



Governance of data ecosystems

Geonovum

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Contents

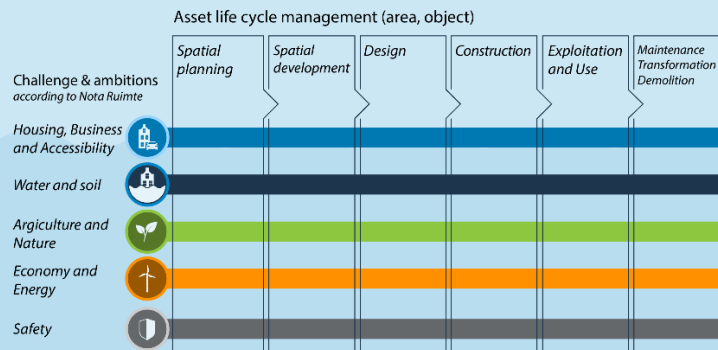
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Outline plate: an interplay of data ecosystems

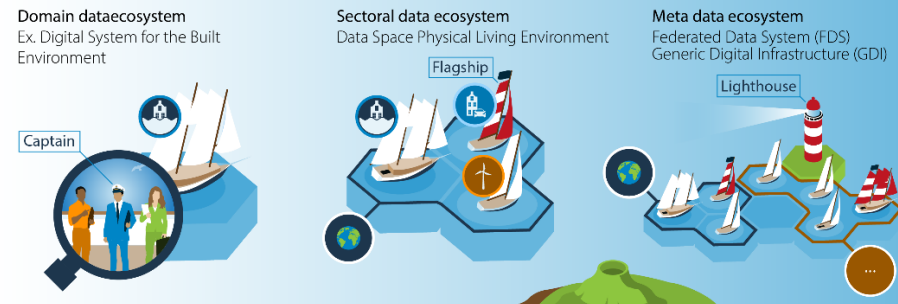
Integral spatial overview for policy decision making



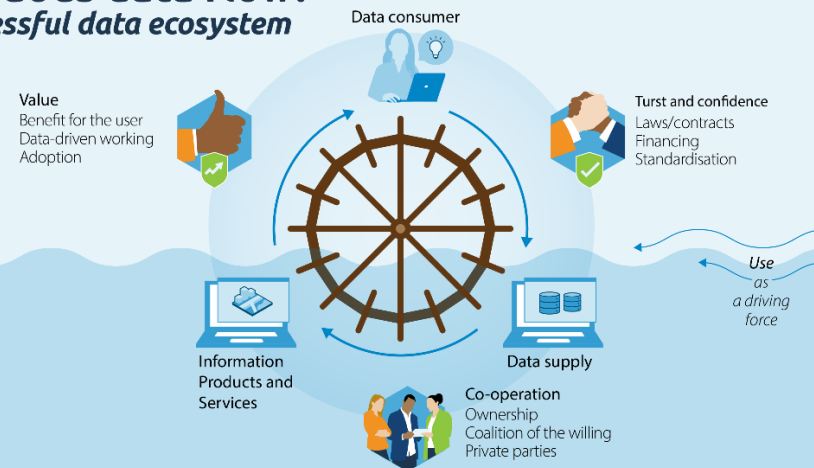
Spatial development life cycle asks for interoperability



The flotilla enables interoperability



How does data flow? a successful data ecosystem



1. Introduction – the mission and approach

This study is the third in a series¹. The policy and programme managers of the Ministries of Infrastructure and Water Management (IenW) and Housing and Spatial Planning (VRO) involved in data ecosystems identified potential benefits in 2024 if the development of part of the basic services for ecosystems were jointly taken up and/or reused, in their own ministries but also more broadly. The Chief Data Officer of IenW strongly stated this in her vision for the future at the beginning of the first study:

Data should be able to flow ‘effortlessly’ from one domain to another in order to create value for the social tasks.

During this research, the need for success, cooperation and interoperability has become even more prominent:

- Interoperability between ecosystems is a necessity for rapid value creation and onboarding;
- Interoperability between ecosystems is necessary to promote data quality through clear data ownership and to counter silos;
- Data is valuable because it gives a competitive advantage. There is an urgent need to control data through our own ecosystems, otherwise Big Tech will take its chance.

And also potential benefits mentioned in the first study were mentioned again:

- Lower realization and management costs of shared components by scaling up;
- Avoid dependency on one specific supplier (‘vendor lock-in’);
- With a joint governance and knowledge base, the Netherlands is better able to respond to developments in Europe and to take a leading position in Europe on topics.

1.1 Assignment

One of the conclusions of the previous studies was that interoperability is already technically feasible to a large extent. Yet ecosystems tend to focus on technical aspects such as standards and data models. Great efforts are being made to get the technical precondition to 100%. But nobody specifically wants a data space or national functionality. It is a means. People want to solve a problem and be provided with all relevant data for that. A data ecosystem can also already be used and deliver value if 70% is filled in. Indeed, a frequently heard call is: get started as soon as possible.

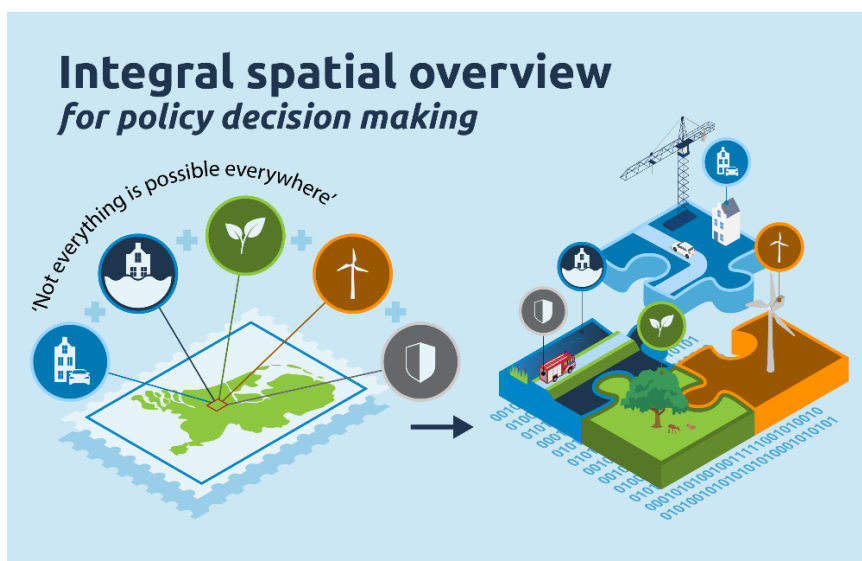
¹ The first research focused on the Architecture of 10 data ecosystems in the IenW domain, see: [Inventory Architecture Data ecosystems for CDO IenW](#)

The second study focused on the Architecture of 5 data ecosystems in the GI deliberation domain and additionally on the geo-aspects of all 15 data ecosystems, see: [Inventory of data ecosystems for VRO](#)

The question is: How? Although it seems to be technically possible, it is still in its infancy, what is needed in terms of organization / governance? How do we get the customers on board and the flywheel spinning? This makes the success of data ecosystems and interoperability a control issue.

With this study, we give substance to scenario 3 from the first study (IenW), and the ‘geo-enables’ from the second study (VRO/GI deliberation). It consists of three questions:

- What is needed to make an ecosystem work? (Intra-data ecosystem);
- What is needed to allow data to flow between ecosystems? How do you control the flotilla? (Inter-data ecosystems);
- How do you work together? How do you determine what is generic or specific? (Interaction data ecosystems).



1.2 Approach

The results of this report are as follows:

- Separate in-depth interviews with the programme managers and in some cases the clients of the 15 data ecosystems and organisations with an interest and role in the context of data ecosystems (DMI, BDI/DIL, DSM/NTM, DSGO/Digigo, VTH, FDS, NGII/ZoN, DSO, VNG, ILT, RWS, CoE-DSC and TNO-Vector), supplemented by desk research;
- Plenary sessions with the program managers of the 10 data ecosystems and the Chief Data Officer of IenW;
- Plenary sessions with a number of NDS ‘contributors’ such as ZoN, FDS, CoE-DSC;
- Review and addition of experts to this report.

1.3 Reading guide

This report is structured as follows:

- *The playing field* - Which data ecosystems have been studied, what are their characteristics and what is the broad line we see? (*Chapter 2*);
- *A successful ecosystem (INTRA)* - The interviews with data ecosystems have led to an image of how to organize a data ecosystem internally for success (*chapter 3*);

- *Link to the DSSC model* - Description of the model, a brief overview of best practices and a link to the interview results in the annex (*chapter 4*);
- *Interoperability and the Metadata Ecosystem (INTER)* - A data ecosystem is not defined and will soon need information from other data ecosystems. Therefore, there is a need for interoperability between data ecosystems. What is needed for this (the metadata ecosystem) must be filled in at national level. NDS stands on the bar to federate this national foundation. (*Chapter 5*);
- *Advice & Application Perspective (INTERACTION)* - Description of the steps to do this (*chapter 6*).

Some preliminary remarks:

- This report talks a lot about NDS (Dutch Digitalisation Strategy). NDS has been simplified here and used as a container concept for the metadata ecosystem. Whether the term NDS will continue is currently unclear, but there is a need for central stimulation and guidance of the “. In practice, there are many parties that (already) play a role in this, such as FDS, IBDS, ZoN/NGII, NTS (Dutch Technology Strategy), Logius, MIDO/GDI, ICTU, Forum Standardization, CoE-DSC, etc.);
- In this report, the term **domain** is used for policy areas (such as Housing, Climate, Energy, etc.) and **sector** for the ‘technical’ focus areas/themes (Physical Environment, Work and Income, Digital Government);
- This report uses the findings, advice and best practices of ecosystems. In parentheses it is indicated which ecosystems provided this input. This is not exclusive: the same remark was often made several times;
- This report talks a lot about ‘standards and agreements’. It is always about **open standards and agreements**.

2. The playing field – 10 data ecosystems

Within the scope of this assignment, 10 data ecosystems were included. Data ecosystems are: environments in which organizations can exchange trusted data to create value.

2.1 Characteristics

Each of the 10 data ecosystems thus has its own origin and its own characteristics on the dimensions of this definition. The environments and organizations differ, the life phase differs, the legal assurance and organization is different, the degree of confidentiality differs and the use cases differ. This chapter provides a brief explanation of the data ecosystems. More details can be found in the appendix.



Of the 10 data ecosystems, four focus mainly on Mobility and Logistics:

1. **FDI/DIL:** The Digital Infrastructure Logistics (DIL) programme investigates and stimulates the smarter use of data exchange in freight transport. The Basic Data Infrastructure (BDI) is used for this purpose;
2. **DSM/NTM:** The Digital System for Mobility (DSM) and the National Access Point for Mobility (NTM) complete parts of the ITS Directive (Intelligent Transport Systems);
3. **EMDS:** The European Mobility Data Space (EMDS) is one of the Common European data spaces from The European Data Strategy and focuses on data sharing in the mobility and transport sector;
4. **DITM:** The Digital Infrastructure for Future-proof Mobility (DITM) will be set up for automated transport to make mobility more efficient and safer.

Five other data ecosystems focus on different aspects of the living environment:

5. **DMI:** Dutch Metropolitan Innovations (DMI) wants to create a digital link between urban mobility, space and sustainability, so that both the available space, the mobility system and the energy network can be better used and cities are more resilient to the consequences of climate change;
6. **DSGO:** The Digital System Built Environment (DSGO) focuses on the Built Environment sector. From infrastructure to housing and utility. The scope is broad, such as bridges, office buildings and rails. The original objective was to reduce emissions from construction. Meanwhile, asset management is also a major driver;

7. **DSO:** The Digital System Environment Act (DSO) is a dataspace for regulations and supports the implementation of the Environment Act. The DSO offers a digital one-stop shop (Omgevingsloket) where initiators, governments and stakeholders can quickly see what is allowed in the physical environment;
8. **VTH:** The Digital Monitoring and Enforcement (VTH) programme ensures that system parties are enabled to exchange data among themselves. With a primary focus on the environment;
9. **NGII / ZoN:** The multi-year vision Vision of the Netherlands (ZoN) describes the further development of the National Geo Information Infrastructure (NGII) to address the complexity of the 'spatial puzzle' in the Netherlands in a data-driven manner.

In particular, the tenth data ecosystem is binding in nature (within government):

10. **FDS:** The Federal Data System (FDS) focuses on interoperability between systems (standards) and on making data available for use between governments.

In addition to the 'original' 10 ecosystems, the following organisations were interviewed because they make an important contribution to or play a role in the data ecosystems:

- **Rijkswaterstaat (RWS):** Rijkswaterstaat owns dozens of data ecosystems in the field of mobility management, asset management and living environment;
- **Human Environment and Transport Inspectorate (ILT).** ILT manages dozens of data ecosystems in the areas of living environment, transport, supervision and enforcement of regulations;
- **VNG** as a representative of the municipalities, which are an important source holder and therefore provide a lot of data around the physical living environment;
- **COE-DSC** and **TNO Vector** as centres of expertise on interoperability.

2.2 First impression

This chapter contains some first impressions of the interviews.

General

- Data is the new gold.
- Enthusiasm about developments: broad sense of urgency;
- NDS and the 'governing agenda' gives flotilla wind in the sails;
- Situation in the world and Europe gives flotilla power;
- Technically, a lot is possible, but how do you organize that? Interoperability therefore seems to be an organisational issue;
- Policy officer in the interviews usually absent, sometimes unknown;
- Continuity of financing is not clear in many cases;
- Management is under pressure;
- It is unclear who can and should go ahead.
- It is unclear what is being offered nationally.

Financing and Ownership

- **NGF/Topsector** takes the initiative and finances the initial phase (DMI, DSGO, DSM). It sees the value of data exchange and hopes to boost value from digitalisation;
- The role of owner/client for the data ecosystems is often not clearly defined;
- Long-term funding not yet (completely) clear: BDI, DITM, DSGO, DMI, FDS, ZoN/NGII;

- Not only the parties responsible for the data sharing infrastructure, but also the source holders are in serious financial difficulties. Their federated data task is under pressure: They are being asked for more and better data, but they do not receive more resources (VNG). They incur costs themselves to get the data in order but receive little / nothing reimbursed (ILT, RWS, VNG). In the absence of standardization of interface/architecture/data model, they are asked to prepare or deliver their data in many different ways.

Adoption and implementation

- Together, the data ecosystems have critical mass to have achieved impact. They are joining forces for a positive boost to digitally driven work and digitalisation in the Netherlands (I&W, VRO, BZK, EZ);
- A number of ecosystems are already working at full capacity and sometimes almost succumb to their own success because the call for better data and more functionality cannot be paid for (DSM, NGII, DSO, DITM);
- A number of ecosystems test value at an early stage through labs (FDS, VNG, BDI, DSGO, VTH, DMI, DSM);
- A number of ecosystems are about to be widely applied (BDI, DMI, DSGO, FDS);
- It is the responsibility of the government, often established by law, to provide reliable basic information, including services that display this information. A data ecosystem provides additional services for the benefit of a domain. A question that comes back nationally and per domain is: what functionality does the government have to develop itself and which can the market deliver?
- Strong basic information built up or reused (DSO, NGII, BDI, DMI, DSGO);
- Strong network of service providers and external network built up (DMI, DigiGo, BDI).

What else stood out in the interviews?

- European developments are a driver, this is undisputed;
- Role Geonovum, CROW, NTM, NEN is undisputed;
- The role of source holders has hardly been mentioned in the discussions (but very important), except by VNG and DSO;
- Back delivery or updating of data is little mentioned (but very important, FDS has this in scope, for example);
- Open source is only mentioned by FDS;
- Standards do not land by themselves, for this software developer kits, examples and drivers are needed;
- A flotilla of loose ships remains in the port (VTH) if stakeholders, data, governance and finance are still loose force fields (variable winds);
- Note Space (82 cards) has not yet been shared as data (because pdf). The Directorate for Spatial Information (DRI) has recently taken up its role as a driver for the digital integral area image;
- The data ecosystems participate in multiple flotillas. A flotilla of physical tasks, with housing (DMI, DSGO, DSO, ZoN) or mobility as the main goal (DSM, DITM, RWS, ILT). A flotilla with economic drive function (CoE-DSC) or authentication functionality (the IShare coalition), with generic standards and components (GDI, Forum for Standardization) or with logistical tasks (BDI, DITM). Within these different flotillas are different interests, data needs, customers and standards. All play a role in the digitization of the physical environment;
- Finally: Of course, there are many more data ecosystems. Think of data ecosystems around water, energy, nitrogen, rural areas, agriculture, food, public order, health, work and

income. Interoperability is often also desired with these systems, for example via keys such as 'person' or 'location'.

Question

The following questions arose from the interviews:

- How do we build a strong and functioning data ecosystem? This is discussed in chapters 3 and 4.
- How do ecosystems work together, who controls the flotilla, how are we part of it without losing autonomous speed? Or do we just get more speed by inserting? This is discussed in chapters 5 and 6.

3. Intra-Eco system: Organize success

The flywheel

Back to basics: the definition of a data ecosystem:

- Is about **trusted, sovereign and** secure data sharing between the participants,
- Federated, distributed (from the source),
- Delivering **value** to a particular domain or sector,
- Based on **jointly** agreed agreements and control.

The initiation, organisation and management of a data ecosystem is the initiation and maintenance of an interplay between:

- **The recipients of services:** the customers of the ecosystem derive value from membership and use. The intended value is described and known through use cases.
- **Data offer:** Customers need data that comes from data. Use cases make it clear (more) which data is needed. Often there is a discrepancy between the required quality and actuality and the current level.
- **Product and service:** This is the functionality that the ecosystem provides to use the data as information. Information products unlock the data from their own or possibly other ecosystems. The functionality must be in line with the primary process and/or the social statement of the customer.

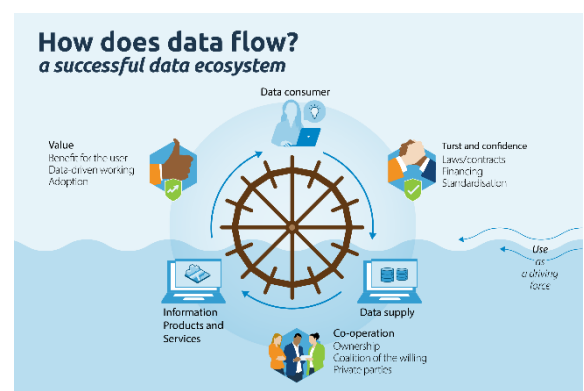
How does the flywheel get started?

The flywheel is triggered when data leads to information products, which help the customer in the performance of his task. Use leads to feedback/enhancement of the current information needs and to new use cases. These lead to a demand for new data and data products, which in turn are interesting for a growing group of customers ... et cetera. Organizing a data ecosystem is thus accommodating and driving the flywheel.

In the interviews we asked about best practices: What works in practice? This list is set out in the Annex for inspiration. The analysis after the interviews showed that the working establishment and initiatives were described in three categories. This is what we call the triggers that trigger the flywheel/shoewheel:

1. **Value /use/use** (usecases, adoption, stimulating use, data-driven work/culture change);
2. **Cooperation/participation/participation** (public, ownership, roles, responsibilities);
3. **Trust (financing, legal/contract, continuity, standards, quality, being able to count on each other/responsibilities).**

Commitment to these aspects leads to a successful (more) ecosystem. We will elaborate on these in the following paragraphs.



3.1 Value/use/use

Without value, no use. The ecosystem provides support for the primary process, a policy change or a social task. There must be a keen understanding and knowledge of the customers and what their value brings.

Link to policy

The ecosystem represents a digital version of reality. The digital world follows the physical world (and increasingly vice versa). The ownership of the data ecosystem lies with the policy party that also bears responsibility in the real world. This can be a coalition (with market parties, industry associations, other governments) that organizes the policy management. Digital transformation is a task at (policy) management level: This is necessary, this is what we want, this is the direction. What do we do generically (reuse FDS/NGII) and what do we do specifically? The implementing power and momentum lies with organizations with a legal task. With a new policy or new law, the digital impact must be taken into account immediately: What is needed for implementation and enforcement?

Use cases for social tasks

Use cases outline the value of data for customers. For the operation, for policy changes, for social tasks. For every data ecosystem, the question is: Which policy direction has a substantive interest? Who are the data providers? Who provides the services and products? Is it the government or are they market players? Who does what to best serve the user for the use case?

In the spatial domain, several tasks call for scarce space. Choices must be viewed in conjunction through an integral area image. Spatial considerations for housing are made by area teams, supported by data services from market parties. This links to the construction chain, which is supported by services and products from DSGO. Other programmes have use cases for European cooperation and activity.

Stimulate data-driven working and connection to the operational processes of the customer

How does the available information reach the customers? This requires more than a good user interface (such as a Digital Twin). Data-driven working is a cultural shift, not only for SMEs, for example, but also for ministries and governments. Which government (low) dares to be a pioneer in data-driven implementation? Does a policy director dare to be a client for a data ecosystem? In the spatial domain, a local area development can also serve as a driver.

The use of useful, accessible and seductive functionality helps, and local software suppliers can assist parties. Process optimization is a next step in which a lot of value and improvement can be achieved (customs process DIL).

Offer a warehouse

Many ecosystems are investing seriously in a 'pilotage system' to guide their customers in the new way of working. This is often done in collaboration with parties who know the customers well: ICT suppliers, industry associations, large companies that take a pioneering role such as mainports.

Work step-by-step and evolutionary

Start small, clear but reliable. The use of living labs, POCs, sandboxes gives space to experiment and achieve results together. Build in steps with easy interface. You can only entice users to participate with appropriate and trusted tools and services.

Realize that even more implementation effort is needed afterwards to get general use and focus on repeatable implementation. Strong evaluation and management processes are needed to keep the ecosystem alive, keeping all partners enthusiastic. A structured change process is necessary.

3.2 Cooperation/Participation/Participation/Ownership

Meeting each other, knowing each other, giving commitment and perseverance

Every data ecosystem needs a *coalition of the willing*. Forerunners, pioneers, clients, *believers* who have the vision that it can be done better and have the energy and courage to do it. They unite in a deliberation that takes ownership of the ecosystem. It is a commitment to each other to make it a success, and also to have fun in it. Preferably with stakeholders from the entire chain. This is also the place to shape (Keten) process improvement.

Virtually every ecosystem implements such a construction: the GI (NGII, ZoN), a participant register (DSGO), a management agreement (DSO, DSGO, VNG), a participation structure (DMI), a partnership with mainport (DIL) or the automotive business (DITM).

Roles and responsibilities

The responsibility (and funding) of a domain data ecosystem lies with the policy directors and social tasks. Together they organize a structure, preferably together with other organizations in the chain, in which existing data and systems are used and expanded. New initiatives are being notified to prevent silo solutions. The costs and benefits for participants must be balanced (excluding purely private dataspace, for example in the business sector).

Public-Private collaboration

Collaboration of the market is crucial to make meters, to gain domain knowledge and to help start the use and implementation. After all, the market has direct access to organisations and would like to provide services. Market participants can and want to invest, but only if the investment can be recouped. It's a chicken/egg problem: the market requires strong initiators and motivated customers, while customers only get on board when they experience value through data and products. The ecosystem recognises the market players involved and their business model and facilitates the development of solutions. Data ecosystems such as DSGO, DMI, DITM, DSM and DIL organize the data ecosystem together with skilled market parties and sometimes even establish joint venture-like organizations.

3.3 Confidence

Only in a trusted, stable, future-proof situation will parties make the effort to get on board and make transactions (cf. bank transactions). It is not for nothing that an ecosystem is primarily a system of agreements. What aspects contribute to trust?

Sufficient and stable funding

Data ecosystems arise from a vision or opportunity (financing by, for example, the NGF), a problem or a legal task (DSO, basic registrations, RWS, ILT). As growth fund money is a one-off injection, it is important to ensure early financing of the further development/management phase. For the management of developed software, roughly 25% of the initial costs must be available annually. For further development even more. Usage will reveal omissions in the data and the demand for higher quality will increase, which entails considerable costs. Not only for the specific data of the ecosystem, but also for the data of source holders. Now extra (quality) data is often financed with one-off funds.

The management organisation must be known from the start, both in terms of funding and organisation. Where is it going to land? Who feels and remains responsible for the ecosystem? If this is not known, and no owner can be found, then that gives us to think about the future of the ecosystem.

Ensuring continuity

Freedom does not give enough confidence. Securing the future and context of the ecosystem is essential to gain customer and market confidence. Private parties only invest if the investment can be recouped.

Many ecosystems are legally secured (DSO, NGII, DSM) or join European directorates (Data act, Inspire, HVD). Other ecosystems enter into contracts with their participants (DSGO, DMI) to secure trust and secure future-proof funding. Stable policy and technical frameworks from the European Union or the Netherlands are also important, as they provide a foundation on which to build.

Agreeing and enforcing agreements and standards

Standards provide certainty to customers, source holders and market parties. They are the traffic rules of data flows. It is better to have fewer standards that are adhered to than more that have no impact. However, it lacks a party that can and may enforce standards. Ecosystems can encourage or even enforce compliance with standards through the contracts they conclude. In addition, the government can also make standards mandatory (NDS).

If an ecosystem meets these agreements, you know what to expect and then it follows that it is a reliable and professional party. If there is no mention of standards, reference architecture and identification, it is not a trust system.

Ensuring and making discoverable the meaning and quality of data and services

If you use data for social tasks, you have to be able to trust the data. The meaning, the relationships, the structure and the quality must be transparent within the ecosystem and across data systems, via information models and vocabulary. Who standardizes and monitors the quality and findability of data? The metadata ecosystem must provide the *capabilities* to find, understand, relate and assess the quality of data across ecosystems.

Early adopters show that the ecosystem is usable and easy to apply.

Trust grows when people feel empowered. This can be done through Living Labs and sample cases and software KITs. DMI and FDI are fully geared towards this. Despite this strong focus, the Advisory Board for ICT testing does not yet assess FDI sufficiently. She advises to make it even easier for customers and market parties to connect by offering open source KITs in different software languages as an ecosystem itself. And to further focus on guidance from sector organisations, who know the customers well.

Confidence framework

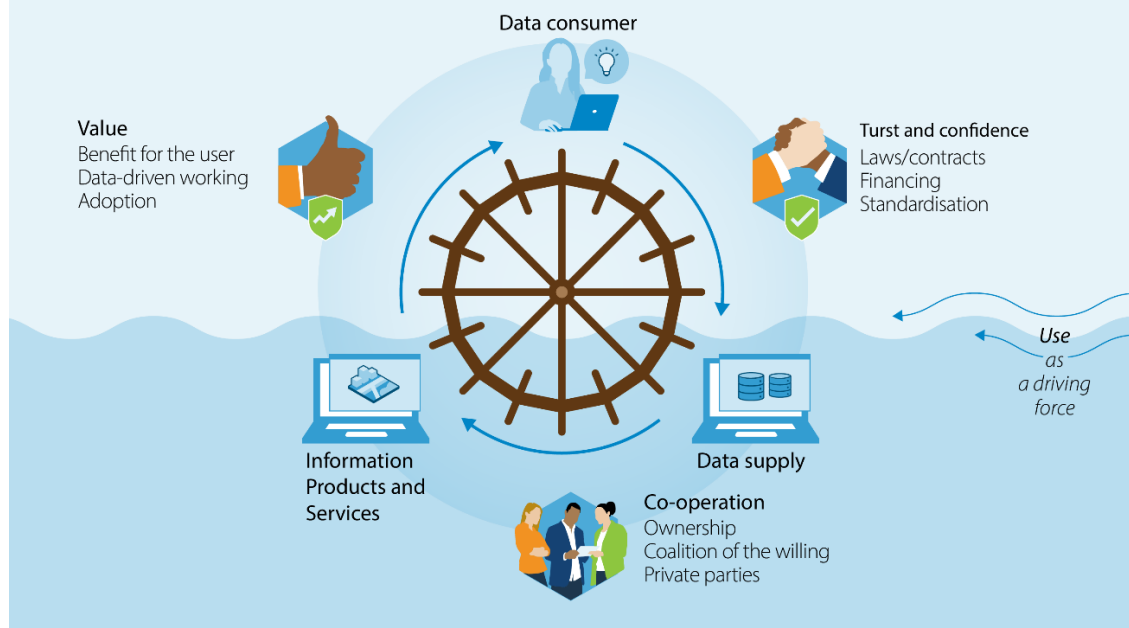
A trust framework, authorization and authentication deserves extra attention. This is necessary to be able to share trusted data but also increases the threshold to participate. As a government, ensure a very limited number of trust frameworks because as a buyer / source holder it will otherwise be an impossible and expensive task to keep crossing this threshold.

Robustness of the ecosystem – working under architecture

Design and develop the data ecosystem under architecture, in line with the architectures already established in the Netherlands and Europe. Give architects a clear advisory role in governance/decision making.

We end this chapter with the visualization that shows the flywheel and the most important aspects:

How does data flow? *a successful data ecosystem*



Participation in an 'ecosystem of ecosystems'

A data ecosystem is not well defined and will soon need information from other data ecosystems. Therefore, it is important that the ecosystem can reuse data from other ecosystems; that the same objects are used, with which they can be linked. Preferably, these key objects are found in the basic registrations, which offer topicality, certainty and structure. The technology makes linking and linking possible. The standards must align form and content and make them interchangeable. The information models must provide insight into the meaning of and the relationships between key objects. That is why there is a need for a national metadata ecosystem for a national ICT & data foundation. This is the subject of Chapter 5.

We used the above findings to create a (first version of) a checklist for a rapid 'flywheel analysis' for an ecosystem:

CHECKLIST FLYWHEEL

Value/use/adoption/use

- ☐ We know the purpose of our ecosystem.
- ☐ We know which primary processes/operational chain supports our ecosystem
- ☐ Digital transformation is on the agenda of our policy management every month
- ☐ We have translated our assignment into B1 language and shared it with our stakeholders
- ☐ We know the needs and value of customers through Usecases
- ☐ We have implemented a Pilotage/implementation team
- ☐ We have a living lab in which we innovate and test together with customers
- ☐ We are in contact with the primary IT service providers of our customers so that they connect to our ecosystem and can play a role in the roll-out
- ☐ We talk to industry organizations about our standards and deployment plans
- ☐ We have more than 15 customers

Cooperation/Participation/Participation

- ☐ Together with our policy directors, we have the ambition to run the show
- ☐ We have monthly contact with our policy management
- ☐ We have an unambiguous control that makes decisions around the ecosystem
- ☐ We know the future developments (e.g. new laws) of our policy management and their impact on our ecosystem
- ☐ We develop our ecosystem together with the market / private parties
- ☐ We have a connection in our domain at European level

Confidence

- ☐ We have sustainable (enough and multiannual) funding for our ecosystem
- ☐ Our policy management contributes at least 50% to sustainable financing of our system
- ☐ We have a management organization that manages change processes
- ☐ We include standards in our purchasing conditions for external parties
- ☐ We know what data we have ourselves and what we need from basic registrations/other ecosystems
- ☐ We know what functionality we build ourselves and what we reuse from elsewhere
- ☐ We have translated our demand for national functionality/data into use cases and shared it with NDS/FDS/GDI
- ☐ Our information links to one or more objects in a basic registration
- ☐ We provide insight into what information we have and what the quality of it is
- ☐ We know from our gatekeeper function on which basis we can share data
- ☐ We invest in increasing data quality
- ☐ We unlock our data through APIs

4. Inventory – the DSSC building blocks

In this chapter we take a trip to the DSSC (Data Spaces Support Centre) and link to the interviews. The DSSC model describes what is needed to build a successful ecosystem. It is therefore no surprise that the three focus areas of the flywheel are broadly reflected in the Governance Building blocks of the DSSC:

- Trust: Legal (but also in Governance and Business)
- Value/Use: Business
- Cooperation: Governance

The Governance building blocks provide the essential set-up needed to organize the dataspace. In this setup, we need to distinguish between the business model of the infrastructure that can support multiple use cases and the business model of the individual participants of the dataspace.

Both the infrastructure and the participants are part of data ecosystems. The concept of ecosystems is derived from biology, where natural ecosystems achieve equilibrium without central planning. Similarly, the dataspace participants have their own business models, which are not centrally coordinated. The entire data ecosystem must ultimately be able to find balance if continuity is to be guaranteed.



Source: [Knowledge-base - Data Spaces Support Centre](#)

In this chapter, the columns from the above Blueprint are explained by means of a translation of the English DSSC text.

4.1 Business

This category contains the following building blocks:

Business model development – supports a data space in developing its business model by identifying the key components and identifying some considerations to be taken into account by the governing authority. The dataspace business model defines how the dataspace creates and delivers value for its participants and how it captures value to be sustainable in the long term. Unless the

dataspace is a continuously publicly funded infrastructure, there should be a mechanism for value addition and compensation, such as a dataspace user fee for participants or users.

Usecase development – is a strategic approach to increase the value of a data space by creating, supporting and scaling up operational business processes or social issues. The use cases depend on the data space to solve social challenges or create value for one or more participants of the data space. Usecases generate demand and potential customers for the dataspace, and the dataspace facilitates the cost-efficient implementation of these usecases. In order to achieve financial sustainability, it is necessary to attract use cases that generate revenue (e.g. through usage fees), while the costs of operating these use cases are lower than the total revenues. Each use case connects additional participants and data products to the dataspace. An essential part of the dataspace business model is strengthening synergies between use cases.

Development of data products – Data products are the basic units of use scenarios. Although data spaces follow a distributed design and differ from centralised platforms, many aspects of the platform economy apply. The creation of network effects between the ‘supply’ and ‘demand’ of data is essential for the value of the data space. Access to a good selection of data products will attract data users, and a large user base will attract more data providers (the flywheel). At the interface between government and the market, it is often market parties that develop data products, such as at DMI. But to stimulate the market, the ecosystem must develop and maintain basic (open source) data products (software KITS). Users should also be helped with simple plug-and-play KITS to easily become participants in ecosystems.

Intermediaries/suppliers of intermediate products–Intermediaries provide support services to the organisation and participants in the data space, preferably ‘shared’ with other data spaces in view of costs. Examples of enabling services are identity, authentication, logging, catalog and connection services. The dataspace can rely on these external organizations instead of providing all support services ‘internally’. The intermediaries may specialise in providing the same services to multiple data spaces.

4.2 Governance

The governance building blocks mainly focus on governance at the dataspace level, with an emphasis on its dynamic nature. Governance in dataspaces must adapt as the dataspace develops. This requires participants in the dataspace to work together strategically for effective governance. This category contains the following elements:

Organisational governance – This is needed to help participants organise the data space and achieve their goals. Governance is versatile and includes several important decisions, such as the scope of the dataspace, the position the dataspace wants to occupy in the ecosystem, openness with regard to new participants, the support it wants to arrange for its participants, or the principles it wants to implement (for example with regard to control). The specific choices will differ per dataspace, but they should strive for collaborative, multi-stakeholder governance for an effective functioning of the dataspace. Governance includes transparent rules and roles.

Controlling data sharing – How are data transactions facilitated within the data space? A supervisory authority may impose rules and standards on the security, findability, accessibility performance, interoperability and traceability of data. Clear data sharing rules are essential for building trust between the dataspace participants and directly reflect the functionality of the

dataspace. The degree of enforcement of rules is a strategic choice that affects the admission requirements and the implementation of new use cases. It also determines the deployment of support services, such as identity and catalog services. This building block provides the basis for efficient data sharing processes and ensures reliable and observable data transactions.

Which supervisory authority will establish rules and standards for the cooperating ecosystems in the physical domain? See Chapter 5.5.

4.3 Legal

The legal building blocks describe means that ensure the security of the dataspace through a legal or contractual framework:

Legal framework – The legal framework covers the legal issues affecting the functioning of the data space and authorises the collection of data for specific, explicit and legitimate purposes (purpose limitation). Think of data protection, competition and intellectual property laws. It clarifies the relationships between different legal frameworks and supports in assigning legal responsibilities and liabilities in data value chains.

Contractual framework – How do you ensure fair reuse if there is no purpose limitation (yet)? The contractual framework sets out clear and enforceable rights and obligations for data space participants and provides contractual means to regulate their data transactions.

4.4 Best practices and reconnaissance boats

During the joint consultation with the ecosystems, mutual trust emerged to exchange open learning points and best practices. There is also the openness to share new initiatives (new ecosystems or policy choices). Every ecosystem has best practices that can be shared with other or new ecosystems. Some examples:

Value/Use/Use:

- Establish a marketplace for providers and recipients of data services and housing acceleration tooling (DMI);
- Build Fieldlabs in which customers, providers and governments jointly develop requested services and products (BDI, VNG, FDS). Use intermediary service providers to build components for trusted and cross-border validation labs (DITM);
- Data-driven working makes it possible to redesign spatial processes, for example working in parallel (DMI). These improved processes quickly have a positive business case, because the planning costs in spatial development are very high (DMI DSGO).

Cooperation/participation/engagement:

- Engage implementation coaches from sectoral interest groups to facilitate their members to start working data-driven (BDI, CoE-DSC, DSO);
- Use the Data Sharing Strategy Model (DSSM) to determine what is already common within an ecosystem, what needs to be further developed and what is specific to certain customers (CoE-DSC);
- Work as a national government service with implementing organisations of co-governments to achieve joint results (ILT, VTH, DMI, DITM);
- Collaborate with and listen to municipalities and provinces, which have the role of customer, data provider and service builder (VNG, DSO, DSGO);

- Collaborate with (semi-) private partners such as the Mainports (BDI, EMDS), who know the information needs of customers;
- Cooperation with SMEs, where there is a lot of implementing power (FDI);
- Create joint roadmaps from customers, market and policy directors. Fund and support this and leave the implementation (partially) to the market, for example in the (automotive) industry (DITM);
- Slowly improve data-driven working by collaborating with data customers and providers of a data platform (RWS, ILT);
- Use private parties/European companies in the construction of data ecosystems (CoE-DSC).

Trust/financing, legal/contract:

- Organize a participation structure of customers, data providers and service builders (DMI, DSGO). Allow fellow governments as members anyway, because you need them in the service (VNG);
- Working with a management agreement to guarantee co-ownership and agreements (DSGO, DSO);
- Build widely accessible exchange channels, such as the Common Carrier Layer (EMDS), Common Ground of the municipalities (VNG) and the data platform (RWS);
- Explain the utility and necessity of data ecosystems in non-technical terms to make the value clear to non-specialists:

4.5 Competence Center/masterclass ‘realisation of data ecosystems’

The 10 collaborating data ecosystems have the ambition to continue to exchange joint components and best practices during the consultation that is planned monthly. The question is whether this offers enough time and space to really learn from each other and safeguard the lessons learned.

Our advice is to set up a competence center Dataecosystems, where (new) ecosystems can turn to for both technical and organizational available and reusable components. This competence centre, which operates under the NDS flag, can offer this information in the form of technical and organisational masterclasses or course ‘realisation of data ecosystems’. The checklist from chapter 3 can provide a starting point for this.

The next chapter focuses on the collaboration between data ecosystems and the metadata ecosystem.

5. The Metadata Ecosystem (INTER)

A data ecosystem is not clearly defined and will soon need information from other data ecosystems, adjacent sector data sources and from market parties.

Therefore, there is a need for a national metadata ecosystem: an ICT & data foundation, which facilitates fast onboarding and low-threshold interoperability. This chapter describes this national ecosystem, sectoral ecosystems that develop parts of it, and how they can be successful.

Why an inter-ecosystem control? Why a national foundation? Not only is this necessary to make ecosystems interoperable, but also to increase efficiency, reduce costs, (not always invent the wheel), increase quality and make ecosystems manageable. We want to lower the threshold for interoperability. Uniformity and recognisability in onboarding, whether technical, contractual or knowledge-gaining, will make adoption easier. In other words, it should be as easy as possible for potential participants to participate in multiple 'data sharing initiatives'.

That is why it is important that the same connection technology and the same objects are used, with which it can be linked. Preferably, these key objects are found in the basic registrations, which provide certainty and structure. The technology must make linking and connecting possible. The standards must make form and content relatable and interchangeable. The information models must provide insight into the meaning of and the relationships between key objects.

The disadvantage is that ecosystems give up part of their autonomy. FDS says about this: 'Our control options are limited. If there are already four solutions, and we standardize one, then we disappoint three. There is a call for leadership. No one is against cooperation. But having to follow leads gives less freedom and that is 'difficult' (FDS).

We talked about this with the ecosystems. Returning autonomy was a *nobrainer* at the time when jointness is needed to meet the customer's needs. For the matters where you need togetherness, you must, and you want to. Data ecosystems indicated that they would work with 90% of the functionality, if necessary, for the benefit of the customers and the higher goal.

Collaboration costs autonomy, but you get interoperability, and therefore functionality, extra data / (data) quality, efficiency and trust in return. At least, if we do this together, as participants in and recipients of the national 'ecosystem of ecosystems'. The executive co-governments VNG and IPO also want to do this and actively cooperate by increasing data quality and interoperability.

NDS stimulates, realizes and secures the metadata ecosystem through federated implementation

NDS is committed to shaping this national foundation, the metadata ecosystem, with the implementation programme IBDS/FDS. This is federated. Parties such as Logius, ICTU, Forum Standardisation, MIDO/GDI, ZoN/NGII fill in parts and already offer national functionality and standards. It must be known how the cake is divided and who takes what responsibility. Who pays, has perseverance and can make decisions.

The NDS is therefore a federated ambition, in which various ministries take responsibility for filling in parts of the national foundation and making it accessible. For example, by ensuring high quality basic registrations and datasets, keeping key objects up to date, securing standards, realizing technology / tooling (including trust framework) and offering training / roll-out. The federated and sectoral architecture describes the structure, coherence and rules through processes.

The NDS is made up of sectoral digitisation strategies (SDS).

To be able to participate in national flotillas, clarity is needed what the NDS offers and who arranges what: High what needs to be done, low what can be done. Make a distinction between what you want to do nationally, what is regulated at sector level and what the data ecosystems themselves fill in.

Divide the cake into pieces and give organizations the opportunity to roll out and further develop what they already have and use. Make money but also (persistence) power available for this. The contributors, such as NGII/ZoN for the integral area image and geo-enabling, describe their contributions in a sectoral digitisation strategy. This is done according to a framework proposed by NDS. In addition to fulfilling their own policy objectives, these sectoral digitisation strategies add up to the NDS.

The flotilla *enables interoperability*

Domain dataecosystem
Ex. Digital System for the Built Environment



Sectoral data ecosystem
Data Space Physical Living Environment



Meta data ecosystem
Federated Data System (FDS)
Generic Digital Infrastructure (GDI)

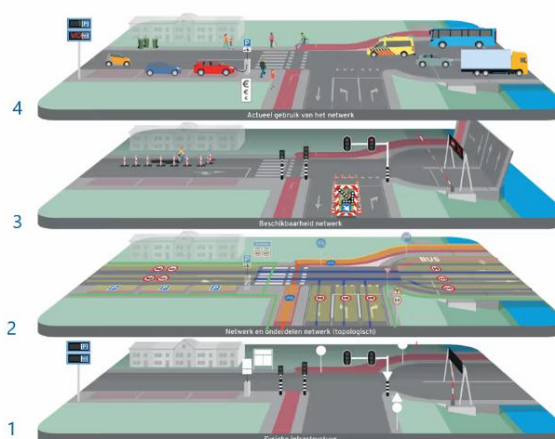


Example of sectoral data ecosystem mobility

The study also shows that the mobility data ecosystem (BDI, DSM, DITM, NTM) has specific sectoral digitisation needs with its own (real-time) data needs, specific customers and standards. The four-layer model describes the sectoral relationships:

1. Static data physical infrastructure
2. Static data road network
3. Dynamic data availability road network
4. Dynamic data use road network

There are of course strong relationships between mobility and networks with the spatial tasks. So data exchange of the planes physical infrastructure and availability (e.g. congestion) is necessary. The Dutch Directorate-General for Public Works and Water Management is working intensively on this.



National Technology Strategy

Digital technology and its further development in the Netherlands is a precondition for the NDS. The National Technology Strategy² of 2024 identifies priority key enabling technologies for the value chains where the greatest opportunities lie in the Netherlands.

This digitalisation policy aims to stimulate and embrace the opportunities of the digital transition in order to safeguard our public values. The strategy focuses on four themes: digital foundation, digital government, digital society and digital economy. The flywheel of the (meta)data ecosystem connects these themes and ensures that results are delivered and used. This makes data ecosystems the implementation vehicles of the (digital) government and economy.

And a reliable digital foundation is also needed as a basis for Dutch and European AI development. In AI development, not only technology and trust, but also adoption by companies and governments plays an important role.

5.1 How will national/sectoral data ecosystems be successful?

What applies to a part also applies to the whole.

As a fractal, in which parts of the figure resemble the whole, but on a larger scale, the **flywheel** applies here just as well. Here, too, the aspects of value, cooperation and trust apply.

The metadata ecosystem leads to better functioning domain ecosystems. Well-functioning ecosystems lead to more satisfied users, who can provide better services to citizens, businesses and other governments. Services aimed at achieving the social goals for which the ecosystems have been established. Together, the ecosystems are the face of the 'digital Netherlands' and stimulate the digital economy.



5.2 Value/use/utility

The success of the data ecosystem, whether in a domain or the national 'ecosystem of ecosystems', depends on only one thing: use. Here too there is a flywheel that has to turn, on various axes and subjects.

Special attention is paid to how national standards, data and functionality are used. Here too, the focus on use case-oriented work, labs, early adopters, knowledge transfer, and roll-out/implementation is a rock-hard precondition for success. The organization of (parts of the) metadata ecosystem must be geared to this from the very beginning.

Linking to policy and social tasks by proxy

Use cases drive the value of ecosystems. NDS/FDS are enablers to make this possible. They offer functionalities that are necessary for multiple tasks, in particular to be able to link and exchange data between domains. The use cases thus determine the content of basic registrations and other core registrations (NDW, INSPIRE datasets, satellite photos, etc.).

² [The National Technology Strategy |](#)

Standard components for fast construction of data ecosystems

In many interviews, the importance of a national digital infrastructure is discussed. Analogous to main infrastructures such as the national road system and utilities of water, electricity and gas, the government is the party to build a main data infrastructure. This is necessary for generic access and the access, unlocking and flow of domain data.

Parts that are already available or are being worked on:

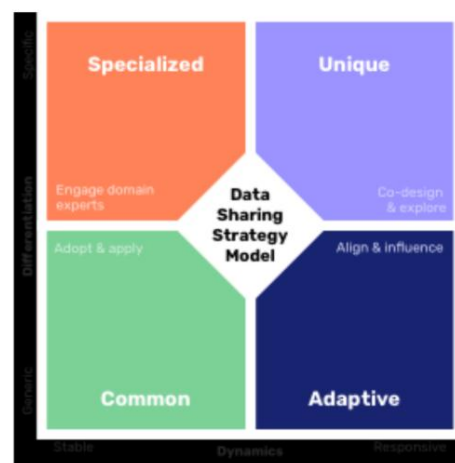
- Generic Digital Infrastructure (GDI);
- Developer kit (IT for IT); API strategy, (Developer.overheid.nl);
- Dutch cloud functionality (DMI, DSO, NGII emphasise the need);
- Create a common carrier layer (CoE-DSC);
- Need for a dataspace kickstart: how to build systems in the Netherlands (asked by VTH);
- Trust framework(s) - for G2G and G2Market. It is very important that companies can share identification data with the government in one way and preferably also in the chain. A logistics service provider must have one standard way of onboarding. Ensure that the interface with companies is standardised.
- Findability and comprehensibility of data. Understanding of coherent information models and concepts is needed, through a master information model of the 'main road network' of key objects (based on MIM) and a master vocabulary (based on NL-SBB);
- A set of basic registrations, filled with these key/link objects;
- A set of reusable components such as Dataspace as a Service (DSaaS), Digital Twin as a service (DTaaS);
- Unambiguous location and possibility of geo-referencing and geo-enabling (objects, coordinates, administrative areas, contours, GLN);
- Marketplace functionality.

How to determine what is needed generically?

It is important to start from a value perspective: What is the value for end users? No one necessarily wants a dataspace or national functionality. It's a means. It is not for nothing that the GDI says 'agreements, above standards above provisions'. Data ecosystems want to solve a problem that requires data exchange, and are willing to give up autonomy for that.

It helps to understand the generic need. Map the desire for ecosystem-crossing functionality through use cases (CoE-DSC). First look at requirements, only then at technical implementations.

There is a role for the CDOs to lead this process. Then the *coalition of the willing* (the flotilla) can be assembled and started.



CoE-DSC provides us with the *Data Sharing Strategy Model* (DSSM) to distinguish common denominator between data ecosystems and enable further development. There are opportunities to apply this model to organize the collaborative governance of ecosystems.

Step by step and evolutionary

Start with what's there. Don't make the mistake of setting up a big extra development program. Divide the cake into pieces and give organizations the chance to develop what they already have and use. Focus on small steps, agility, early use, showcases, enthusiasm, distribution, reworking, making generic what already works. Clear but reliable. Collaborate with the market and with Europe. The use of living labs, POCs, sandboxes gives space to experiment together.

Provide room for management and further development

Strong management processes are needed to keep the ecosystem alive. FDS and especially the GDI must move along with what ecosystems need. In the spatial domain, the BAG (Key Register of Addresses and Buildings) is an example. In order to be able to meet the demand, in addition to the authorised use as included in the BAG, the current use must also become available. A structured process to address new data needs is necessary.

Focus on communication/training/implementation

Here too: Being available is not enough. From the very beginning, the metadata ecosystem must focus on use. Knowing its customers, building a *coalition of the willing* (the flotilla), engaging early adopters, testing, giving training, developer kits via developer.overheid.nl, and so on.

5.3 Cooperation/Participation

Meeting each other, knowing each other, giving commitment and perseverance

- There is a need for a flagship ecosystem flotilla;
- BZK has the task of organising the table where we jointly discuss what is needed, for example via FDS or MIDO/GDI;
- Digitalisation should be an issue in the Council of Ministers.

Search for the customers that benefit from national standards and components per theme. Bundle these customers in a coalition on this theme, as the GI council, for example, gives direction to the

theme of geo/integral area image. Clarify the conditions and strategy you are signing up to, based on the first parties to see cooperation on interoperability. Sketch an eye-catching perspective.

Roles and responsibilities

It is not yet clear how the management on NDS will be organized, especially on the execution side. Who runs the whole thing? Who divides the cake into sectoral assignments? What is the interaction between national governments and other governments? How does the NDS translate into components and standards that bring value?

Public-Private collaboration

Here too, market commitment is valuable, depending on the theme. Low thresholds to enter help. Open standards can (and should) be enforced through purchase contracts. Overall is that a generic marketplace functionality can be thought of, in which requesters and providers of data and functionality, such as calculation models for Digital Twins, can find each other and do business.

Cooperation in Europe: generic standards and functionality

The data ecosystems interviewed are based on and aligned with European initiatives and standards. It builds on or provides input to the development of European initiatives:

- Intelligent Transport Systems (DSM NTM);
- Napcore (DSM NTM);
- Mobility dataspace (EMDS);
- EDICs in formation (EMDS, ZoN) focused on use cases;
- Data Sharing Coalition (CoE-DSC);
- Gaia (CoE-DSC).

Recent research by ICTU³ shows that the Dutch efforts towards Europe have yielded the above important key positions, but have limited coherence overall. The research identifies three key needs: better overview, light national coordination and structural knowledge building. These are necessary to achieve sustainable and strategically relevant Dutch involvement in the European digitalisation agenda.

Municipalities/VNG/Common Ground as a driver

Municipalities are crucial in the realization of the most important physical tasks: housing, energy and heat transition and climate adaptation. In its *Digital Municipalities Agenda 2028*, VNG⁴ indicates how it wants to contribute to these tasks with the right data at the right time. By the municipalities themselves, but also by providing better services to citizens and businesses. The municipalities provide, but also ask for certainties to be able to carry out their tasks with sufficient decisiveness. Common ground⁵ is an informational vision that the municipalities want to roll out. In the context of the NDS, the VNG has requested one billion euros to be able to provide the full range of (source) data quality and digital services. Soon the VNG will come up with a detailed proposal towards GDI in order to be able to fulfil the requested digital effort of the municipalities. The VNG asks the GI Council to take the necessary decisions, including funding, in order to be able to take the NGII digitally.

Provinces/IPO/Provincial strategy as a driver

As a regional area director, provinces must have a good overview of the social challenges and in-depth knowledge of their area. This is the basis for developing an area vision and potential integral

³ [The Netherlands and standardisation: seize opportunities](#)

⁴ [Digital Agenda Municipalities 2028](#)

⁵ [Common Ground | VNG](#)

solutions for the societal challenges such as housing construction, energy transition, but also nature conservation and development. The provinces provide physical source data to the data foundation of the rural area. They want to strengthen and improve the quality of this information position and also provide innovative information products for this. The IPO has a key role to play in this programme.⁶

5.4 Confidence

Sufficient and stable funding

The national digitalisation foundation is a national responsibility. Think of other networks such as the railway or Rijkswegennetwerk. Not only the construction, but also the long-term management and maintenance must be guaranteed. Everything that falls under the NDS must therefore be financed for a long period of time. Again: rather a smaller foundation that is secured and can be counted on, than a large but incalculable structure.

This is in line with the recently published PBLQ Report, which looked for solutions to current financing issues (for which 5 'data systems' were examined, four of which were basic registrations) and asked for building blocks for a (future) structural financing arrangement for data systems in general.

A recommendation is to 'look at it from a broader common perspective' and organise it with 'other arrangements' and more central direction. It is recommended 'to start with a group of systems that have a very broad scope and where funding bottlenecks are currently experienced'. These could be the basic data, standards and tools that form the basic structure of the Netherlands and are therefore included in the NDS.

Difficult point: How do you prioritize the common interest over the silo interest? A minister should not only receive credits for tackling and solving his own task, but also for stimulating and realizing unity.

Make the meaning and quality of data and services discoverable

Approach government data management step by step as a whole-data are not from an individual organization but for broader applicability of tasks for government. Look over domains for data sharing. Make clear who is responsible for which data and invest in data quality. The registrar must ensure quality and keep multiple uses in mind at all times.

Focus on semantic standardization and a coherent system of information models. Provide an overall insight into data quality, insight and quality assurance and quality control. Install a quality planning system.

Manage standards and ensure they are adhered to

Organize perseverance to enforce standards. Ministers (or a Minister of Digitalisation) should be able to make a fist, similar to the Minister of Finance: If you don't follow the guidelines/standards, you won't get any money. Separate the administrator from the default and administrator provision. This 'supervisory authority' is also needed in the physical domain. There is a need for a sectoral party to draw up rules and standards for the cooperating ecosystems in the physical domain. Show customers that the metaecosystem is usable and easy to apply.

Deploy Developer.overheid.nl. Give trainings, e.g. API trainings like Geonovum does for BZK in the domain of the living environment.

⁶ [Digitalization - Interprovincial Consultation](#)

Stability and future-proofing of the ecosystem – working under architecture

Design and develop the data ecosystem under architecture. Work with a reference architecture.

Redesign processes, if necessary. Give architects a clear role in governance/decision making. Set up a management organization, including version management and change communication. Pay attention to what you need for Innovation, which is often more data than in the operational chain.

5.5 What do ecosystems demand from NDS?

The table in the annex describes in detail what the ecosystems demand from NDS. A brief overview:

Value/use/use

- Know as NDS the use cases that bring value to the customers so that you know what the metaecosystem has to deliver. Find *coalitions of the willing* (FDS) by theme or sector. Make widely known which coalitions/flottilles are sailing out, adopt their results and make them available for generic use;
- Ask the customers to translate their desire/need for national/generic functionality into use cases; as a flotilla, provide joint use cases to ZoN/FDS/NDS;
- Know as NDS which operational processes you support;
- Translate the NDS assignment into B1 language and practical terminology that stakeholders/customers understand;
- Be committed to adoption. Spend as NDS but also sector (SDS) serious money on pilotage/adoption/data-driven working at the customers;
- As NDS, also use the market/IT service providers for realisation, standard setting and roll-out. They not only ensure that their software is interoperable with the ecosystem, but also include their customers, the customers, in the roll-out;
- Encourage access to data through APIs.

Cooperation/participation/participation

- Act as NDS as the flagship of the meta flotilla. At this table, generic plans are made, the route is determined, the overview is monitored, the cake is divided. Here smaller flotillas are started per subject and per sector. We're going to do it and we're going to do it now.

Trust/financing/legal/contract

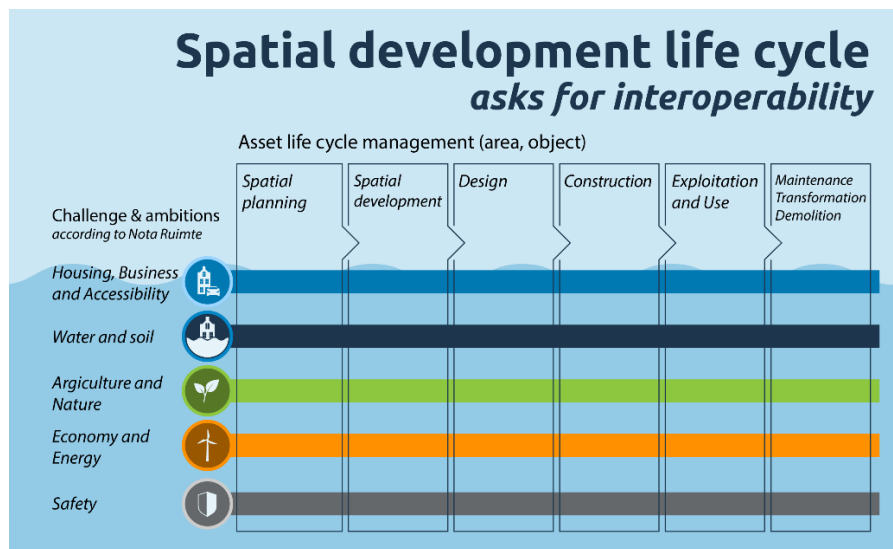
- Ensure structural financing of the joint digital infrastructure (all);
- Do not strive for perfection and do not wait with data sharing until it is perfect, but give insight into the quality of your data and products;
- Each system has a gatekeeper function. Please indicate which data is shared on which basis.

5.6 What do ecosystems ask of the physical environment sector?

Value/use/use

- The image of the outdoor space, the integral area image, is necessary for all tasks in the spatial domain. It shows what is there, what is possible, what is allowed. Ensure that this integral digital area image is created;
- Start yourself and digitize the NOVEX / Note Space. This is the basis for understanding spatial planning and joint policy direction;
- Align the Physical Environment vision with the policy cycle and adjust the data and functionality accordingly;

- Create reference processes (take the area cycle as a starting point) and a reference architecture that includes the basic registrations, key objects and generic facilities;
- Invest in a coherent, sleek but up-to-date and complete data foundation for the living environment. Make sure that BAG, BGT, WOZ and BRO connect seamlessly so that coherence does not have to be sought for every use. This is also the basis for 3D data;
- Connect with and between the data ecosystems that have area information, through a standardised data sharing infrastructure. Offer pivot/key objects in the physical domain to which you can relate distributed spatial objects;



- Use and implement what FDS already arranges, such as authorization and catalogs. The existing GDI lines are a starting point, including the use of the feedback structure to make the agreements, standards and provisions even better;
- Together with DMI, ensure that analyses, applications, calculation models and visualisations become common facilities;

Adoption

- Create an adoption approach for geo-referencing and geo-enabling for a spatial information/integral area image, together with declining data ecosystems;
- As VRO, together with VNG and DMI, stimulate organizational data-driven working in operational processes at municipalities. For example: municipalities receive subsidies for housing, on the condition that they start working data-driven, for example with a sustainable digital twin. This requires pilots with knowledge of municipal practice, for example to add to existing expert team housing acceleration at RVO. Data-driven working thus becomes a part of project-based area development;
- Use a crisis (scarcity of space, or scarcity in professionals for example) to effect a change and do it faster, better and together;
- Focus on a joint spatial field lab for testing and early adopters.

Cooperation/participation/participation

- Act as a GI advisor in the role of director, responding to what is needed in terms of spatial information and functionality for different policy domains. This is the spatial flotilla: Take joint responsibility for an integral area image (all);

- Show more control power as GI Counseling. Here are the people who have perseverance and power. Take this responsibility, go ahead, give clarity about the future. Feel the urgency and act accordingly. There is pressure and turmoil in tackling societal challenges;
- The Directorate of Spatial Information plays a coordinating role in this;
- Dataspace Physical Environment must work together with DSGO to connect the world of areas and buildings via BIM;
- Create unambiguous catalogues and meaning in the spatial domain. See if it is possible to join the IPO's Interprovincial Dictionary initiative;
- Which supervisory authority will establish rules and standards for the cooperating ecosystems in the physical domain?

Trust/financing/legal/contract

- As GI, take joint responsibility for the financial deficit for the NGII, the lack of money for further development and for the costs and implementation of an integrated area picture;
- Create a multi-year vision. The aim is an integral area image, made up of the information from multiple data ecosystems and with possibilities for scenarios and visualisation (all);
- Create awareness that data availability and quality appear to be 'water from the tap', but that there will be time, energy and therefore money to keep it that way. We are going down to the success of the registrations, there is hardly any money to keep it in the air, let alone improve and expand it. A new arrangement is needed (VNG, ZoN, DSO);
- Stimulating standardization for the source holder side, SOR, including mobility data (VNG) Arrangement for source holders for data delivery or sharing, including financial solution (DSM, NTM). Link this to Common Ground. The municipality of Rotterdam is working on this with project Mercator, in which the work process of the municipality for the collection and updating of basic registrations is optimized into an Integral Source Registration Objects (IBRO);
- Further development is needed on the NGII, starting with good change management.

6. Advice & Action Perspective

6.1 Flotilla & Prosperity

During the first study, the image of the ‘flottile’ arose: An occasional coalition of ships (ecosystems) with a common purpose. By sailing together, they can achieve their goal faster, better or safer. Each ship, of its own free will, draws on this. After reaching the goal (and the party to celebrate it), the fleet shares its experiences with other ships and pilots and chooses a next goal (and coalition). It is important that each ship bears its own responsibility. His own customers, a well-considered course, a skilled captain and crew. With whom do you go on the journey, who do you trust in foresight and adversity?

Times of growth; value creation

When the Netherlands became a federation of provinces (16th century), all of Europe dreamed of sailing to India with sailboats to buy spices there. These spices were expensive at the time, because land transport was long, dangerous and inefficient. The Portuguese managed to reach India by sea. The Netherlands followed quickly. Mapmakers on board mapped the coast. These maps were the main source of information allowing ships to find their route to India. The trip took more than a year, but the financial gain was large: The trip was recouped 6x.

This business case led to a rapid expansion of this trade in the Netherlands. The Netherlands was able to build ships quickly and relatively cheaply, because our windmills could saw wood efficiently and well, thanks to research by natural scientist Volker Stevin. Ships were being designed better and better. More advanced navigation technology made the journey faster. Sailing in flotillas made the trip less dangerous. The success was that all this knowledge and experience was quickly disseminated through yards and boardrooms.

Trust and cooperation

Despite this, these loose flotillas did not succeed in becoming profitable, it was considered a ‘risky business’. Subsequently, the States General decided to encourage cooperation between the companies. They gave the unified companies (this became the VOC) extra security by giving them a concession for 20 years on this spice trade. Thanks to this concession and trust in Dutch laws and regulations, financiers ventured to invest in this cooperation, both citizens and large foreign financiers.

Prosperity and frameworks

A combination of a promising business case, daredevils, knowledge sharing (map information), technological development (better navigation) and rapid production via standard components (wood from modern mills) and a government that gives confidence and stimulates cooperation has led to great prosperity in the federated Netherlands.

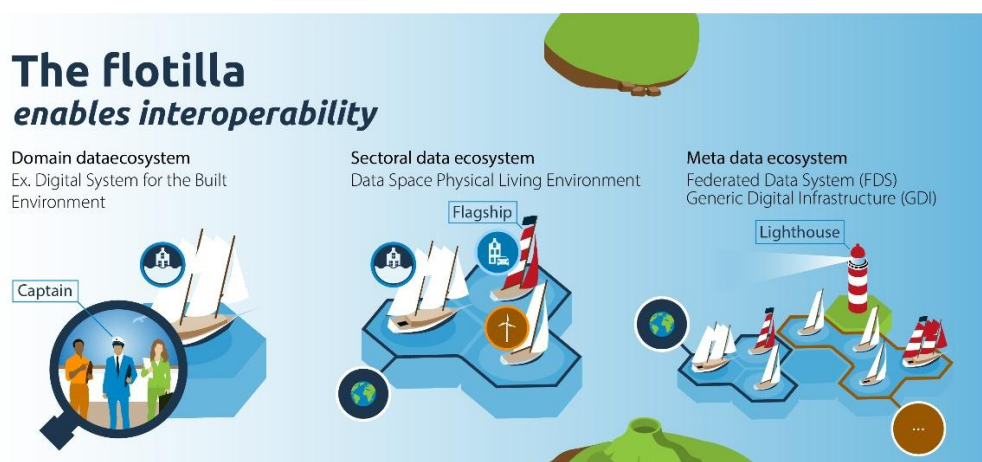
Unfortunately, this often came at the expense of other countries and even led to excesses such as slavery. We now know that the government also plays a role in ethical frameworks, laws and regulations and enforcement to prevent extremities.

6.2 Advice

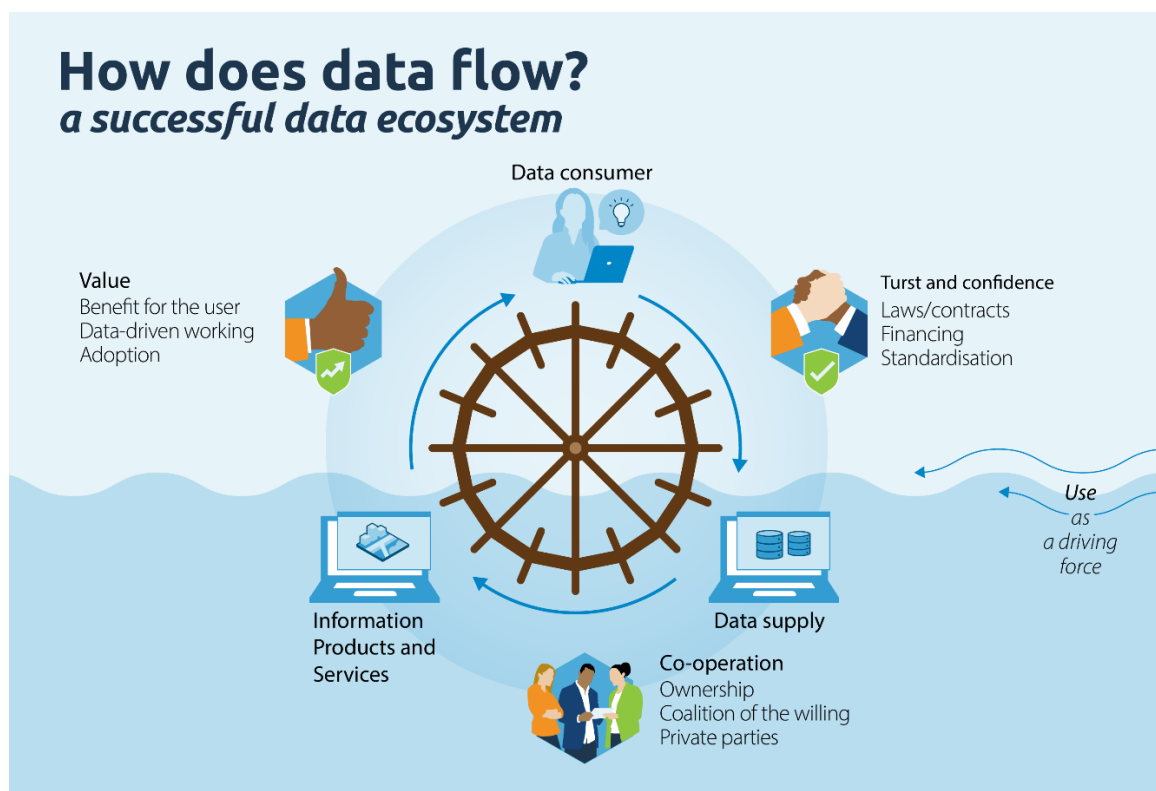
This report contains best practices, tips and ideas. But which ones have the most impact? In this chapter, we highlight the most important advice.

Advice for NDS for a successful metadata ecosystem

1. Find **ownership for the federation** that creates and manages the metadata ecosystem. Who is at the helm of the metavlaggenschip and has decision-making power? How is the multi-annual funding going? FDS may play this role. Make this even more widely known and create a roadmap outlining what is available. Provide insight into which topics flotillas are sailing and which flagship to approach to join or use the result;
2. Offer and communicate a **national foundation that already exists**, made up of current building blocks, data and functionality. Reserve money for improvement proposals from customers (= the ecosystems). The GDI may fulfil this role. Here too, clarity is needed about available components and a roadmap for future components;
3. Build a **coalition of national providers** (public and private) that offer standard components for the ship nationally or per sector. Divide the cake: invest the responsibility/ownership for themes/sectors (such as 'integrated area image') so that it is known who provides what and what they are working on;
4. Betting on **semantic interchangeability**: key objects, concepts (authoritative definitions), information models. For the physical environment, the IPO's Interprovincial Dictionary initiative, which uses the Logius system catalogue, could be a good starting point;
5. Offer **compact, slender basic registrations** that are a current representation of reality with reliable objects. These are a coat rack for unlocking domain information. Make the delivery efficient and cost-effective for the source holders;
6. Use the ambition, knowledge and energy of *scout boats (coalition of the willing)* to offer a national **trust framework in the short term**;
7. Create a **pilotship** where all knowledge and experience is collected and distributed through the pilots to the pilots on the bridge of the vessels. Start and collaborate in a Competence Center Realization Data Ecosystems to lower the threshold for interoperability. Uniformity and recognisability in onboarding, whether technical, contractual or knowledge-gaining, will make adoption easier. It should be as easy as possible for potential participants to participate in multiple data sharing initiatives;
8. Publish an **agenda of meetings and initiatives** of the thematic areas so that ecosystems know which flotillas are sailing. Create platforms for architects and programme managers/managers of data ecosystems to continuously exchange best practices and experiences.



1. Acquire responsibility from NDS/FDS to develop the strategy for the spatial information sector in a **Sectoral Digitalisation Strategy** that lands in the NDS (corresponds to point 3 under ‘Opinion for the NDS’);
2. Strengthen **ownership through** the GI council, as a decision-making body with vision and strength. Develop a multi-year roadmap and a stable financing arrangement;
3. Focus on the **dataspace physical living environment**, which enables the federated combination of spatial data by means of geo-enabling;
4. **Connect the geo-base registrations.** Build a slim base as a coat rack (offer stable and current key objects). Provide standards and semantic unambiguousness;
5. Ensure **connection and accessibility** of existing and new spatial registrations, such as for energy, climate, etc. Monitor the availability and quality of information;
6. Commit to an **efficient and cost-effective supply to** the source holder;
7. Perform **management** and enforcement on needs, data quality and facilities. Bundle your customers and early adopters for the change process and quality improvement;
8. Dedicate a lab for innovation and a **pilot for customers** to accelerate deployment/adoption;
9. Keep up with European developments.



1. Find **ownership** of the data ecosystem in policy management (with possible partners). The idea is that the digital world is analogous to the real world; so that the responsibility for the information is synchronised with the policy responsibilities. Policy programmes should take responsibility for their own domain of data/digitalisation. These finance policy issues, which

can be tackled more efficiently if you do it data-driven. Reserve part of the money for data-driven work in major policy programmes. Immediately when making legislation, take the impact on Digitalization into account. Organize the target binding as early as possible;

2. Ensure **structural financing** of data ecosystems, for example as part of the financing of societal challenges;
3. Create **value together with customers from the start**, step by step via use cases in the primary process. Use test beds. Keep searching for new customers by listening to the information needs in the primary process (e.g. area developers, urban planners, etc.);
4. Weigh what you **specifically** develop and which **generic** components you need/want to use. Hook to the flotillas that already exist for that (or start one);
5. From day one, give serious attention to the **piloting** of the data ecosystem (= knowledge center for digitization for customers, through adoption and implementation) together with partners (IT service providers, industry organizations, large companies) and the meta data ecosystems.

Advice for CIOs and CDOs

1. Stimulate data-driven working and the responsibility for **digitalisation among policy directors**. Make sure that the importance, usefulness, need for a stable digital infrastructure is taken seriously, especially in policy directorates. A quote: “We, data people, are not able to highlight the importance of a digital infrastructure for the primary policy process.”;
2. Assign the clientship/responsibility for the **management of data ecosystems** to policy directors (supported and supervised by CIO/CDO) to prevent a thousand flowers from blooming and a new data ecosystem is created instead of reusing/improving what is already there;
3. Offer data ecosystems a **methodology** to streamline joint development and balance specific/generic against common functionality (DSSM process);
4. See the opportunities for **occasional coalitions** (flottiles) and facilitate them;
5. Become a **knowledge centre/pilotage to hunt the** ‘flywheel ecosystems’ within the Ministry. Roll out the knowledge and approach as a process supervisor with the backing of policy directors. Work together with the national competence center (see advice NDS);
6. Create **KPIs** for the success of the data ecosystem. The questionnaire (Chapter 3) can serve as a basis.

6.3 Perspective of action

How do we continue?

1. **Continue the** ‘Periodical Consultation on Data Ecosystems’. This *coalition of the willing* is the place to identify themes, send out scout boats, catch up and exchange knowledge;
2. Play your role as a **joint buyer**. Directly respond to the urgent need for **trust and cloud functionality**. Reinforce this flotilla: bundle the early adopters in a usergroup, in which the entire flywheel is represented. Use cases to clarify what you need from this national/European functionality as a group of customers. Insist on small development steps that you can quickly test/use;
3. Determine the (future) **need for other generic data and functionality**. Start coalitions (flottiles). Play the game with national providers. Focus on the need for a national flotilla overview and a meta-roadmap;
4. Determine the work area and **owner** of your ecosystem. Regulate future-proof financing and management;



5. Create a **roadmap** for the large line but develop the (meta) data ecosystem **step by step with** direct validation of customers (labs);
6. Determine the role of the market and make entry attractive to them;
7. From day one, focus on **adoption and roll-out**, choosing your partners (pilotage).

Geonovum

T 033 460 41 00
E info@geonovum.nl
I www.geonovum.nl

visiting address

Barchman Wuytierslaan 10
3818 LH Amersfoort

postal address

P.O. Box 508
3800 AM Amersfoort

