.02:** *For each GDDS Use Case, the Use Case Leader and other Participants with “administrative privileges” can invite desired actors to join the Use Case as Participants. Participants may agree to be onboarded to the Use Cases to which they have been invited as well as to the GDDS as a whole. Participants may select different Roles for each Use Case in which they participate, as well as different Roles in the GDDS as a whole.*

**GR6.03:** *For each GDDS Use Case, the Use Case Leader and other Participants with “administrative privileges” can invite Participants in the Use Case to onboard specific data sources, data services and other services to the Use Case. Participants may agree to onboard their resources to the Use Cases to which they have been invited as well as to the GDDS as a whole.*

**GR6.04:** *Participants in each GDDS Use Case can be identified in the GDDS’ Data Protection Taxonomy (see Requirement GR1.01) as acceptable data recipients and/or service consumers for each resource onboarded to the Use Case, limiting data transactions to other Use Case participants.*

This limitation of access allows valuable data products and services to be created and shared within the Use Case, generating value for the contributors to the value chain.

**GR6.05:** *For each GDDS Use Case, the Use Case Leader and other Participants with “administrative privileges” can agree to vary the Governance Requirements applied within the Use Case, with all such variations to be documented and transparently communicated to all Use Case Participants.*

Governance variations for specific Use Cases might include relaxing or strengthening requirements around metadata and other aspects of data “productization”. Relaxing requirements would allow participants whose data is not fully productized to still participate in the GDDS in a more limited way, increasing their experience and confidence in the GDDS. Strengthening requirements might enable more effective data interoperability and improved value creation within the scope of the Use Case.

Within the Use Case, certain monetary, quasi-monetary, and reputational mechanisms can be used to incentivize and reward desired behaviour.

## 6.6. Operations and Monitoring

Most initial design decisions are complemented by the need for operational processes to implement those decisions. This section complements any operations and monitoring requirements identified above with general operational requirements that must be supported.

**GR7.01:** *Implement Governance Tracking Processes including: Notices of meetings, advanced agendas, minute-taking in meetings, open and in camera deliberations, Formal consultation processes, properly identifying stakeholders, issues being consulted, consultation time periods, alternative modes of consultation (town halls, surveys, etc.); Follow-ups to decisions: status of implementation, measurement of results, etc.*

**GR7.02:** *Communications: Communication of decisions to stakeholders, measurement of effectiveness of the communication strategy/plan, and channels. Including: Analyse and*

***gather feedback for improvement; Tailor communication to target users; Ensure user consent and preferences are respected for the different communications channels.***

**GR7.03: Onboarding Participants:** Application of agreed inclusion criteria are likely to specify alignment of the participant with the principles and objectives of the GDDS, commitment to quality and sustainability, other assessments.

Ideally onboarding would be automated, but many dimensions of the onboarding of participants may be subjective. Automated onboarding may be possible, e.g. using verified credentials that would confirm facts about a participant such as legal status and jurisdictions of establishment, or successful certifications. Gaia-X and the DSBA present structures to support such approaches, but not every inclusion criterion can be automated.

**GR7.04: Onboarding Services & Data:** Application of agreed Inclusion criteria, such as fitness for purpose as measured by quality standards, completeness of metadata annotations, declared levels of sustainability (i.e., for how long in the future will the data provider commit to updating the data), etc.

Automated onboarding could be important for services and data since their volume will be greater than for data providers per se.

**GR7.05: Data Policy Management:** Supporting negotiation of access and use conditions consistent with stated access and use policies; enforcing agreed/negotiated access and use policies set by data holders in the context of requests/bids for data.

**GR7.06: Use Case Onboarding:** Processes for Use Cases to be proposed, considered and implemented, identifying Use Case Leaders, distinct governance requirements and other considerations for set up and operation.

**GR7.07: Use Case Support and Monitoring:** Provide selected “concierge” services within Use Cases to improve their effectiveness. Monitor Use Case participation and activity for anticompetitive behaviour.

**GR7.08: Use Case Evolution:** Track status, success and sustainability of each use case; recognize re-use of infrastructure capabilities as well as expanding the range of capabilities, including increasing the "objective level" (from Table 1) that the infrastructure supports. Identify synergies across Use Cases and assist and encourage synergistic Use Cases to merge to exploit these synergies. Assist and encourage Use Cases to increase the maturity of the data products they use and the readiness of both data products and data providers for participation in the broader GDDS.

**GR7.09: Provenance & Traceability:** tracking sources, processing, dependencies

**GR7.10: Orders/Requests for Data from “Data as a Service”.**

**GR7.11: Operate Data Transfer Service.**

**GR7.12: Transaction Logging and Usage Accounting.** Logging legally relevant transactions, including data transactions, in a secure but auditable manner, performing analysis to enable assessment of compliance and measurement of performance.

**GR7.13: Composition: Enabling workflows with multiple services and pipelines**

**GR7.14: Infrastructure Supports: orchestration of compute & storage. Ensuring orchestration services operate as needed by users, providing helpdesk support.**

**GR7.15: Value-creation events (see section 3.4.2) are recorded and tracked. Value creation is monitored, reported and evaluated; feedback is provided as appropriate; value-creation mechanisms and related monitoring processes may be modified as needed for the data space to meet its objectives. Governance processes around value creation and sharing, as well as the mechanisms included are assessed to find opportunities for improvement and innovation.**

**GR7.16: Consent Management: Managing and securing consents of data subjects (including the subjects of non-personal data)<sup>102</sup>. Decide How performance and compliance of the consent management process will be monitored and reported.**

Technical aspects: How are consents for personal data managed? How is the interaction with consent owners (e.g., persons) managed? What standards and/or solutions are used?

**GR7.17 User Requirements: Collect, validate, and prioritize user needs to be supported in the GDDS. This includes both the functionality of the GDDS and the array of services and data that are desired by users.**

**GR7.18: Concierge Services: Beyond collecting requirements from users, help them find solutions to their problems – including both resources already available in the GDDS as well as identifying new providers and resources that could be onboarded to the GDDS to help create value.**

**GR7.19 User Experience: Ensure each user's experience with the infrastructure helps achieve the objectives of the platform, contributes to the value that can be generated, and does not detract from either. The user experience should be consciously designed and assessed regularly for effectiveness.**

For example, [data.europa.eu](https://data.europa.eu) assessed its user experience and made 10 recommendations for improvement<sup>103</sup>. All recommendations impacted the design of the portal, but most also required the collection of additional information on each item of data (e.g., ethical, statistical) that translated into new metadata requirements.

**GR7.20: Innovation & Growth: Build processes that advance the maturity and capabilities of the people and systems involved in the data spaces/data space initiatives. Assess current skills sets, identify gaps and opportunities, act to fill those gaps and exploit those opportunities.**

**GR7.21: Training: e.g., improving data awareness and data literacy among stakeholders, increasing skills of stakeholders to engage with one or more data spaces/data space**

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<sup>102</sup> See [13] BO.5.3 Consent management ; TS.3.3 Data usage control solution

<sup>103</sup> European Commission. "Principles and recommendations to make data.europa.eu data more reusable". April 2022. <https://data.europa.eu/sites/default/files/report/D3-4-1-1-Strategy-Mapping-Report-v3-0.pdf>

*initiatives, working with boundary resources and actively participating in data transactions.*

**GR7.22: Compliance Monitoring and Management:** Operate compliance monitoring systems that measure compliance with agreed policies, rules and regulations established for the data space, as well as with relevant legislation (EU and member state, horizontal and sector-specific).

**GR7.23: Performance Monitoring and Management:** Measure performance against agreed indicators (KPIs), monitor trends, identify opportunities for improvement or emerging risks.

**GR7.24: Risk Monitoring and Management:** Create and maintain a register of risks related to legal compliance, stakeholder satisfaction, achievement of overall objectives. Evaluate risks to identify those likely to create significant impact on individual entities and on the GDDS more generally.

**GR7.25: Financial Sustainability:** Based on the agreed Business Model, establish ongoing processes for monitoring the performance of the data space enterprise in terms of measures of its sustainability (e.g., financial reports, impact reports, etc.). Resource initiatives to improve financial performance, capture/improve impacts, etc. as needed to achieve the sustainability objectives, including updating business plans and reporting, preparing funding proposals, etc.

## 7. Requirements alignment with the DSSC Blueprint

The DSSC released the Blueprint v1.0 on the 12 of March 2024 at the Data Spaces Symposium<sup>104</sup>. Throughout its development, the GREAT project closely monitored the progress of the DSSC Blueprint<sup>105</sup>.

The interactions and information exchange with the DSSC and other Data Spaces projects was presented in "D2.2 Interaction report with DSSC and CSA's"<sup>106</sup>. GREAT made use of the resources today presented in the Blueprint from the very early days, including the Starter Kit<sup>107</sup> and the Glossary<sup>108</sup>, the latter being adopted in GREAT and extended in the GDDS domain.

The DSSC conceptual model<sup>109</sup> reached heightened maturity in v1.0, with all its components integrated across the GDDS governance framework. As a member of the Legal and Governance Expert Teams, GREAT (represented by EGI) played a pivotal role in shaping the evolution of corresponding Building Blocks (BB). Aligning the GREAT governance framework with the DSSC BB has remained a primary objective, crucial for streamlining the deployment and operations of governance structures, supported by both the DSSC and the Data Spaces Community of Practice.

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<sup>104</sup> <https://www.data-spaces-symposium.eu>

<sup>105</sup> <https://dssc.eu/space/BVE/357073006/Data+Spaces+Blueprint+v1.0>

<sup>106</sup> [https://www.greatproject.eu/wp-content/uploads/2024/03/D2.2-Interaction-report-with-DSSC-and-CSAs\\_v1.0-1.pdf](https://www.greatproject.eu/wp-content/uploads/2024/03/D2.2-Interaction-report-with-DSSC-and-CSAs_v1.0-1.pdf)

<sup>107</sup> <https://dssc.eu/space/SK/29523973/Starter+Kit+for+Data+Space+Designers+%7C+Version+1.0+%7C+March+2023>

<sup>108</sup> <https://dssc.eu/space/BVE/357073672/DSSC+Glossary>

<sup>109</sup> <https://dssc.eu/space/BVE/357073105/Conceptual+Model+of+Data+Spaces>

Today's DSSC Building Blocks are represented by a set of Technical and Governance components<sup>110</sup>. While these are presented as two separate areas, the interrelationships between the BB are more explicitly illustrated through the Co-Creation Method<sup>111</sup>. The method represents a walkthrough the BB in the process of establishing, developing and operating a Data Space.

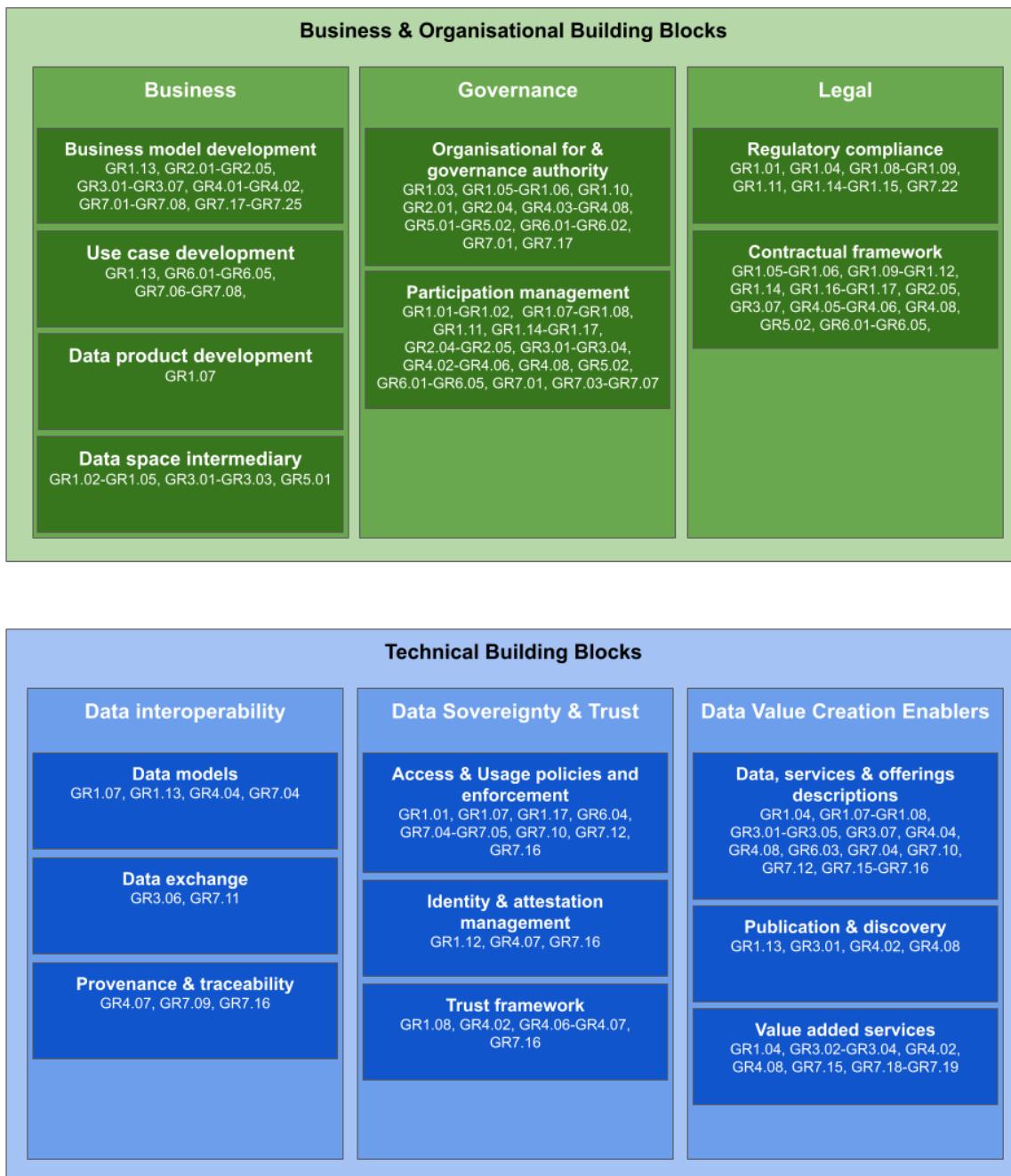
The Figure 7 represents a mapping of the GREAT requirements into the DSSC BB.

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<sup>110</sup> <https://dssc.eu/space/BVE/357073899/Building+Block+Overview>

<sup>111</sup> <https://dssc.eu/space/BVE/357076940/Co-Creation+Method>

Figure 7 GDDS requirements mapping to DSSC BB



The implementation of the GDDS will need to evolve continuously with the DSSC Blueprint and therefore an agile iterative process that accommodates and caters for change in its governance processes will be imperative.

## 8. Conclusion and Next Steps

The governance requirements proposed for the Green Deal Data Space (GDDS) in this report define:

- a framework for complying with a complicated regulatory environment,
- business models for the entities responsible for deploying the GDDS,
- mechanisms for value generation and sharing among collaborating parties,
- multi-layer governance involving overlapping sets of stakeholders,
- mechanisms to ensure trust between participants and to guarantee sovereign control of data by their holders and rights holders.

These requirements have been developed through consideration of best practices for data sharing initiatives relevant to the European Green Deal, examination of green deal use cases from across academia, the public sector and industry, and consultation with the broader green deal community of practice.

These requirements also reflect a preliminary business context proposed for the GDDS by the GREAT project, designed to achieve the objectives set for the GDDS by the European Union through the European Strategy for Data and the recent call for proposals for the GDDS' deployment. The scope of the European Green Deal, and the broad range of sectors, actors and data involved, require that this business context should be comprehensive, translating into a sophisticated mission, objectives and vision for the GDDS.

Governance is about decision-making. The governance framework proposed in this report represents a preliminary set of decisions made to set the scope and objectives of the GDDS. These preliminary decisions must be revisited in the initial stages of deployment to allow the Green Deal Community of Practice to confirm its agreement with the proposed mission, objectives and vision, creating the required consensus-based foundation for the GDDS' deployment.

In addition to this community co-creation effort, this report identifies several other “next steps” that will be critical, including:

- A progressive process for crystallizing the business model(s) of the entities required to deploy the GDDS, starting with an assessment of costs and value generated for the different value propositions fulfilled by the GDDS, experimentation with potential value generation approaches, and community confirmation of final business model(s) that will ensure sustainability.
- Rigorous evaluation of technical solutions to be adopted by the GDDS, including both SIMPL and alternative approaches if SIMPL is not yet available at the required level of maturity. Technical requirements will be defined based on governance and other requirements identified by the GREAT project, as well as additional requirements identified by the Green Deal Community of Practice
- Working with the broader Data Space Community of Practice, developing a comprehensive Data Protection Taxonomy and Data Service Vocabulary, and corresponding metadata/self-description standards, with which to annotate the data and services to be offered through the GDDS, in order to support regulatory compliance by all participants.
- Assessing the optimum form and jurisdiction in which to establish the legal governing entity for the GDDS, and for a possible dedicated entity that would operate the GDDS.

- Gaining increased clarity about the practical implications of a range of horizontal EU legislation related to data spaces and similar endeavours, including the Data Act, Data Governance Act, AI Act, as well as relevant aspects of legislation on competition and cybersecurity.

## Appendix 1: Data Space interoperability

Section 4.1.6 describes the solid European legal framework supporting the interoperability in Data Spaces as well as the solid, as well conceptual, model stemming from the European Interoperability Framework Toolbox<sup>112</sup> as described in section 3.5.6. They foster harmonization driven by the stakeholders as much as possible and give the mandate to EU, national and regional authorities to dictate interoperability policies, whenever such harmonization is not reachable.

In sections 5.6 and 6.3 the implications of implementing the required level of interoperability are described, among which the creation of an interoperability committee. Provenance and traceability are mentioned in section 6.5. This annex elaborates further on those concepts.

### Semantic and technical levels

At the technical level the GDDS will support the two approaches relying on its layered architecture (D3.1 Blueprint Architecture), where the core services will implement the semantic and technical part, which enforces intra data space and European agreements (top-down approach), while the outer layer of services federates the eco-system of data providers and consumers.

It may be useful to refer here to the Data Space Support Center's data interoperability pillar, which consists of the following building blocks<sup>113</sup>:

1. Data Models<sup>114</sup>: capabilities to define and use shared semantics in a data space.
2. Data Exchange<sup>115</sup>: capabilities relating to the actual exchange and sharing of data.
3. Provenance and traceability<sup>116</sup>: capabilities for tracking the process of data sharing, so it becomes traceable and compliant.

Points 1 and 2 are the keys to the very existence of a data space, because having those capabilities allows a data space to fulfill its main scope: creating an environment where data can be easily discovered and exchanged.

**Data Models.** The various data providers and consumers, data intermediaries, data analytics, transformation providers and so on, can share and find data only if there are registries where those data are indexed, or, better, where metadata about those data are findable. Therefore, it is necessary that those metadata that describe the data (data models) are well understood by all the participants, or, at least, by all the interested parties of a certain domain, community, or sector. This is where federation shines, because the GDDS complexity is too great to be tamed with data models common to everyone. At the same time, the GDDS registries will connect with other data space registries, so a common way, beyond the specific domains and communities, must be found. We need to agree on how to describe the registries themselves and their data models. We need "meta-metadata" in a catalogue of data models (a catalogue of

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<sup>112</sup><https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/solution/european-interoperability-framework-eif-toolbox/levels-interoperability>

<sup>113</sup> <https://dssc.eu/space/BBE/178422384/Data+interoperability>

<sup>114</sup> <https://dssc.eu/space/BBE/178422412/Data+Models>

<sup>115</sup> <https://dssc.eu/space/BBE/178422510/Data+Exchange>

<sup>116</sup> <https://dssc.eu/space/BBE/178422616/Provenance+%26+Traceability>

data models is mentioned in the Report ISO TC 211-AHG10 Input to EU Data Spaces<sup>117)</sup>. This is where the authoritative approach (top-down) is beneficial.

**Data Exchange.** The same reasoning is valid for the data exchange building block. We use the definition of the Data Space Business Alliance here4: “transport interoperability deals with data delivery (i.e. sending the data); syntactic interoperability allows reading the data in a known format and grammar; whereas semantic interoperability is responsible for the meaning, enabling the unambiguous interpretation and understanding of data”.

Even in this case, the GDDS will provide the semantic tools, such as vocabularies and ontologies, to allow the participants to interpret the metadata describing the APIs, the formats, the protocols exposed and advertised by the service providers. Besides, it will contribute to build, together with the other data spaces, a data space protocol to exchange data. The protocol should be flexible enough to support different connectors, like, for example, the smart middleware Streamlining cloud-to-edge federations for major EU data spaces (SIMPL)<sup>118</sup>. The following Figure 8 shows how the International Data Space Association conceptualises the data space protocol<sup>119</sup>.

## Dataspace Protocol V0.8

*Foundation for technical Interoperability*

INTERNATIONAL DATA SPACES ASSOCIATION

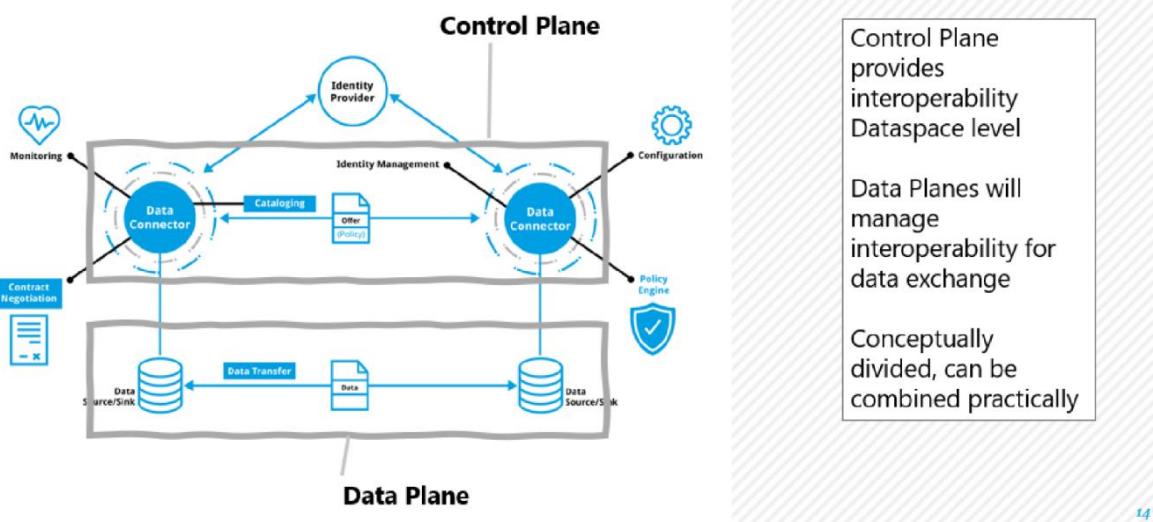


Figure 8 Data Space Protocol

**Provenance and Traceability.** Over time, the knowledge acquired by the GDDS through provenance and traceability information, could allow to build an interoperability model, which can be used to automatically map which formats and protocols are compatible with each other, or which tools can transform them to become interoperable.

But provenance and traceability capabilities are important not just for the semantic and technical levels, they are fundamental for the legal and organizational levels because they

<sup>117</sup>[https://committee.iso.org/files/live/users/fh/aj/aj/tc211contributor%40iso.org/files/EU/ISO-TC211\\_N5971.pdf](https://committee.iso.org/files/live/users/fh/aj/aj/tc211contributor%40iso.org/files/EU/ISO-TC211_N5971.pdf)

<sup>118</sup> <https://digital-strategy.ec.europa.eu/en/policies/simpl>

<sup>119</sup> <https://internationaldataspaces.org/offers/dataspace-protocol-overview/>

provide the information about the compliance with policies and regulations, especially in the case of sovereignty and trust.

### Legal and organizational level

If discovering and exchanging data are the activities at the heart of the data space, they still cannot happen without trust. Trust among the participants of the GDDS, trust between the stakeholders and the GDDS, trust between the GDDS and any external entity, such as other data spaces, infrastructures, clouds, within the EU boundaries or outside.

Data owners, providers, users need to know that their rights over the data are preserved, that, in case of a business transaction, the contract is honored, and the contractors are reliable. As mentioned before, it seems difficult to tackle the expected complexity of the data space with a monolithic solution, it is wise to devise a mix of strategies. Again, the federative approach will complement those common policies. The GDDS can, naturally, establish specific agreements of collaboration, within the EU framework, with external entities. It will provide tools for reputation management within the data space and will support any effort in that sense at EU level, to evaluate the quality of data and services provided by organizations and individuals. The identity management services of the GDDS will have to be interoperable with the other data space counterparts and a chain of trusted authorities have to be established at European level to guarantee the identity of physical persons, legal entities or just loosely coupled associations.

### Growth

Finally, as clearly described in section 3.2 about the Taxonomy of Objectives, the GDDS is expected to be an evolving platform, capable of growing over time. Any effort towards interoperability should consider that the governance policies and technical measures should grow with the platform. For example, adopting measures too stringent at the beginning could hinder participation. They should be tuned in and reviewed periodically with the clear objective of the benefit of the largest number of participants. The review process should be transparent and engage as much as possible all the stakeholders, under the supervision of the interoperability committee.

We highlight here the interoperability aspects aligned with the Taxonomy of Objectives proposed for the GDDS:

*Table 18 Interoperability aspects of the GDDS objectives*

Objective Level	Description
<b>Level 0: Presence of Many Parties, Relevant Parties</b>	Description of the roles and of the interests of the stakeholders in an interoperable way, so that they can be compared and modelled as input for the next level.
<b>Level 1: Level 0 + Broad Information sovereign resource</b>	Trust and identity interoperability layer is in place. The foundation of the legal framework to support the identity management is agreed within the data space and interoperable at EU level. Basic semantic layer: metadata models to describe the data services, APIs, protocols. Those models must be interoperable. Basic provenance and traceability: tracking transactions and data exchanges within the data space.

	First implementation of the Data Space protocol.
<b>Level 2: Level 1 + Quality</b>	Advanced semantic layer: metadata and vocabularies to define the level of quality and the level of assurance.
<b>Level 3: Level 2 + Analysis</b>	Extensions of the existing vocabularies and metadata catalogues to support data analytics tools. Extension of the Data Space protocol in terms of supported connectors: federation with computing and analytics platforms.
<b>Level 4: Level 3 + Actionable Insights</b>	Advanced provenance and traceability: interoperability with the ecosystem at large.
<b>Level 5: Level 4 + Aggregation/Analysis of impact</b>	The metadata models to collect and exchange the information related to Data Risks are available and interoperable across sectors, jurisdictions, etc.;
<b>Level 6: Level 5 + Performance Monitoring</b>	Agreement on performance and monitoring vocabularies and ontologies to compare metrics within the data space and with other data spaces.
<b>Level 7: Level 6 + Target Setting</b>	Models to describe policy templates and use cases so that forecast results are comparable.

## Appendix 2 Business Model Canvas: EMODnet Case Study

The European Marine Observation and Data Network (EMODnet)<sup>120</sup> is a European Commission *in situ* marine data service, and a flagship initiative funded by DG MARE. Complementary to Copernicus Marine Service, EMODnet is one of the main Marine Knowledge Initiatives of the European Union. EMODnet is an operational, unified and interoperable data service, providing the knowledge base for thousands of diverse users from research and academia, EU policy and national administration, the private sector and wider Blue Economy. User demand in 2023 reached 140,00 unique visits and 200,000 sessions as a result of returning customers.<sup>121</sup>

EMODnet's key assets include:

- Trusted Findable, Accessible, Interoperable and Reusable (FAIR) pan-European data layers from the marine environmental and human activities domains published with associated metadata, aggregated from Europe's diverse *in situ* ocean observation capability and key actors in the marine data pipeline;
- Open marine data products, metadata and services produced for European regional seas and beyond, many of which are unique EU assets in terms of coverage and resolution e.g., the EUSeaMap broad-scale seabed habitat map, EU Digital Terrain Model for harmonised bathymetry, pan-European Marine Litter Database, Vessel Density composite maps, etc.<sup>122</sup>

All EMODnet services are available for free and public use via the EMODnet Portal, which offers a central Map Viewer and common metadata catalogue for Data Discovery, Access, Visualisation and Download, in addition to data and web services, tools and guidelines.

<sup>120</sup> [Home | European Marine Observation and Data Network \(EMODnet\) \(europa.eu\)](https://emodnet.ec.europa.eu/)

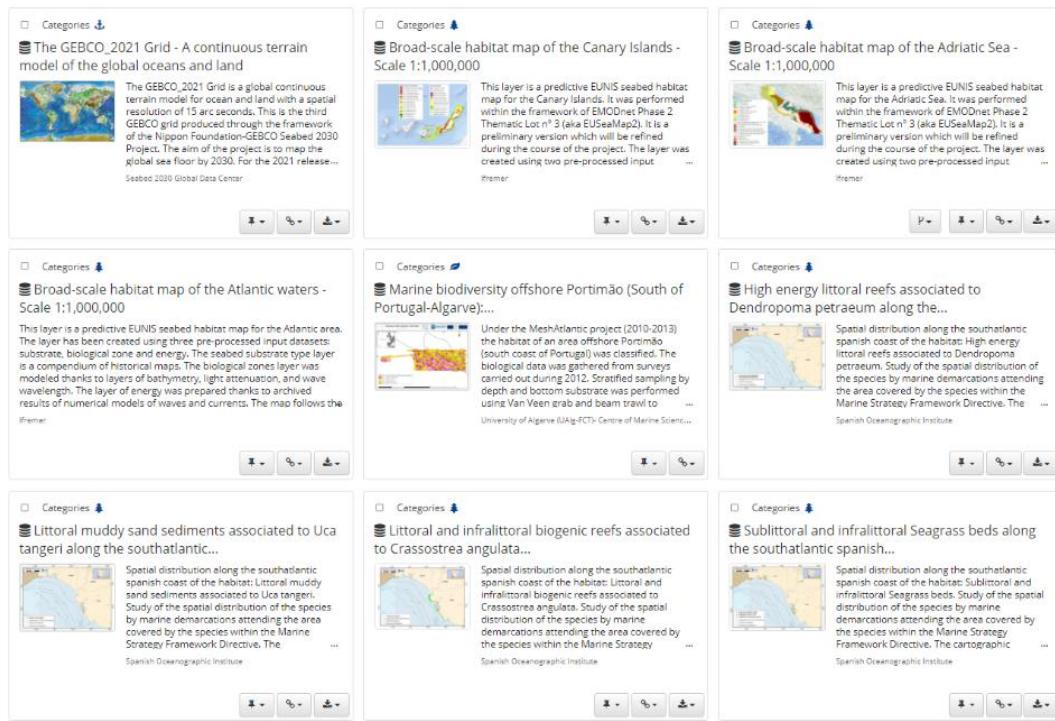
<sup>121</sup> <https://emodnet.ec.europa.eu/en/emodnet-2024-powering-marine-knowledge-digital-and-green-future>

<sup>122</sup> Questionnaire and inputs from EMODnet Secretariat, 2024

EMODnet promotes the "collect once and use many times" philosophy amongst marine data producers and data users and is aligned with the Open Data Strategy, INSPIRE Directive and Digital Strategy for Europe. EMODnet is delivered by a large network of >140 organizations supported by the European Maritime, Fisheries and Aquaculture Fund. This network includes marine data experts in seven broad thematic areas, namely bathymetry, biology, chemistry, geology, human activities, physics and seabed habitats, plus experts in data sharing and data ingestion.<sup>123</sup>

One of the main drivers behind the creation of the network is that marine data collection, storage and access in Europe has been carried out in a fragmented way for many years with most data collection focused on meeting the needs of a single purpose by a wide range of private and public organizations. Every year, the EU and its Member States invest a huge amount in marine observation and data collection. Most of this data ends up in different databases and systems scattered around Europe and is difficult to find, access, assemble and use.<sup>124</sup>

A centralization of EMODnet services in January 2022 enabled a more seamless user experience. It has also enabled EMODnet's key contribution to the European Digital Twin of the Ocean, in collaboration Copernicus Marine Service, via the EDITO infrastructure project<sup>125</sup>



The screenshot shows the EMODnet Data Product Catalogue interface. It displays eight data products in a grid format:

- Category:** Categories
- Title:** The GEBCO\_2021 Grid - A continuous terrain model of the global oceans and land
- Description:** The GEBCO\_2021 Grid is a global continuous terrain model for ocean and land with a spatial resolution of 15 arc seconds. This is the third GEBCO grid produced through the framework of the Nippon Foundation-GEBCO Seabed 2030 Project. The aim of the project is to map the global sea floor by 2030. For the 2021 release...
- Thumbnail:** A world map showing the GEBCO\_2021 Grid.
- Detailed Description:** This layer is a predictive EUNIS seabed habitat map for the global oceans and land. It was created using three pre-processed input datasets: substrate, biological zone and energy. The seabed substrate type layer is a compendium of historical maps. The biological zones layer was modeled thanks to layers of bathymetry, light attenuation, and wave wavelength. The layer of energy was prepared thanks to archived results of numerical models of waves and currents. The map follows the IHO S-22 standard.
- Source:** Seabed 2030 Global Data Center
- Actions:** Filter, Sort, Details, Download

**Category:** Categories

**Title:** Broad-scale habitat map of the Canary Islands - Scale 1:1,000,000

**Description:** This layer is a predictive EUNIS seabed habitat map for the Canary Islands. It was performed within the framework of EMODnet Phase 2 Thematic Lot n° 3 (aka EUSeaMap2). It is a preliminary version which will be refined during the course of the project. The layer was created using two pre-processed input...

**Thumbnail:** A map of the Canary Islands showing the habitat distribution.

**Detailed Description:** This layer is a predictive EUNIS seabed habitat map for the Canary Islands. It was performed within the framework of EMODnet Phase 2 Thematic Lot n° 3 (aka EUSeaMap2). It is a preliminary version which will be refined during the course of the project. The layer was created using two pre-processed input...

**Source:** Ifremer

**Actions:** Filter, Sort, Details, Download

**Category:** Categories

**Title:** Broad-scale habitat map of the Adriatic Sea - Scale 1:1,000,000

**Description:** This layer is a predictive EUNIS seabed habitat map for the Adriatic Sea. It was performed within the framework of EMODnet Phase 2 Thematic Lot n° 3 (aka EUSeaMap2). It is a preliminary version which will be refined during the course of the project. The layer was created using two pre-processed input...

**Thumbnail:** A map of the Adriatic Sea showing the habitat distribution.

**Detailed Description:** This layer is a predictive EUNIS seabed habitat map for the Adriatic Sea. It was performed within the framework of EMODnet Phase 2 Thematic Lot n° 3 (aka EUSeaMap2). It is a preliminary version which will be refined during the course of the project. The layer was created using two pre-processed input...

**Source:** Ifremer

**Actions:** Filter, Sort, Details, Download

**Category:** Categories

**Title:** Broad-scale habitat map of the Atlantic waters - Scale 1:1,000,000

**Description:** This layer is a predictive EUNIS seabed habitat map for the Atlantic area. The layer has been created using three pre-processed input datasets: substrate, biological zone and energy. The seabed substrate type layer is a compendium of historical maps. The biological zones layer was modeled thanks to layers of bathymetry, light attenuation, and wave wavelength. The layer of energy was prepared thanks to archived results of numerical models of waves and currents. The map follows the IHO S-22 standard.

**Thumbnail:** A map of the Atlantic waters showing the habitat distribution.

**Detailed Description:** This layer is a predictive EUNIS seabed habitat map for the Atlantic area. The layer has been created using three pre-processed input datasets: substrate, biological zone and energy. The seabed substrate type layer is a compendium of historical maps. The biological zones layer was modeled thanks to layers of bathymetry, light attenuation, and wave wavelength. The layer of energy was prepared thanks to archived results of numerical models of waves and currents. The map follows the IHO S-22 standard.

**Source:** Ifremer

**Actions:** Filter, Sort, Details, Download

**Category:** Categories

**Title:** Marine biodiversity offshore Portimão (South of Portugal-Algarve)...

**Description:** Under the Mesh-Atlantic project (2010-2013) the habitat of an area offshore Portimão (south coast of Portugal) was classified. The biological data was gathered from surveys carried out during 2012. Stratified sampling by depth and bottom substrate was performed using Van Veen grab and beam trawl to...

**Thumbnail:** A map of the offshore area around Portimão showing marine biodiversity.

**Detailed Description:** Under the Mesh-Atlantic project (2010-2013) the habitat of an area offshore Portimão (south coast of Portugal) was classified. The biological data was gathered from surveys carried out during 2012. Stratified sampling by depth and bottom substrate was performed using Van Veen grab and beam trawl to...

**Source:** University of Algarve (UAlg-IFCT)- Centre of Marine Sciences

**Actions:** Filter, Sort, Details, Download

**Category:** Categories

**Title:** High energy littoral reefs associated to Dendropoma petraeum along the...

**Description:** Spatial distribution along the southatlantic spanish coast of the habitat: High energy littoral reefs associated to Dendropoma petraeum. Study of the spatial distribution of the species by marine demarcations attending the area covered by the species within the Marine Strategy Framework Directive. The...

**Thumbnail:** A map of the southatlantic spanish coast showing high energy littoral reefs.

**Detailed Description:** Spatial distribution along the southatlantic spanish coast of the habitat: High energy littoral reefs associated to Dendropoma petraeum. Study of the spatial distribution of the species by marine demarcations attending the area covered by the species within the Marine Strategy Framework Directive. The...

**Source:** Spanish Oceanographic Institute

**Actions:** Filter, Sort, Details, Download

**Category:** Categories

**Title:** Littoral muddy sand sediments associated to Uca tangeri along the southatlantic...

**Description:** Spatial distribution along the southatlantic spanish coast of the habitat: Littoral muddy sand sediments associated to Uca tangeri. Study of the spatial distribution of the species by marine demarcations attending the area covered by the species within the Marine Strategy Framework Directive. The...

**Thumbnail:** A map of the southatlantic spanish coast showing littoral muddy sand sediments.

**Detailed Description:** Spatial distribution along the southatlantic spanish coast of the habitat: Littoral muddy sand sediments associated to Uca tangeri. Study of the spatial distribution of the species by marine demarcations attending the area covered by the species within the Marine Strategy Framework Directive. The...

**Source:** Spanish Oceanographic Institute

**Actions:** Filter, Sort, Details, Download

**Category:** Categories

**Title:** Littoral and infralittoral biogenic reefs associated to Crassostrea angulata...

**Description:** Spatial distribution along the southatlantic spanish coast of the habitat: Littoral and infralittoral biogenic reefs associated to Crassostrea angulata. Study of the spatial distribution of the species by marine demarcations attending the area covered by the species within the Marine Strategy...

**Thumbnail:** A map of the southatlantic spanish coast showing littoral and infralittoral biogenic reefs.

**Detailed Description:** Spatial distribution along the southatlantic spanish coast of the habitat: Littoral and infralittoral biogenic reefs associated to Crassostrea angulata. Study of the spatial distribution of the species by marine demarcations attending the area covered by the species within the Marine Strategy...

**Source:** Spanish Oceanographic Institute

**Actions:** Filter, Sort, Details, Download

**Category:** Categories

**Title:** Sublittoral and infralittoral Seagrass beds along the southatlantic spanish...

**Description:** Spatial distribution along the southatlantic spanish coast of the habitat: Sublittoral and infralittoral Seagrass beds. Study of the spatial distribution of the species by marine demarcations attending the area covered by the species within the Marine Strategy Framework Directive. The...

**Thumbnail:** A map of the southatlantic spanish coast showing sublittoral and infralittoral Seagrass beds.

**Detailed Description:** Spatial distribution along the southatlantic spanish coast of the habitat: Sublittoral and infralittoral Seagrass beds. Study of the spatial distribution of the species by marine demarcations attending the area covered by the species within the Marine Strategy Framework Directive. The...

**Source:** Spanish Oceanographic Institute

**Actions:** Filter, Sort, Details, Download

Figure 9 EMODnet Data Product Catalogue

<sup>123</sup> The original data remains the property of the organization who collected them or commissioned them, and this is acknowledged in EMODnet's metadata, together with the data license for each dataset which is as open as possible, as closed as necessary with most data providers – particularly in the public sector – accepting to make their data openly available for use, usually under no or minimum restrictions. All EMODnet data products are property of the EU (funded directly by EMODnet) and for this reason these are all open access according the CC BY 4.0 license.

<sup>124</sup> [https://emodnet.ec.europa.eu/en/about\\_emodnet](https://emodnet.ec.europa.eu/en/about_emodnet)

<sup>125</sup> <https://emodnet.ec.europa.eu/en/emodnets-pivotal-role-boosting-eu-dto-through-edito-infra>

## Why was EMODnet chosen as a case study?

EMODnet is the focal point in Europe for in situ marine data, harvesting and aggregating data from National, Regional and European efforts. As such EMODnet is an existing model of data sharing, as an EU open marine data repository, with the added value of pan-European data and data products offered via data and web services. To this end, EMODnet plays an integral role in the European marine data space and as a key marine infrastructure contributor to the European Digital Twin Ocean and the European Green Deal Data Space.

EMODnet is an example of an open data repository in which third party users leverage this data to gain insights or develop new products or services. Many governments are creating or contributing to open data repositories in the EU and beyond.<sup>126</sup> While EMODnet is not a data space, data spaces are still in the early stages of research and development and piloting, therefore full-production examples are not readily available to analyse.<sup>127</sup> Unlike the other case study developed in this report, the CO2 DataHub, EMODnet is a publicly owned and driven data ecosystem with no current mandate for profit generation. Therefore, it provides a useful point of comparison.

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<sup>126</sup> [https://data.europa.eu/sites/default/files/odm2023\\_report.pdf](https://data.europa.eu/sites/default/files/odm2023_report.pdf)

<sup>127</sup> <https://joinup.ec.europa.eu/collection/semic-support-centre/data-spaces>

## Green Deal Data Space Business Model Canvas: EMODnet

Key Partners	Key Activities	Value Proposition Data Users	Customer Relationship	Customer Segments
Key Resources		Data providers	Channels	
Cost Structure	Revenue Streams		Social, environmental and economic benefits	Social, environmental and economic benefits
<p>European Commission Services e.g., DG ENV</p> <p>Advisory Bodies e.g., Marine Knowledge Expert Group</p> <p>Associated partners (many of which are data providers) e.g., hydrographic offices</p> <p>European and International Data Initiatives e.g., the Marine Environment Monitoring Service</p>	<p>Technical e.g., operating EMODnet central portal</p> <p>Functional e.g., data management and cataloguing</p> <p>Operational e.g., monitoring portal usage</p> <p>Legal e.g., MoUs with partners</p> <p>Physical e.g., office space</p> <p>Human e.g., partner management</p> <p>Technical e.g., federated data infrastructure</p> <p>Financial e.g., funding through EC DG MARE</p>	<ul style="list-style-type: none"> <li>- Free unrestricted access to reliable in situ marine data and data products</li> <li>- Reduces operational costs and ease of accessing a broad range of marine data</li> <li>- Data can be used for research, planning, studies, product and service development etc.</li> </ul> <p>Data providers</p> <ul style="list-style-type: none"> <li>- Adding value to their own data sets</li> <li>- Satisfying funding requirements</li> <li>- Safeguarding data</li> <li>- Preventing duplication of effort</li> <li>- Compliance</li> <li>- Acknowledgement and brand profile</li> </ul>	<p>EMODnet thematic groups</p> <p>Engaged community of practice of data providers and users</p> <p>EMODnet Portal e.g., visualizing (map viewer), searching (metadata catalogue)</p> <p>Global ocean data and metadata catalogues e.g., IOC-UNESCO</p>	<p>Research and academia (approx. 50% of EMODNET users)</p> <p>Public bodies (approx. 20% of users)</p> <p>Private companies (approx. 30% of users) including a range of SMEs</p>
<p>Central services e.g., data ingestion</p> <p>Studies e.g., ocean data knowledge for policy making</p> <p>Sea basin checkpoints (assessing data products)</p> <p>Operating thematic groups</p>	<p>EC DG MARE with funding through the European Maritime and Aquaculture Fund</p> <p>There are no fees to access or download the data</p>	<p>Economic e.g., stimulating research and innovation</p> <p>Social e.g., job creation and participation in governance</p> <p>Environmental e.g., climate change mitigation activities</p>	<p>Economic costs e.g., limited cost of improving data quality for public bodies</p> <p>Environmental and social cost e.g., socio-environmental footprint of Secretariat operations e.g., office space and IT</p>	

## EMODnet Business Model Canvas

### Value Proposition:

As in all data ecosystems, cooperatives and data spaces, the role of data user and data supplier is not clear cut and one organization or individual can fall into both categories; for example, a university research department can share its data sets with EMODnet and also consume its data products and services. For example, Copernicus Marine Service – which has an MoU with EMODnet – uses EMODnet data to validate satellite-derived data and as an input to forecast modelling. In turn, some Copernicus Marine Service model outputs are used by EMODnet.

The value proposition for EMODnet for **data users** is access to free, unrestricted access to insitu marine data and data products in order to serve the future needs of all marine and maritime sectors as a critical marine service. A study by the United States National Oceanic and Atmospheric Administration (NOAA) estimates that having a fragmented, as opposed to an integrated marine infrastructure adds an additional burden of 25% to any data processing operation.<sup>128</sup>

EMODnet data sets span over seven discipline-based themes including, *inter alia*, biology, chemistry, biology, human activities, and seabed habitats. For each of these themes, EMODnet has created a gateway to a range of data archives managed by local, national, regional and international organizations. Through these gateways, users have access to standardized observations, data quality indicators and processed data products, such as basin-scale maps. EMODnet also has a portal for users with a map viewer and other data products. An additional value proposition, currently being developed is the EDITO, marine digital twin with a comprehensive data lake bringing together EMODnet and Copernicus Marine products.<sup>129</sup>

Access to this data can be an input into organizations' research and development as well as a means to create new value-added services. For example, SMEs can leverage this data to create new services and innovations – in fact, the EMODnet hosts hackathons for this purpose.<sup>130</sup> Better access to data also creates the opportunity for greater collaborative research, including for improved forecasts of the behavior of the seas. Finally, EMODnet enables data users to monitor and report on national and international regulations and treaties, take for example the Convention on the Protection of the Marine Environment of the Baltic Sea Area (The Helsinki Convention).<sup>131</sup>

The value proposition for EMODnet **data suppliers** include:

- *Adding value to their own data:* Making data available allows datasets to be combined to create data products, such as digital terrain models. Underlying data sources are always acknowledged. Exposing data to other potential users, inside or outside the organization can help to detect errors in the datasets and ultimately improve their quality.
- *Satisfying funding requirements:* increasingly funding bodies and governments require that data obtained using public funds be made open access. Submitting data and making it available via EMODnet ensures data is publicly shared for maximum re-use.

<sup>128</sup> [https://maritime-forum.ec.europa.eu/contents/costs-and-benefits-emodnet\\_en](https://maritime-forum.ec.europa.eu/contents/costs-and-benefits-emodnet_en)

<sup>129</sup> <https://emodnet.ec.europa.eu/en/emodnets-pivotal-role-boosting-eu-dto-through-edito-infra>

<sup>130</sup> <https://emodnet.ec.europa.eu/en/emodnet-open-sea-lab-30-hackathon>

<sup>131</sup> [The Helsinki Convention – HELCOM](#)

- *Safeguarding data:* submitting data to EMODnet can ensure the longevity of the data set.
- *Preventing duplication of effort:* Making a data set visible via EMODnet prevents unnecessary duplication of effort, reducing costs for operators and environmental impact.
- *Compliance:* In some cases, EMODnet can help data providers to comply with legal requirements to share data in a certain way (e.g. INSPIRE<sup>132</sup> or High Value Data Sets)<sup>133</sup>
- *Acknowledgement and Brand Profile:* EMODnet ensures that sources of data are properly acknowledged. Data owners can benefit from greater visibility and recognition. For example, scientists who share their data, for example, have increased citation rates.<sup>134</sup>

A common value proposition for data providers and users is the reliability of the service. "In order for data providers and users to invest time in both using and contributing to any data provision service, they have to trust the reliability of the service... EMODnet has gained this trust."<sup>135</sup>

#### **Customer Segments:**

*Research and Academia:* Researchers and academics make up about 50% of EMODnet users. Some of the main reported applications include development of, validation of, or comparison with other data or models of all kinds (species distribution modeling, wave modeling, tsunami modeling etc); input data for research papers, MSC theses and PhD dissertations.<sup>136</sup> For example, Cyprus Subsea Consulting and Services (CSCS (blending academic and technical expertise) specialized in marine robotics and autonomous systems. CSCS relies on the access of ocean observations of known quality from the EMODnet Physics thematic area to plan glider missions. EMODnet data is combined with modelling and remote sensing data from other sources such as Copernicus Marine Service.<sup>137</sup>

*Public Bodies:* Government and public administration make up approximately 20% of users. For example, Frontex is the European Border and Coast Guard Agency, and it promotes, coordinates and develops European border management in line with the EU Charter of Fundamental Rights. Frontex regularly uses EMODnet Human Activities' vessel density maps, a data product showing the distribution of ships based on the instantaneous number of vessels per square kilometer in a month.<sup>138</sup>

*Private Companies:* Private companies make up approximately 30% of users. Among business users, developers of offshore wind projects and companies laying cables and pipelines clearly stand out as the most recurring users. They make use of EMODnet data mainly in the

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<sup>132</sup> [https://knowledge-base.inspire.ec.europa.eu/index\\_en](https://knowledge-base.inspire.ec.europa.eu/index_en)

<sup>133</sup> <https://digital-strategy.ec.europa.eu/en/policies/legislation-open-data>

<sup>134</sup> Piwowar and Vision, 2013, <https://peerj.com/articles/175/>

<sup>135</sup> Frontiers | The European Marine Observation and Data Network (EMODnet): Visions and Roles of the Gateway to Marine Data in Europe ([frontiersin.org](http://frontiersin.org))

<sup>136</sup> Frontiers | The European Marine Observation and Data Network (EMODnet): Visions and Roles of the Gateway to Marine Data in Europe ([frontiersin.org](http://frontiersin.org))

<sup>137</sup> EMODNet AnnualReport2022\_June2023\_FINAL.pdf ([europa.eu](http://europa.eu))

<sup>138</sup> EMODNet AnnualReport2022\_June2023\_FINAL.pdf ([europa.eu](http://europa.eu))

preliminary phases of their projects when screening potential areas that may be suitable for their activities.<sup>139</sup>

Miguez et al. note in their research that EMODnet has "transformed over the years from a bottom-up initiative developed largely from data provider communities to a more user-oriented service." Through the identification of stakeholders and uses cases and the engagement of stakeholders the secretariat has been able to work towards essential products and services for different domains and industries.

#### **Customer Relationship:**

The EMODnet Secretariat has created a strong and engaged community of practice of data providers and data users. As noted by Miguez et al. "It has done much more than providing access to data, meta data and products. It has created a network and community of experts and specialists working to promote the development and adoption of standards, sharing best practices, and technical solutions to promote integration and interoperability between various systems."

It is actively looking to grow its ecosystem. In a dedicated effort since 2022, all EMODnet thematic assembly groups, e.g. biology and chemistry, are systematically extending their geographic coverage and resolution of integrated marine environmental and human activities data and data products to neighbouring countries around the Caspian Sea and to the Caribbean Sea. EMODNet is also growing the international user based on Africa to China.<sup>140</sup>

#### **Channels:**

End-users visit and interact with the EMODnet Portal (<https://emodnet.ec.europa.eu/en>) in various ways: (i) reading information including news, use cases, communication material, etc.; (ii) visualising (map viewer), searching (metadata catalogue), accessing and downloading data and data products through various ways e.g. file download, web services, ERDDAP (see line 26); (iii) users can subscribe to the monthly EMODnet newsletter to stay informed; (iv) there's a contact form leading to a helpdesk; (v) a voluntary short user survey is available on the website to enquire about user experience with the EMODnet website and services. The EMODnet Secretariat notes that the EMODnet Portal is updated continuously, and that user friendliness and experience are the highest priority.<sup>141</sup>

The EMODnet service is now also connected to global ocean data and metadata catalogues and initiatives such as the IODE of IOC-UNESCO Ocean Data and Information System (ODIS). Further, workshops are also used to engage with stakeholders to increase and encourage use, collect feedback and identify opportunities and needs for further product developments.<sup>142</sup>

#### **Key Partners:**

EMODnet has over 120 partner organizations.<sup>143</sup> It is composed of "inner layers" as well as a broader ecosystem.

The EMODnet ecosystem is composed of several "inner layers" with DG MARE at its core with CINEA as Contracting Authority and the support from the EMODnet Secretariat for

<sup>139</sup> [EMODnet AnnualReport2022\\_June2023\\_FINAL.pdf \(europa.eu\)](#)

<sup>140</sup> [https://emodnet.ec.europa.eu/sites/emodnet.ec.europa.eu/files/public/EMODnet\\_AnnualReport2022\\_June2023\\_FINAL.pdf](https://emodnet.ec.europa.eu/sites/emodnet.ec.europa.eu/files/public/EMODnet_AnnualReport2022_June2023_FINAL.pdf)

<sup>141</sup> Questionnaire completed by EMODnet Secretariat, 2024

<sup>142</sup> [Frontiers | The European Marine Observation and Data Network \(EMODnet\): Visions and Roles of the Gateway to Marine Data in Europe \(frontiersin.org\)](#)

<sup>143</sup> [https://emodnet.ec.europa.eu/sites/emodnet.ec.europa.eu/files/public/EMODnet\\_AnnualReport2022\\_June2023\\_FINAL.pdf](https://emodnet.ec.europa.eu/sites/emodnet.ec.europa.eu/files/public/EMODnet_AnnualReport2022_June2023_FINAL.pdf)

implementation. The governance layer consists of (i) the EMODnet Steering Committee comprising DG MARE, CINEA, the Secretariat, the EMODnet (thematic and data ingestion) project coordinators and a number of representatives from other Commission Services and agencies (e.g. DG DEFIS, DG ENV, DG RTD, ...); (ii) the European Commission (EC) Marine Knowledge Expert Group (MKEG) as an independent advisory body; (ii) and an external partner network.<sup>144</sup>

In terms of "external layers", EMODnet has a large ecosystem of partners, including data providers and users. These span organizations and experts involved in in situ marine data collection, data management and service provision spanning research institutes and associations, universities, hydrographic offices, national data centres, private companies and more.<sup>145</sup> In terms of data providers, EMODnet has a program for "associated partners" which can join EMODnet's network without heavy administrative or contractual agreements.<sup>146</sup> Estimates indicate that EU Member states are spending more than €1 billion a year in public money collecting, archiving and distributing marine data while European private companies are spending more: at least €3 billion per year. This highlights the scale of the activity and data ecosystem.<sup>147</sup>

EMODnet collaborates with a large number of other European and international data initiatives including the Copernicus Programme, in particular the Marine Environment Monitoring Service (Mercator Ocean International), the International Council for the Exploration of the Sea (ICES), the Global Earth Observation System of Systems (GEOSS), the International Oceanographic Data and Information Exchange (IODE) of the Intergovernmental Oceanographic Commission (IOC), and the National Marine Data and Information Service (China) through EMODPACE (EMODnet Partnership for China and Europe).<sup>148</sup> EMODnet also works together with the European Marine Board; the Board supports the EMODnet Secretariat in European Ocean Observing activities and interactions with ecosystem stakeholders.<sup>149</sup>

#### **Key Activities:**

*Technical:* EMODnet offers a fully public EMODnet Central Portal where all EMODnet data and data products can be sourced using the open and free data and web services. The Secretariat also partners with other organizations for the development of products; for example, it partners with Bilobomatica for the development of the European Atlas of the Sea.<sup>150</sup>

*Functional:* EMODnet thematic partners aggregate and harmonize multi-parameter datasets; make data available with searchable metadata as downloadable datasets and/or map layers or through web services (OGC).

*Operational:* EMODnet monitors portal usage and overall progress, supports communication, dissemination of information and outreach, collects feedback from EMODnet users, supports the governance of EMODnet and provides guidance and support to data holders to assist them in releasing their data for subsequent processing and quality control and ultimately publishing as open data.<sup>151</sup> EMODnet also runs Sea-basin check points to assess the quality of the current

<sup>144</sup> Questionnaire completed by EMODnet Secretariat, 2024

<sup>145</sup> [https://emodnet.ec.europa.eu/sites/emodnet.ec.europa.eu/files/public/EMODnet\\_AnnualReport2022\\_June2023\\_FINAL.pdf](https://emodnet.ec.europa.eu/sites/emodnet.ec.europa.eu/files/public/EMODnet_AnnualReport2022_June2023_FINAL.pdf)

<sup>146</sup> [https://emodnet.ec.europa.eu/sites/emodnet.ec.europa.eu/files/public/PDF/TOR\\_AssociatedPartnershipScheme.pdf](https://emodnet.ec.europa.eu/sites/emodnet.ec.europa.eu/files/public/PDF/TOR_AssociatedPartnershipScheme.pdf)

<sup>147</sup> [Evaluation of the European Marine Observation and Data Network \(EMODnet\) - Publications Office of the EU \(europa.eu\)](https://ec.europa.eu/eurostat/documents/eurostat-newsroom/2023/10/evaluation-of-the-european-marine-observation-and-data-network-emodnet-publications-office-of-the-eu_en.htm)

<sup>148</sup> [Project Partners List | European Marine Observation and Data Network \(EMODnet\) \(europa.eu\)](https://emodnet.ec.europa.eu/en/emodnet-secretariat)

<sup>149</sup> <https://emodnet.ec.europa.eu/en/emodnet-secretariat>

<sup>150</sup> <https://emodnet.ec.europa.eu/en/emodnet-secretariat>

<sup>151</sup> <https://emodnet.ec.europa.eu/en/emodnet-secretariat>

observation monitoring data across different geographic areas such as the Atlantic, Baltic Sea, Black Sea etc.<sup>152</sup>

**Business:** While EMODnet is not a commercial operation, a crucial activity for the data network is stakeholder and partner management and recruitment. EMODnet Secretariat has to recruit, retain and manage this partner network. It has an application and review process to onboard new associated partners.<sup>153</sup>

**Legal:** EMODnet has contractual partners, primarily for contracts for seven thematic data assembly activities and data ingestion activities. However, the majority of partners do not require a legal contract for onboarding due to the associated partner program.<sup>154</sup>

#### **Key Resources:**

**Physical:** EMODnet Secretariat has physical offices at the European Marine Observation and Data Network InnovOcean site in Belgium. It is co-located with other influential organizations such as the Flanders Marine Institute, European Marine Board, and the IODE project office for IOC/UNESCO.

**Human:** The EMODnet has a core Secretariat includes a head of the secretariat, technical coordinate, marine data analyst, project managers and communications and partnership officers. As noted in the partnership EMODnet also relies on "inner layers" of partners from other Commission Services and agencies (e.g. DG DEFIS, DG ENV, DG RTD).

**Technical:** As well as the technical skills required (listed under human resources) EMODnet's technical resources include: (i) the EMODnet Central Portal where all data, data products can be sourced. The federated data infrastructure is dependent on the use of web services (OGC:WMS, WFS, WMTS, CSW) and restful web services. (ii) the EMODnet Map Viewer/Geoviewer; the Searchable EMODnet Products catalogue and the EMODnet server providing data query and download functionality. The data products are stored in repositories across Europe, accessible through machine-to-machine communication and available to download.<sup>155</sup>

**Financial:** EMODnet is funded through EC DG MARE with funding through the European Maritime Fisheries and Aquaculture Fund for the seven thematics, data ingestion, Central Portal and Secretariat. Table x provides an overview of the budget commitments made to EMODnet running from 2008 through to 2022 (the latest annual report published).

#### **Cost Structure:**

As per the budget outlined in Table 19, the main costs for running the EMODnet data ecosystem include, inter alia, central services (including data ingestion; and operating the Secretariat); sea basin check points (see activities section), studies, and operating the thematic groups.

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<sup>152</sup> <https://emodnet.ec.europa.eu/en/checkpoints#:~:text=Sea%2Dbasin%20Checkpoints,-Between%202013%20and&text=By%20testing%20the%20data%20against,as%20significant%20bottlenecks%20were%20highlighed.>

<sup>153</sup> [https://emodnet.ec.europa.eu/sites/emodnet.ec.europa.eu/files/public/PDF/TOR\\_AssociatedPartnershipScheme.pdf](https://emodnet.ec.europa.eu/sites/emodnet.ec.europa.eu/files/public/PDF/TOR_AssociatedPartnershipScheme.pdf)

<sup>154</sup> [https://emodnet.ec.europa.eu/sites/emodnet.ec.europa.eu/files/public/PDF/TOR\\_AssociatedPartnershipScheme.pdf](https://emodnet.ec.europa.eu/sites/emodnet.ec.europa.eu/files/public/PDF/TOR_AssociatedPartnershipScheme.pdf)

<sup>155</sup> Questionnaire completed by EMODnet Secretariat, 2024

### Revenue Streams:

EMODnet is funded through EC DG MARE with funding through the European Maritime Fisheries and Aquaculture Fund for the seven thematics, data ingestion, Central Portal and Secretariat. The service is run by consortia that receive interim payments from the commission. There are no fees to access or download the data. Funding is sustained due to the role of EMODnet in supporting the EU's integrated maritime policy as well as other EU priorities such as the EU Green Deal and Digital Agenda. EMODnet notes that its main risk is unstained funding.<sup>156</sup>

EMODnet relies on the strength of its partners, assembling data in cooperation and coordination with existing programs and projects with major input from regional and national stakeholders. These long-term initiatives and operations tend to be in line with national strategies related to the marine environment and well-funded. As noted by Miguez et al. "By building upon these existing initiatives and developing beneficial partnerships, EMODnet has ensured an optimization of resources."

Table 19: EMODnet Budget Overview

### Budget

The figures below represent the budget committed in thousands of Euro.

Theme & Project	Preparatory Actions <sup>1</sup>	Maritime Policy Fund <sup>2</sup>	European Maritime and Fisheries Fund <sup>3</sup>							European Maritime, Fisheries and Aquaculture Fund <sup>4</sup>	Grand Total (k€)	
	2008-2010 (k€)	2011-2013 (k€)	2014 (k€)	2015 (k€)	2016 (k€)	2017 (k€)	2018 (k€)	2019 (k€)	2020 (k€)	2021 (k€)	2022 (k€)	
<b>Central services</b>		520		4,565	155	1,420	1,000	1,420	138	2,665		11,883
Data Ingestion				4,045			1,000			1,340		6,385
Secretariat		520		520		1,420		1,420	138	1,325		5,343
Secretariat Support					155							155
<b>Sea-basin Checkpoints</b>		1,695	4,175									5,870
Arctic			906									906
Atlantic			1,590									1,590
Baltic Sea			784									784
Black Sea			895									895
Mediterranean		1,095										1,095
North Sea		600										600
<b>Observation</b>				4,000								4,000
Argo				4,000								4,000
<b>Studies</b>	230	450			52	250				300		1,282
Costs and benefits		450										450
Current status	230											230
Evaluation					250							250
Observationbenefits					52							52
Ocean data and knowledge for EU policy making										300		300
<b>Thematic Groups</b>	6,350	16,350	1,194	4,917	13,483	7,098	4,671	5,737	7,074	4,237	6,810	77,921
Bathymetry	2,175	2,000		4,917		3,720		2,800		2,800		18,412
Biology	750	1,700			1,770	1,770		1,500			2,000	9,490
Chemistry	700	4,000			2,805		1,399		2,234			11,138
Coastal mapping			1,194									1,194
Geology	925	4,200			4,500		1,770		2,420		2,420	16,235
Human Activities		2,060			1,608	1,608		1,437		1,437		8,150
Physics	1,000	1,000			1,400		950		1,050		1,020	6,420
Seabed Habitats	800	1,390			1,400		552		1,370		1,370	6,882
<b>Grand Total (k€)</b>	<b>6,580</b>	<b>19,015</b>	<b>5,369</b>	<b>13,482</b>	<b>13,690</b>	<b>8,768</b>	<b>5,671</b>	<b>7,157</b>	<b>7,212</b>	<b>6,902</b>	<b>7,110</b>	<b>100,956</b>

Source: EMODnet annual report, 2024

### Social, Environmental, and Economic Benefits:

The ultimate goal of EMODnet is to improve accessibility of marine data to users and change the present fragmented EU repositories of marine data with an interoperable sharing

<sup>156</sup> Questionnaire completed by EMODnet Secretariat, 2024

framework. This 'collect once and use many times' philosophy benefits all marine data users, including policy makers, scientists, private industry and the public.<sup>157</sup>

Some of the key **economic impacts** identified in an evaluation of EMODnet included (i) greater competition for value-added services based on marine data (ii) greater innovation driven by entrepreneurs due to reduced operational costs for accessing marine data (iii) stimulating research (iv) reduced operating costs and conduct of business, and reduced uncertainty (v) growth in value added sectors.

An evaluation of EMODnet conducted by the Secretariat, published in 2020, found that EMODnet "delivers annual user benefits of €288 million to €407 million from a combined effect of increased productivity, fostered innovation and reduced uncertainty."<sup>158</sup> An further evaluation conducted by the EC of the 2014-2020 period also highlighted the significant value generated by the EMODnet data network: "Overall, the external evaluation study assessed that improvements in productivity, innovation and accuracy yielded cumulative benefits in the order of 20 times the annual cost."<sup>159</sup>

Further, as noted in an evaluation of EMODnet, "by their nature marine data already fulfil one necessary condition of a public good – consumption by one individual does not reduce availability of the good for consumption by others. It is therefore of public interest that marine data produced with public money be as widely used as possible. Unused data are a lost opportunity and still require expensive, maintenance, storage, cataloguing etc."<sup>160</sup>

The main **social impacts** include (i) job creation in sectors that build on marine data infrastructure (ii) better access to coherent marine data will improve participation in governance. There are also broader social impacts that will be driven through the application of the data to different use cases such as the social benefits derived from better coastal planning.<sup>161</sup>

The main **environmental impacts** include (i) Supporting the EU's efforts to mitigate and adapt to clime change (ii) protection of marine biodiversity, flora, fauna and landscape, particularly linked to effective cross-border planning (iii) renewable or non-renewable resources, for example identifying appropriate locations that maximize effectiveness and minimize environmental impact.<sup>162</sup>

For example, the University of Girona used EMODnet datasets in the Horizon EU project Blue-Paths, to develop a dashboard demonstrator with the goal of informing a wider audience about the geographic, social, ecological, and economic characteristics of the high potential areas for offshore wind energy in the Spanish sea space. Data products are widely used in maritime spatial planning, coastal zone management and environmental impact assessments, and especially by a rapidly growing community of offshore renewable energy sector actors. A library of use cases can be found on the EMODnet website.<sup>163</sup>

### **Social, Environmental, and Environmental Costs:**

<sup>157</sup> Questionnaire completed by EMODnet Secretariat, 2024

<sup>158</sup> <https://op.europa.eu/en/publication-detail/-/publication/5dfd0c1f-8fa2-11ea-812f-01aa75ed71a1>

<sup>159</sup> <https://op.europa.eu/en/publication-detail/-/publication/5897e1d8-2ba9-11ee-95a2-01aa75ed71a1/language-en/format-PDF/source-search>

<sup>160</sup> [Evaluation of the European Marine Observation and Data Network \(EMODnet\) - Publications Office of the EU \(europa.eu\)](#)

<sup>161</sup> Ibid

<sup>162</sup> Ibid

<sup>163</sup> [Use Cases | European Marine Observation and Data Network \(EMODnet\) \(europa.eu\)](#)

The environmental, social and broader economic costs of EMODnet are limited as the raison d'etre of the organization is to promote social and environmental sustainability in marine environments.

An evaluation of EMODnet found that the **economic costs** to public authorities are limited as EMODnet is paid through procurements from the EU budget.<sup>164</sup> The main cost to authorities is expected to be the process of adopting common standards and improving access to national databases. However, member states are already working on good data management practices through initiatives such as INSPIRE<sup>165</sup> and the Data Governance Act and the Open Data Directive.<sup>166</sup> The evaluation also notes that there may be some loss if income to public bodies providing data for a fee, mainly bodies selling added-value products rather than raw data; however, the assessment notes that "the replacement of one operator by another that can deliver the same product cheaper or better quality is not, of course, a loss to the economy as a whole."<sup>167</sup>

The main **environmental** and **social costs** of the organization are related to the footprint of the Secretariat operations, which are relatively low due to the organization sharing an office space. EMODnet is a federated data network and has no control over the types of computing technologies that members of the EMODnet federation use to serve the data and the products. However, the Secretariat notes that this may change in the future as the Cloud based resources of the marine data lake (EDITO) become available. EDITO is the European Digital Twin of the Ocean Offer. The EDITO Infra platform will be accessible to EMODnet user community, providing access to state-of-the art technologies and data resources.<sup>168</sup>

### Appendix 3: Business Model Canvas: CO2 DataHub Case Study

The CO2 DataHub is the result of a project funded through the NextGeneration EU framework and Business Finland with a project budget of €1.7 million. The project aimed to develop a trusted data exchange across the built environment sector to enable companies to more effectively calculate the CO2 emissions generated across supply chains. The CO2 Hub project was led by Vastuu Group, an ICT and data services company focused on the real estate and construction industry. The project ran from March 2022 to May 2023, with a major part of the project consisting of use case-based pilot projects with companies, cities and municipalities.<sup>169</sup>

Moving beyond the pilot project, work on establishing a data ecosystem began in 2023 and is ongoing. The facilitation for the CO2 DataHub has now been taken over by the KIRAHub, a real estate and construction industry innovation ecosystem operating as a non-profit association. The Association is part of the EU-funded Finnish AI Region Innovation Hub. The KIRAHub facilitates a number of 'sub ecosystems' including the CO2 DataHub Data Ecosystem as well as a Digital Building Permit Data Ecosystem. While these ecosystems are currently focused on the national scale, the steering group sees the opportunity to expand internationally due to common pain points across the built environment industries.<sup>170</sup>

The CO2 DataHub is trying to solve the following problem across the built environment sector: currently, the majority of companies calculate the carbon footprint of their properties

<sup>164</sup> Evaluation of the European Marine Observation and Data Network (EMODnet) - Publications Office of the EU ([europa.eu](http://europa.eu))

<sup>165</sup> INSPIRE Knowledge base - European Commission ([europa.eu](http://europa.eu))

<sup>166</sup> The Data Governance Act & The Open Data Directive | [data.europa.eu](http://data.europa.eu)

<sup>167</sup> Evaluation of the European Marine Observation and Data Network (EMODnet) - Publications Office of the EU ([europa.eu](http://europa.eu))

<sup>168</sup> <https://emodnet.ec.europa.eu/en/emodnets-pivotal-role-boosting-eu-dto-through-edito-infra>

<sup>169</sup> <https://co2datahub.vastuugroup.fi/>

<sup>170</sup> GREAT Interview with KIRAHub, 2024.

individually without ecosystem collaboration. This is often a time-consuming, manual and incomplete process due to data inconsistencies and gaps.<sup>171</sup> IDC research highlights that, across Europe, for 48% of organizations, a lack of supply chain data is one of the key barriers to decarbonizing their buildings.<sup>172</sup> Inputs are required from across a company's supply chain and require data inputs from multiple stakeholders across industries such as energy, waste, logistics and manufacturing (see Figure 10 which highlights the emissions for building maintenance).



Figure 10 CO2 DataHub Project's Conceptualization of the Built Environment CO2 Data Ecosystem

*"It is all about trusted and interoperable data for the built environment... The problem is that data is scattered around different applications along the value chain and it's in different formats and so forth. So that's why it's very difficult to get the holistic picture of what you can do with the data and how to exchange it."* Antii Harjunpää, CEO, Platform of Trust.

One of the main drivers behind this project is the increasing regulatory requirements for emission reporting. For example, the Corporate Social Responsibility Directive (CSRD) which will start being enforced from January 2024 for in scope organizations<sup>173</sup> requires greater ESG reporting, including Scope 3 emissions (emissions up and down a companies' supply chain). As noted by the CEO of KIRA Hub, "One company cannot solve this alone. We need to build competence together as an ecosystem to solve these needs." He also noted that companies' own ambitions are a key driver, including organizations pushing to surpass currently regulatory requirements and lead in sustainability.<sup>174</sup>

The CO2 DataHub consists of a *data exchange platform* to orchestrate data sharing between built environment suppliers (data suppliers) and their clients (data users) looking to calculate their carbon footprint. The CO2 Hub describes this as a CO2 situation room (Figure 11). For the CO2 DataHub, the role of data intermediary is played by Platform of Trust, which operates the data exchange platform to link and transfer data between parties. The Platform has been

<sup>171</sup> <https://co2datahub.vastuugroup.fi/>

<sup>172</sup> IDC Survey, 2023, Sustainable Buildings Homes and Districts Survey n=738

<sup>173</sup> For EU-incorporated companies that are already subject to the NFRD, with reports to be published in 2025. There is a staggered approach for other EU companies that are not already subject to NFRD, with in-scope EU subsidiaries or branches of non-EU groups with significant activity in the EU to be required to report in 2029. [https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting\\_en](https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en)

<sup>174</sup> GREAT Interview with KIRA Hub, 2024.

created using principles and frameworks from Gaia-X including developing a federated model and will incorporate further Gaia-X standards, frameworks and tools as they are established.<sup>175</sup>

This platform can enable different use cases, for example measuring the emissions for property maintenance as well as measuring the emissions at a construction site. These use cases were piloted through the project implementation. The Platform of Trust and Vastuu Group are in the process of establishing different data products and tools to build on top of this data ecosystem.<sup>176</sup>

#### Utilization of CO<sub>2</sub> emission data in the real estate and energy sectors for the climate change mitigation

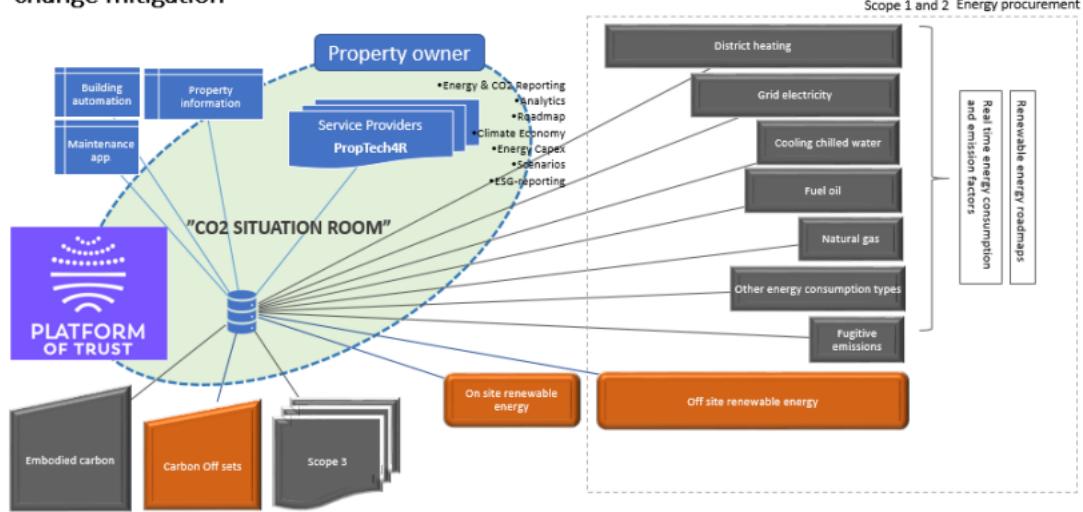


Figure 11 CO<sub>2</sub> DataHub Project's Conceptualisation of the Built Environment CO<sub>2</sub> Data Ecosystem

Source: Gaia-X Hub Finland Event, Presentation by Saint-Gobain.

#### Why was the CO<sub>2</sub> Hub chosen as a case study?

The CO<sub>2</sub> Hub provides an early example of a data space under development that supports the objectives of the Green Deal including (i) building and renovation in an energy efficient and resource efficient way (ii) mobilising industry for a clean and circular economy.<sup>177</sup> The CO<sub>2</sub> DataHub also involves a variety of data users and providers across sectors, for example energy, logistics, waste, material suppliers, construction, real estate and property owners across different industries. While CO<sub>2</sub> DataHub is in its nascent phase, it can still provide valuable lessons learnt in the development of business models for the green deal data space. Going forward, it will be valuable to keep researching the progress of the CO<sub>2</sub> DataHub as it develops in maturity and some of the data products, services and revenue models become more established.

<sup>175</sup> 2022, PPT from SITRA Event where members of the CO<sub>2</sub> Hub presented including Vastuu Group, Platform of Trust and Saint Gobain. [https://www.sitra.fi/app/uploads/2022/09/2022-09-14-presentations-how-can-built-environment-use-data\\_.pdf](https://www.sitra.fi/app/uploads/2022/09/2022-09-14-presentations-how-can-built-environment-use-data_.pdf)

<sup>176</sup> GREAT Interview with KIRA Hub, 2024.

<sup>177</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52019DC0640>

## Green Deal Data Space Business Model Canvas: C02 Data Hub

<p><b>Key Partners</b></p> <ul style="list-style-type: none"> <li>Data suppliers across the built environment e.g., energy, construction, manufacturing</li> <li>Steering Committee Members including public and private sector organizations</li> <li>Data intermediary and infrastructure providers e.g., the Platform of Trust</li> </ul>	<p><b>Key Activities</b></p> <table border="1"> <tr> <td>Technical e.g., identity verification and data exchange</td><td>Functional e.g., defining rules of data exchange</td></tr> <tr> <td>Operational e.g., access and usage control</td><td>Legal e.g., contract-based data exchange</td></tr> <tr> <td></td><td>Business e.g., partner management</td></tr> </table> <p><b>Key Resources</b></p> <table border="1"> <tr> <td>Physical e.g., office space for the KIRA Hub</td><td>Human e.g., community managers</td></tr> <tr> <td>Technical e.g., federated data infrastructure</td><td>Financial e.g. NextGenEU R&amp;D funds &amp; membership fees</td></tr> </table>	Technical e.g., identity verification and data exchange	Functional e.g., defining rules of data exchange	Operational e.g., access and usage control	Legal e.g., contract-based data exchange		Business e.g., partner management	Physical e.g., office space for the KIRA Hub	Human e.g., community managers	Technical e.g., federated data infrastructure	Financial e.g. NextGenEU R&D funds & membership fees	<p><b>Value Proposition</b></p> <p>Data Users</p> <p>Access to data and data products from different suppliers across the built environment ecosystem to enable organizations to effectively monitor their carbon footprint, comply with regulations and meet their targets.</p> <p>Data providers</p> <ul style="list-style-type: none"> <li>Potential for commercialization of data</li> <li>Increasing impact and brand by sharing existing data</li> <li>Regulatory disclosure requirements and CSR initiatives</li> </ul>	<p><b>Customer Relationship</b></p> <p>Preliminary customers engaged as part of EU-funded pilots (call for proposals)</p> <p>KIRA Hub is growing the ecosystem through its existing network across real estate and construction industries.</p> <p><b>Channels</b></p> <ul style="list-style-type: none"> <li>Website and social media</li> <li>Email-based newsletter</li> <li>Physical events and workshops</li> </ul>	<p>Cities and municipalities e.g., measuring CO2 emissions from schools and public buildings</p> <p>Commercial and real estate owners and operators, e.g., measuring maintenance emissions</p> <p>Architecture, Engineering and Construction companies e.g., measuring construction site emissions</p>
Technical e.g., identity verification and data exchange	Functional e.g., defining rules of data exchange													
Operational e.g., access and usage control	Legal e.g., contract-based data exchange													
	Business e.g., partner management													
Physical e.g., office space for the KIRA Hub	Human e.g., community managers													
Technical e.g., federated data infrastructure	Financial e.g. NextGenEU R&D funds & membership fees													
<p><b>Cost Structure</b></p> <ul style="list-style-type: none"> <li>Community management and coordination</li> <li>Physical meetings spaces</li> <li>Collaboration tools and platforms</li> </ul>	<p><b>Revenue Streams</b></p> <ul style="list-style-type: none"> <li>The KIRA Hub receives funding from the EU as part of the Finnish AI Regional Innovation Hub</li> <li>Project specific R&amp;D funding for the C02 Data Hub from NextGenEU</li> <li>The KIRA Hub receives membership fees for its sub-ecosystems including the C02 Data Hub</li> <li>The data intermediary, the Platform of Trust has its own revenue model based on a fee per data flow</li> </ul>	<p><b>Social, environmental and economic benefits</b></p> <ul style="list-style-type: none"> <li>Environmental e.g., supporting Green Deal and Energy Efficiency Directive</li> <li>Economic e.g., commercial opportunities for data suppliers and intermediaries</li> </ul>	<p><b>Social, environmental and economic costs</b></p> <ul style="list-style-type: none"> <li>ESG footprint associated with data storage and processing (federated)</li> <li>ESG footprint associated with organizational operations of the KIRA Hub</li> </ul>											

## CO2 DataHub Business Model Canvas

### Value proposition:

The value proposition of the CO2 DataHub for **data users** is a data exchange as a service platform for the built environment sector to make the process of calculating and reporting their carbon emissions more efficient and effective to help meet regulatory requirements and emission targets. The DataHub is facilitating this by removing barriers to data flow through a data exchange platform so that business applications can run on real-time scope 1-3 data.<sup>178</sup> With the introduction of CSRD, Scope 3 emission reporting will be mandated for a greater number of in-scope organizations from 2023. Scope 3 reporting, by definition, covers an organization's up-stream and down-stream supply chain, and therefore, relies on data inputs from multiple stakeholders.

On top of the data exchange service, the Platform of Trust is building new digitally enabled services for the data users such as emission monitoring dashboards built on proprietary models.<sup>179</sup> It is building these in partnership with specialist data reporting partners with expertise in specific areas such as construction, ESG reporting etc.<sup>180</sup> <sup>181</sup> During the EU project, a prototype was developed of an emissions dashboard for real estate owners and providers to calculate the emissions associated with the 'use' phase of a property's life cycle including property maintenance transport, materials used in property maintenance, district heating energy and electricity etc.<sup>182</sup>

Overseen by the KIRA Hub, new projects are underway to create additional CO2 DataHub applications. For example, the Platform of Trust is in the process of creating a data model for CSRD reporting. They are creating a joint information model for the built environment sector regarding the reporting needs so not every company needs to do the same thing independently.<sup>183</sup>

The value proposition for **data suppliers** is evolving. During the pilot projects, data was provided by the suppliers for free as part of the research and development phase. However, since the pilots, the Platform of Trust have been experimenting with different revenue models in order to compensate data suppliers. They have been experimenting with both pay per transaction as well as subscription models – this will be discussed further in the revenue model section of the business canvas.<sup>184</sup>

In addition to the potential commercialization of the data, a number of built environment suppliers have already taken steps to help their customers to decarbonize through making product and service data available, as part of organizational CSR objectives, regulatory requirements, and as a competitive differentiator to meet customer demands. The CO2 DataHub provides a trusted platform to support these initiatives and enables data suppliers to increase the potential scope of impact through higher data utilization. Take for example, the French manufacturing company Saint Gobain, a participant in the CO2 DataHub project pilots. Saint-Gobain already publishes over 1500

<sup>178</sup> <https://co2datahub.vastuugroup.fi/>

<sup>179</sup> GREAT Interview with KIRA Hub, 2024.

<sup>180</sup> GREAT Interview with Antti Harjunpää, CEO Platform of Trust, 2024

<sup>181</sup> GREAT Interview with Antti Harjunpää, CEO Platform of Trust, 2024

<sup>182</sup> <https://co2datahub.vastuugroup.fi/blogi/prototyppi>

<sup>183</sup> GREAT Interview with KIRA Hub, 2024.

<sup>184</sup> GREAT Interview with KIRA Hub, 2024.

Environmental Product Declarations (EPDs) on its operator platform and has organizational KPIs to increase this number to cover 100% of its products by 2025.<sup>185</sup>

However, this is not always the case, as Antii Harjupää, CEO of the Platform of Trust noted, in some instances the creation of data is already a core part of a business's operations, they don't have to create anything new. In other instances, it isn't and then the question is, who is going to pay for the creation of more CO2 data. This will be discussed further in the section on 'revenue.'

It is also important to note that one company can be a data user and data supplier. This is an important point of distinction for data ecosystems and cooperatives in the context of the business model canvas: the distinction between partners, providers and customers is not clear cut. Take for example a waste removal company that provides services for office buildings but also has its own premises.

Both **data providers** and **data users** are being given the option to become collaboration members of the different KIRAHub data ecosystems. The value proposition for becoming an ecosystem member is that these organizations have the opportunity to be part of the steering group guiding the development and direction of KIRAHub's ecosystems. The CO2 DataHub currently has 22 members that act as a steering group leading the development of the data ecosystem. To date, these members include energy companies, construction material companies, operators of public and private sector buildings and estates.<sup>186</sup>

In the CO2 DataHub Project, the value proposition was conceptualized as dynamic. The cross-industry Ecosystem Steering Group that led the development of the pilot phase included 'future needs' in its value proposition definition process (see Figure 12). It is important to note that the components of the business model canvas are not static but are evolving.<sup>187</sup>

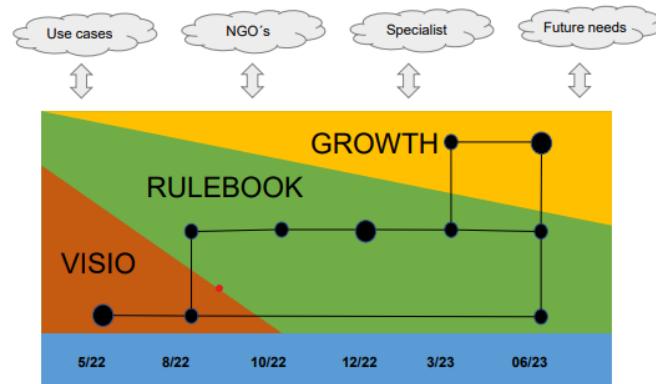


Figure 12: CO2 DataHub's Process to Define the Value Proposition

Source: Gaia-X Hub Finland Event, Presentation by Platform of Trust

<sup>185</sup> 2022, PPT from SITRA Event where members of the CO2 Hub presented including Vastuu Group, Platform of Trust and Saint Gobain. <https://www.sitra.fi/app/uploads/2022/09/2022-09-14-presentations-how-can-built-environment-use-data.pdf>

<sup>186</sup> GREAT Interview with KIRA Hub, 2024.

<sup>187</sup> 2022, PPT from SITRA Event where members of the CO2 Hub presented including Vastuu Group, Platform of Trust and Saint Gobain. <https://www.sitra.fi/app/uploads/2022/09/2022-09-14-presentations-how-can-built-environment-use-data.pdf>

### **Customer Segments:**

*Cities and municipalities:* For example, a CO2 DataHub project pilot was undertaken in the City of Tampere. The goal was to monitor the construction process of a school and daycare in order to meet a commitment made by the city for carbon neutral construction sites.<sup>188</sup> A project was also conducted across 5 other cities, including Espoo, to monitor the carbon footprint of a day care construction project.<sup>189</sup> The Cities and municipalities are not currently included in KIRA Hub membership body; however, this is one of the planned next steps in the ecosystem development.<sup>190</sup>

*Commercial real estate owners and operators:* For example, a CO2 DataHub project pilot was undertaken for two buildings owned by the Ilmarinen Mutual Pension Insurance Company. The pilot focused on determining the CO2 footprint of maintenance related services including basic maintenance, technical maintenance, outdoor maintenance, cleaning, waste management and security services.<sup>191</sup>

*Architecture, engineering and construction (AEC) companies:* While no AEC companies were the targeted end-user of the pilot projects. These companies have regulatory responsibilities and also demand from their clients to measure the carbon emissions associated with their operations. In recognition of this, KIRA Hub has design firms such as Granlund – the largest MEP design firm in Finland – as part of the CO2 Hub ecosystem membership body.<sup>192</sup>

The objective of the CO2 DataHub is to create automatic CO2 calculation and reporting tools drawing on common information standards for the entire ecosystem of the built environment. Customers calculation and reporting requirements may differ and drive different data usage behaviours, for example, some organizations may calculate their CO2 footprint on a quarterly or annual basis for specific reporting deadlines, whereas others may want to monitor this continuously and identify opportunity for optimization.<sup>193</sup>

### **Customer relationships:**

The preliminary customers of the CO2 DataHub were engaged as pilot customers through the EU-funded project. Customers were recruited from across the public and private sector. After the pilot phase, KIRA Hub has taken over ecosystem recruitment activities. KIRA Hub already has a strong network across real estate and construction industries. It leverages this network to recruit members to the ecosystem membership bodies, including the CO2 DataHub.<sup>194</sup> It will need to

<sup>188</sup> The City made a commitment via Sitoumus2050 an online service where organizations, companies and individuals can make operational commitments for sustainable development. The service is maintained by the Commission for Sustainable Development. Commitments are categorized into different areas, including one category for the Green Deal.

<sup>189</sup>[https://www.vastuugroup.fi/hubfs/CO2%20DataHub%20-%20hanke/CO2%20DataHub%20verkkosivut/CO2%20pilottiraporttien%20tiivistelm%C3%A4t/Espoo\\_%20Guiding%20the%20Confirmatory%20Carbon%20Footprint%20Calculation%20of%20a%20House%20Construction%20project\\_pilot\\_abstract\\_.pdf](https://www.vastuugroup.fi/hubfs/CO2%20DataHub%20-%20hanke/CO2%20DataHub%20verkkosivut/CO2%20pilottiraporttien%20tiivistelm%C3%A4t/Espoo_%20Guiding%20the%20Confirmatory%20Carbon%20Footprint%20Calculation%20of%20a%20House%20Construction%20project_pilot_abstract_.pdf)

<sup>190</sup> GREAT Interview with KIRA Hub, 2024.

<sup>191</sup>[https://www.vastuugroup.fi/hubfs/CO2%20DataHub%20-%20hanke/CO2%20DataHub%20verkkosivut/CO2%20pilottiraporttien%20tiivistelm%C3%A4t/Ilmarinen\\_The%20carbon%20footprint%20of%20property%20maintenance\\_pilot\\_abstract\\_.pdf](https://www.vastuugroup.fi/hubfs/CO2%20DataHub%20-%20hanke/CO2%20DataHub%20verkkosivut/CO2%20pilottiraporttien%20tiivistelm%C3%A4t/Ilmarinen_The%20carbon%20footprint%20of%20property%20maintenance_pilot_abstract_.pdf)

<sup>192</sup> GREAT Interview with KIRA Hub, 2024.

<sup>193</sup> GREAT Interview with KIRA Hub, 2024.

<sup>194</sup> GREAT Interview with KIRA Hub, 2024.

move beyond this nationwide network if it plans to achieve its objective of creating an international ecosystem.

**Channels:**

KIRA Hub communicates to its members and the members of the CO2 DataHub steering committee through different channels such as its website, social media, an email-based newsletter, and physical events and workshops.<sup>195</sup>

**Key partners:**

*Data suppliers:* In order for the CO2 DataHub to be successful, partnerships are required with a broad range of stakeholders across the built environment including energy, logistics, waste management, manufacturing, construction, maintenance companies and material suppliers.

*Data Intermediaries:* The data intermediary in the pilot projects was the Platform of Trust, a unit of the Vastuu Group. Platform of Trust is a "data-sharing ecosystem host" focused on the built environment and offers 'trust as a service.'<sup>196</sup> Going forward, the Platform of Trust is expected to be one of many solution providers, offering different data products and services.<sup>197</sup>

**Key activities:**

*Technical:* The data intermediary (to date, this role has been played by the Platform of Trust) provides services such as identity verification, data exchange through the ontological data mesh (a decentralized domain driven architecture), and security.

*Functional:* Data intermediaries are also responsible for setting data formats, creating metadata and discovery protocols.

*Operational:* Both KIRA Hub and the data intermediaries are responsible for creating the rules of trusted data exchange. KIRA Hub has created a rule playbook for the ecosystem so that everyone has the same understanding to build trust.<sup>198</sup> The Platform of Trust is based on 'trust elements' including identification, agreeing and monitoring. These are outlined in the platform's operation principles.

*Business:* A crucial activities for the project, and the future of the CO2 DataHub ecosystem is stakeholder and partner management and recruitment. The project included a full-time role dedicated to this and KIRA Hub has now taken over this activity. This ecosystem developed includes organising virtual and in-person workshops and events for the steering committee and broader ecosystem stakeholders. For the data intermediaries, data usage accounting and billing as well as customer service are key business activities.

*Legal:* For data intermediaries, contract-based data exchange activities are required. Also, the intermediary needs to monitor regulatory compliance, including EU data strategy compliance.

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<sup>195</sup> GREAT Interview with KIRA Hub, 2024.

<sup>196</sup> [www.platformoftrust.net](http://www.platformoftrust.net)

<sup>197</sup> GREAT Interview with KIRA Hub, 2024.

<sup>198</sup> GREAT Interview with KIRA Hub, 2024.

### **Key resources:**

*Physical Resources:* KIRA Hub includes physical spaces to host steering group and stakeholder workshops.

*Human resources:* KIRA Hub is run by a small core team, including a CEO, COO and Community Manager.<sup>199</sup> Data intermediaries, such as the Platform of Trust, also require human resources such as legal officers, product owners and managers, marketing and sales, finance and HR. The Platform of Trust also has human resources dedicated to impact measurement.<sup>200</sup>

*Technical:* In the case of the platform of trust, the platform is based on an ontological data mesh (decentralized domain-driven architecture), orchestrator tool and data catalogues to build data connections, Harmonizer tool, to ensure interoperability of data and a Contract Console tool, to build data-exchange contracts.<sup>201</sup>

*Financial:* The CO2 DataHub Project was able to launch as a result of €1.7 million from the NextGeneration EU framework and Business Finland. Data intermediaries such as the Platform of Trust are looking to generate revenue through data exchange and data products and services to ensure its sustainability. The KIRA Hub is a non-for-profit association and part of an EU-funded Finnish AI Regional Innovation Hub. In order to operate the CO2 DataHub Membership body it charges membership fees (see section on revenue streams).<sup>202</sup>

### **Cost structure:**

According to the KIRA Hub, the most important costs in the business model, required to maintain the CO2 DataHub ecosystem include financing for: community management and coordination amongst stakeholders; physical and digital meeting spaces; collaboration tools and platforms.<sup>203</sup>

### **Revenue streams:**

For the KIRA Group, one of their main revenue streams is funding from the EU as part of the EU-funded Finnish AI Regional Innovation Hub as well as the Ministry of Environment. They also receive funding for specific projects such as the Low-carbon Built Environment Program funded from the EU's Recovery and Resilience Fund (RRF).<sup>204</sup> In order to operate the CO2 DataHub Membership body it charges membership fees (see section on revenue streams). The membership fees vary depending on the type and size of organization.<sup>205</sup>. See Figure 13 for the membership fee structure. It is important to note that membership fees do not enable access to data, this is, instead, organized separately through data platforms and intermediaries.

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<sup>199</sup> <https://KIRAhub.org/en/contact/>

<sup>200</sup> <https://www.platformoftrust.net/about-us>

<sup>201</sup> <https://www.platformoftrust.net/operating-principles>

<sup>202</sup> GREAT Interview with KIRA Hub, 2024.

<sup>203</sup> GREAT Interview with KIRA Hub, 2024.

<sup>204</sup> <https://KIRAhub.org/en/low-carbon-built-environment-programme/apply-funding-KIRAIalmasto/>

<sup>205</sup> GREAT Interview with KIRA Hub, 2024.

<p>Annual cost of collaboration membership for companies and other organizations:</p> <ul style="list-style-type: none"> <li>• Startups and micro-organizations (less than 10 people and no more than 2 million) <b>€500/year</b></li> <li>• Small organizations (10–49 people and no more than €10 million) <b>€1,200/year</b></li> <li>• Medium-sized organizations (50–249 and no more than €50 million) <b>€2,500/year</b></li> <li>• Large organizations (more than 250 people and more than €50 million) <b>€4,000/year</b></li> </ul> <p>Annual cost of cooperative membership for universities and research institutes: <b>€2,000/year</b></p> <p>Annual cost of cooperative membership for municipalities:</p> <ul style="list-style-type: none"> <li>• Residents under 20,000, <b>€500/year</b></li> <li>• Residents 20,000 – 100,000, <b>€1,200/year</b></li> <li>• Residents 100,000 – 150,000, <b>€2,500/year</b></li> <li>• Residents over 150,000, <b>€4,000/year</b></li> </ul>
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Figure 13 Cost of Collaboration Membership at KIRA Hub

Source: <https://KIRAhub.org/en/membership/> 2024

For the EU-funded project pilots, the data exchange services and data products were offered for free. Data suppliers also participated on a voluntary basis. However, post pilots, the Platform of Trust has been experimenting with different revenue models to ensure financial sustainability. It is important to note that these models are still in the early stages of experimentation and are in the process of being defined and refined. The Platform of Trust has tried multiple models to determine which is most effective including:

- i. Fee per data flow
- ii. Membership fees, including monthly subscriptions,
- iii. Results-based payments (e.g. based on savings as a result of using the services).

The Platform has decided to proceed with 'fee per data flow.' This fee covers a payment to the Platform of Trust for the 'data exchange as a service' as well as the different data models and applications (e.g. the data model for property maintenance) as well as a fee to the data provider. The CEO of platform of Trust noted that this model was chosen because the typical models that work for IT product projects, e.g. subscriptions, do not work as well in the real estate world where costs are linked to individual projects. This highlights the importance of the need for different revenue models for different industries and data users.<sup>206</sup>

*"In the real estate world, platform licenses and maintenance fees are less common. It is clearer to pay for a data flow, with a value attached that will appear as a specific line item." Antti Harjunpää, Platform of Trust CEO*

As different data intermediaries are on-boarded and start providing services in the CO2 DataHub, they will have the freedom to establish their own revenue models and undergo the same experimentation as the Platform of Trust.

#### Social, Environmental and Economic Costs:

The social and environmental costs are not being measured. Based on the business model information provided, it is estimated that the main costs include: the environmental footprint of data storage and processing – in the future, this may include the ESG footprint of AI applications in data products and services; and the GHG emissions associated with the organizational

<sup>206</sup> GREAT Interview with Antti Harjunpää, CEO Platform of Trust, 2024

operations of the KIRA Hub. No set plan has been established to measure or monitor these costs going forward.

### Social, Environmental and Economic Benefits

The value of the data space is to enable property owners and built environment stakeholders to measure, monitor and report their Scope 1, 2 and 3 CO<sub>2</sub> emissions more accurately. Giving organizations visibility of the CO<sub>2</sub> footprint across their supply chain is a foundational step to support greater transparency and identify the most impactful actions they can take to reduce their emissions. The Data Space directly supports the Green Deal's Strategy for a Sustainable Built Environment.<sup>207</sup> As highlighted in the strategy, GHG emissions resulting from material extraction, manufacturing of construction products, construction and renovation of buildings amount to around 5-12% of total national GHG emissions.<sup>208</sup>

At this moment in time, only preliminary impact measurements have been conducted; The KIRA Hub is looking for more scientific methodology to measure and account for the impact of the CO<sub>2</sub> DataHub and its other sub-ecosystems.<sup>209</sup> "It's a pain point that is quite challenging. We need more standard ways to measure impact." CEO KIRA Hub. The Platform of Trust has also contracted a research company to undertake some impact assessment research. They found that the CO<sub>2</sub> emissions that could be saved by better utilizing data in the built environment is roughly equivalent to the emissions associated with the annual flight traffic emissions in Finland.<sup>210</sup>

## ANNEX 4: Legal and Ethical Assessment Methodology

The Legal and Ethical Assessment Methodology provided by the Ethics Advisor of the GREAT project, serves as a comprehensive framework designed to systematically identify, evaluate, and address legal and ethical risks associated with a project's deliverables. Following a "by design" approach, this methodology is seamlessly integrated into the project's technical workflow, ensuring the consideration of legal and ethical aspects throughout the project's lifecycle. Its primary objectives encompass optimizing technical and business goals, ensuring compliance with relevant legal standards and ethical principles, and fostering ongoing competence-building within the research community involved.

Implemented in three key steps, the methodology begins with a preliminary meeting involving Work Package (WP) leaders, where the foundational literature and guiding legal and ethical principles are presented. The checklist analysis phase follows, employing a proactive "learning-by-doing" approach to identify potential gaps and risks across domains such as Data Privacy, Ownership, Licenses, Competition, Artificial Intelligence, and Social Media. Feedback from the Ethics Advisor on identified gaps and risks is integrated into the final deliverable, concurrently nurturing the skills necessary for crafting resilient legal and ethical solutions. These solutions address a breadth of domains and prioritize the overall impact of the deliverable while aligning with research and business goals, fostering a comprehensive legal and ethical framework.

<sup>207</sup> <https://www.europarl.europa.eu/legislative-train/theme-a-european-green-deal/file-strategy-for-a-sustainable-built-environment>

<sup>208</sup> <https://www.europarl.europa.eu/legislative-train/theme-a-european-green-deal/file-strategy-for-a-sustainable-built-environment>

<sup>209</sup> GREAT Interview with KIRA Hub, 2024.

<sup>210</sup> GREAT Interview with Antti Harjunpää, CEO Platform of Trust, 2024