

**An assessment of the open data
governance of middle-sized
Dutch municipalities**

MSc. Thesis

Author:

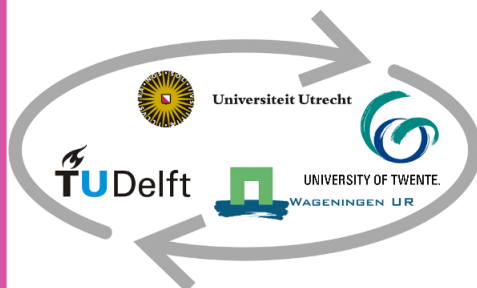
Renato Markus
(5532264)
r.a.markus@students.uu.nl

Supervisor:

Frederika Welle Donker PhD

Responsible professor:

Prof.dr.ir. P.J.M. van Oosterom



Abstract

Open data has been recognized around the world for numerous benefits. As a result, the European Union has been working on various open data regulations for two decades, and are to implemented in all its member states, including the Netherlands. However, the benefits of open data cannot be achieved by simply publishing data as open, it requires good governance to ensure its success.

A previous study on open data governance in the five largest Dutch municipalities a number of issues. These are departmental fragmentation and the inability to engage citizens with open data. In the 1990s, a study of municipal implementation of geoinformation structures found similar problems in large municipalities. The same study discovered that middle sized municipalities managed to balance the issues faced by both small and large ones.

This research examined to which extent the structural characteristics of mid-sized municipalities influence their open data governance. By modifying an existing data governance assessment framework, this research tested the open data governance of a selection of middle-sized municipalities in the Dutch Randstad area. Special attention was given to the governance aspects of cooperation and participation.

This research shows that mid-sized municipalities have a number of advantages in their open data governance. However, as in the previous research on large municipalities, not all aspects of governance are at a high level of maturity. This is especially true for participation. Municipalities with more affluent populations tend to be more successful in engaging their citizens with their open data, while those with less affluent populations are not as successful.

Keywords: open data, governance, municipalities, Netherlands

Abbreviation list

Abbreviation	Definition
AVG	Algemene verordening gegevensbescherming (See: GDPR)
BZK	Ministerie van Binnenlandse Zaken en Koninkrijksrelaties (Ministry of the Interior and Kingdom Relations of Netherlands)
DGA	Data Governance Act
EU	European Union
EPE	External political efficacy
G5	Amsterdam, Rotterdam, Den Haag, Utrecht, Eindhoven
GDPR	General Data Protection Regulation (See: AVG)
INSPIRE	Infrastructure for Spatial Information in Europe
OGD	Open Government Data
OZB	Onroerende zaakbelasting (property tax)
Rijkswaterstaat	Directorate General for Public Works and Water Management
SDI	Spatial data infrastructure
Who	Wet hergebruik overheidsinformatie
Wob	Wet openbaarheid van Bestuur (Access to Public Information Act)
Woo	Wet Open Overheid (Open Government Act)
WOZ	Waardering onroerende zaken (property value)

Contents

1	Introduction	7
1.1	Open Government Data, importance and scale effect	8
1.2	Problem statement	9
1.3	Research aim and objectives	10
1.4	Relevance	11
1.5	Scope	12
1.6	Research limitations	14
2	Literature review	15
2.1	Introduction	15
2.2	Defining the middle-sized municipalities	15
2.3	General qualities of the middle-sized municipalities	16
2.4	Open Data development	17
2.4.1	Open Data for economic growth	17
2.4.2	Open Data for transparency	19
2.4.3	Open Data for government efficiency	20
2.5	Open Data governance	20
2.5.1	Towards open governance	22
2.6	Planning open data	24
2.7	Financing open data	25
2.8	Cooperation within open data governance	26
2.9	Participation within open data governance	27
2.10	The legal framework for open data	28
2.10.1	Protection of personal data	28
2.10.2	Data ownership	29
3	Methodology	31
3.1	Developing the assessment framework	31
3.1.1	Levels of open data maturity	32
3.1.2	Strategizing open data	34
3.1.3	Sustaining open data	34
3.1.4	Legal framework of open data	35
3.1.5	Cooperation of open data	35
3.1.6	Participation of open data	37
3.1.7	Reading guide for assessment and scoring	38
3.2	Data gathering and analysis	39
3.2.1	Data validation	40
4	Gouda	41
4.1	Background of open data in Gouda	42
4.2	Gouda in Cijfers	42
4.3	Strategizing open data in Gouda	44
4.3.1	Task division and leadership of open data in Gouda	44
4.4	Sustaining open data in Gouda	45

4.5	Legal framework of open data in Gouda	45
4.5.1	Open Data ownership in Gouda	45
4.6	Cooperation of open data in Gouda	45
4.7	Participation of open data in Gouda	46
4.7.1	Open Data governance in Gouda	47
4.8	Open Data in Gouda summarized	47
5	Zoetermeer	49
5.1	Background of open data in Zoetermeer	50
5.1.1	Open Data Zoetermeer	50
5.1.2	Stadsatlas Zoetermeer	51
5.1.3	Zoetermeer in Cijfers	52
5.2	Strategizing open data in Zoetermeer	53
5.2.1	Task division and leadership of open data in Zoetermeer	53
5.3	Sustaining open data in Zoetermeer	54
5.4	Legal framework of open data in Zoetermeer	55
5.5	Cooperation of open data in Zoetermeer	55
5.6	Participation of open data in Zoetermeer	56
5.7	Open Data in Zoetermeer summarized	57
6	Zaanstad	59
6.1	Background of open data in Zaanstad	60
6.1.1	Zaanstad in Cijfers	61
6.1.2	Zaanatlas	62
6.1.3	Data Pakhuis	63
6.2	Strategizing open data in Zaanstad	63
6.3	Sustaining open data in Zaanstad	64
6.4	Legal framework of open data in Zaanstad	65
6.5	Cooperation of open data in Zaanstad	65
6.6	Participation of open data in Zaanstad	66
6.7	Open Data in Zaanstad summarized	68
7	Hilversum	69
7.1	Background of open data in Hilversum	70
7.1.1	Hilversum in Cijfers	71
7.1.2	Open Hilversum	72
7.2	Strategizing open data in Hilversum	73
7.3	Sustaining open data in Hilversum	74
7.4	Legal framework of open data in Hilversum	75
7.5	Coordination of open data in Hilversum	76
7.6	Participation of open data in Hilversum	77
7.6.1	Open governance in Hilversum	78
7.7	Open Data in Hilversum summarized	79

8 Haarlem	81
8.1 Background of open data in Haarlem	82
8.1.1 Open Data Platform Haarlem	83
8.2 Strategizing open data in Haarlem	83
8.3 Sustaining open data in Haarlem	84
8.4 Legal framework of open data in Haarlem	85
8.5 Coordinatinon of open data in Haarlem	86
8.6 Participation of open data in Haarlem	87
8.7 Open Data in Haarlem summarized	88
9 The G5 municipalities	90
9.1 Den Haag	90
9.2 Utrecht	91
9.3 Rotterdam	92
9.4 Amsterdam	93
9.5 Eindhoven	94
9.6 The large municipalities summarized	94
10 Summary of the middle-sized municipalities	95
10.1 Themes and indicators	97
10.2 Strategizing open data in middle-sized municipalities	97
10.3 Sustaining open data in middle-sized municipalities	98
10.4 Legal framework of open data in middle-sized municipalities	98
10.5 Cooperation of open data in middle-sized municipalities	99
10.6 Participation of open data in middle-sized municipalities	99
11 Conclusion, discussion and recommendations	101
11.1 Findings of this research	101
11.2 Discussion	103
11.2.1 Managing resources for a mature open data governance	103
11.2.2 Involving citizens in open data	103
11.2.3 The lack of cooperation in open data	104
11.2.4 Reflection and future research	105
11.3 Recommendations	105
A Appendix	107

1 Introduction

Spatial data is increasingly valued as a tool in the development of government policies on issues such as land registration, environmental management and economic development (Johnson, 2017; Janssen, 2011). Its usefulness is evidenced by the fact that governments are among the largest data collectors in the field of geographic information, with over 80% of government data having a location base (Vancauwenberghe et al., 2014; Janssen, 2011).

Over time, the increased use and storage of spatial data has led to the need for strategies on how best to manage and share the data with larger audiences (Rajabifard et al., 2002). This has led to the development of Spatial Data Infrastructures (SDIs). These SDIs enable the exchange of spatial data between different stakeholders, both users and producers, in a cost-effective and efficient manner (Rajabifard et al., 2002). The main argument for building SDIs is that they can provide a unifying platform for different administrative units to share spatial data, which can prevent the collection and storage of redundant data. (Van Loenen and Grothe, 2014; Vancauwenberghe et al., 2014).

The desire to improve the control, production and use of government data has led to the international development of SDIs. The INSPIRE Directive of the European Union (EU) is an example of such development (Vancauwenberghe and van Loenen, 2018). Since the adoption of the Directive in 2007, considerable efforts have been made to enable public bodies of the EU Member States, and the European Commission to share geographic information (Vancauwenberghe and van Loenen, 2018).

Since the 1990s, SDIs have enabled users within public bodies to share data. However, individuals and organizations outside the public sector have had limited access to data. This is because the necessary mechanisms and tools to facilitate and support data sharing had not been in place, creating a barrier to more efficient use. (Vancauwenberghe and van Loenen, 2018).

Open Data, the concept that government data should be published in open formats and available to anyone without any restriction, provided new opportunities and the potential to overcome previous barriers (Kassen, 2013). Publishing data as open allows the public to access, process, enrich and combine data with other resources. This creates a whole new range of possibilities for data usage (Janssen et al., 2012). There are a number of requirements that need to be met for data to be considered "open". According to the Open Knowledge Foundation, data is 'open' when it can be freely used, modified, and shared by anyone for any purpose while subject only to the measures that preserve its provenance and openness (Open Knowledge Foundation, nd).

Public access to government data has been theorized to have numerous benefits. Societal benefits are among the most frequently cited, as the release of data improves government transparency and allows the public to use data as a tool to more effectively monitor government activities. This provides new methods for holding governments accountable for their actions (Kassen, 2013). Moreover, access to government data allows the public to participate in interactive government services, enabling the public to better engage with their govern-

ment (Kassen, 2013). By empowering the public, open data has the potential to facilitate the deconstruction of traditional boundaries between the citizens and government (Janssen et al., 2012).

Governments benefit from open data because it improves efficiency. Different departments can reuse single data sets for multiple purposes, preventing unnecessary transaction time and costs (Welle Donker, 2018). Moreover, open data also increases government efficacy, as policies can be shaped through data-driven decision making. Previously, policy-making was limited to non-data-driven analyses, or the knowledge and intuition of policymakers (Safarov et al., 2017).

Despite the many benefits attributed to open data, not all governments are able to meet the desired expectations when they start opening their data. For instance, neither increased transparency nor citizens trust in their government are guaranteed (Welle Donker and Van Loenen, 2017). This lack of success can be attributed to poor governance of the initiative. Examples of such governance include a lack of cooperation between the governmental departments. This leads to an inefficient task division and lack of confidence needed to successfully implement and sustain open data (Welle Donker and Van Loenen, 2017). To counteract the aforementioned issues, it is important for governments to develop policies aimed at improving the governance of their open data (Welle Donker and Van Loenen, 2017).

1.1 Open Government Data, importance and scale effect

The majority of all government data is collected by municipalities (Conradie and Choenni, 2014). In the Netherlands, this is exemplified by the "Basisregistraties Adressen en Gebouwen (BAG)", the registers of addresses and buildings (Overheid, 2022). While the national government combines BAG data and releases it as a national coverage to the public, municipalities are responsible for collecting and maintaining the quality and accuracy of the data (Overheid, 2022). Because local governments bear the burden of processing the majority of (geo)data, it is important to analyze how local governments perform in the governance of their open data and to observe the barriers they face (Conradie and Choenni, 2014).

However, since municipalities are not equal to one and another in terms of size (territory, population, density) and available resources, their barriers may not be the same either (Graafland, 1993). Previous research has shown that municipalities of different sizes faced different issues and barriers when implementing their first spatial IT infrastructures in the early 1990s (Graafland, 1993). It was observed that the municipalities that were classified as "large" (over 100,000 inhabitants) had different governance issues than those classified as "small" (under 50,000 inhabitants). And while large municipalities had more resources at their disposal, they lacked coordination and cooperation between different isolated departments. The opposite was true for the smaller municipalities (Graafland, 1993). In the research, the municipalities classified as "middle-sized" (between 50.000-100.000) seemed to balance the issues of the two extremes in terms of implementation success. Since OGD is effected by the

municipal size as well, it can be speculated that middle-sized municipalities have an advantage in their open data activities, as compared to larger and smaller municipalities, in a similar way faced with implementation of geo-infrastructure during 1990s (Zuiderwijk et al., 2018; Graafland, 1993). In the literature review section, a definition on the "middle-sized" municipality (50,000 - 250,000 inhabitants) is provided as well as a number of pros and cons in relation to an OGD initiative. This research will apply the classification of "middle-sized", within the context of the Netherlands.

1.2 Problem statement

Previous research has resulted in a variety of assessment frameworks for examining the strengths and weaknesses of open government data initiatives, including their governance (Vancauwenberghe et al., 2018). However, these frameworks have largely been created and applied to assess open data of (supra-)national governments, largely neglecting the local level (Zuiderwijk and Janssen, 2014). This neglect results in missed research opportunities, as local governments have proven their value in collecting spatial data, and acting as catalysts for higher-level open data projects (Zuiderwijk and Janssen, 2014).

Recent assessments of local governments and their open data have focused heavily on large municipalities. In the Netherlands for example, only the five largest municipalities (by population) have been studied so far (Welle Donker et al., 2018). Meanwhile, middle-sized municipalities may have various advantages (or disadvantages) with open data governance, but are currently understudied. Previous research on the implementation of spatial data infrastructures suggests an underlying advantage among these middle-sized municipalities (Graafland, 1993). In addition, middle-sized municipalities may have advantages due to their scale-efficiency, as well as their ability to engage with their citizens (McDonnell, 2020; Avellaneda and Gomes, 2015). This lack of research and potential benefits justify the need for research on OGD governance in middle-sized municipalities.

1.3 Research aim and objectives

This research attempts to discover how the inherent structural characteristics of Dutch middle-sized municipalities affect the governance of data within local open government data, and how other municipalities can use the results to the benefit of their own open data governance.

The objective of this research is to assess the performance of open data governance, using a modified framework for middle-sized municipalities in the Netherlands. Previous research found that middle-sized municipalities had several advantages in the implementation of SDIs in 1990s (Graafland, 1993). However, as municipal responsibilities and budgets change over time, the question is whether the same is true for municipalities when it comes to open data.

The framework will be tested through using a series of case studies. Case studies are commonly used in the study of government efficiency (Kassen, 2013; Boehnke et al., 2019). Moreover, case studies have been used in previous research on Dutch municipal open data governance (Welle Donker et al., 2018).

There are three structural characteristics of middle-sized municipalities that this research explores. The first structural characteristic is a lower level of organizational fragmentation within middle-sized municipalities as compared to large municipalities. This allows for more efficient communication and coordination between the various employees and departments within the municipality. The second structural characteristic is having an adequate amount of resources and staff available for open data. The third characteristic is the lower threshold for citizens to participate in open data. This, in turn, would also motivate the municipality to involve citizens in open data activities. A full description of these characteristics can be found in section Chapter 2.3. These characteristics lead to the following main research question.

To what extent do the structural characteristics of middle-sized municipalities in the Netherlands influence their open data governance?

This research also focuses on two different aspects of open data governance. These aspects are **cooperation** and **participation**.

Cooperation explores how different government entities share knowledge and work together to develop open data. This research approaches cooperation on two levels. The first level explores the cooperation between staff and departments within a single municipality. The second level explores cooperation between multiple municipalities, as open data is increasingly becoming a collaborative development. This leads to the first sub-question:

1) How do the structural characteristics of Dutch middle-sized municipalities influence the aspect of cooperation in their open data governance?

Participation explores how the municipalities outwardly present their open data activities to the public and how they involve users, specifically citizens, in

their open data development. The effect of the characteristics of the middle-sized municipalities on participation leads to the second sub-question:

2) How do the structural characteristics of Dutch middle-sized municipalities influence the aspect of participation in their open data governance?

Previous studies have shown that large municipalities struggled with involving citizens in their open data activities. However, as open government data tends to develop quickly, results from previous research may no longer apply. Thus, this research also explores the current state of cooperation and participation in large-sized municipalities. Comparing the two municipality sizes provides additional insight into the current state of open data governance in the Netherlands and how middle-sized municipalities perform in comparison to others. This leads to the third and final sub-question:

3) How do the Dutch middle-sized municipalities differ from the Dutch large municipalities in the open data governance aspects of participation and cooperation?

1.4 Relevance

There are several reasons why governance aspects of an OGD initiative underperform, and in turn, hinder a successful implementation. First, governance tactics are often developed and modified through ongoing processes of trial and error within a single governmental organization. As a result, the knowledge gained from the experience of one organization does not always directly diffuse to another. (Sjoukema et al., 2017).

Second, there are general guidelines available for establishing local open government data initiatives. For example, previous advisory research has developed decision trees for the Directorate General for Public Works and Water Management (Rijkswaterstaat) to evaluate sensitive data sets. These were later published by data.overheid.nl. However, these guidelines do not equip municipalities with the tools to establish effective open data governance. Such governance would involve raising awareness of their open data activities and engaging users, specifically citizens, to gather feedback for future improvements.

Governments of any type often establish unrealistic goals when initiating new projects without clear direction. If they lack the knowledge and experience for successful implementation, they may attempt to imitate the successful projects of their peers, a phenomenon known as 'mimetic isomorphism' (DiMaggio and Powell, 1983).

Imitating other governments brings potential risks to the success of the project. The primary risks include overlooking structural differences between governments, which can lead to mismatched policies that could hinder the implementation success and the long-term sustainability of the project (DiMaggio and Powell, 1983; Zuiderwijk and Janssen, 2014). Such mismatched governance would occur if a small municipality mimics the open data governance of a large

municipality. When the policymakers of the small municipality ignore the differences in manpower and resources, they will struggle to find adequate funding or people to guarantee the success of their open data implementation (Zuiderwijk and Janssen, 2014).

Therefore, this research explores how the structural characteristics of the middle-sized municipality relate to their open data governance. This is achieved by examining and understanding the strengths and weaknesses of middle-sized municipalities. Comparing the middle-sized municipalities with their larger counterparts provides a baseline for future local open data guidelines. These insights will be valuable to municipalities who aspire to initiate in open data, and provide key information to prevent mismatched governance.

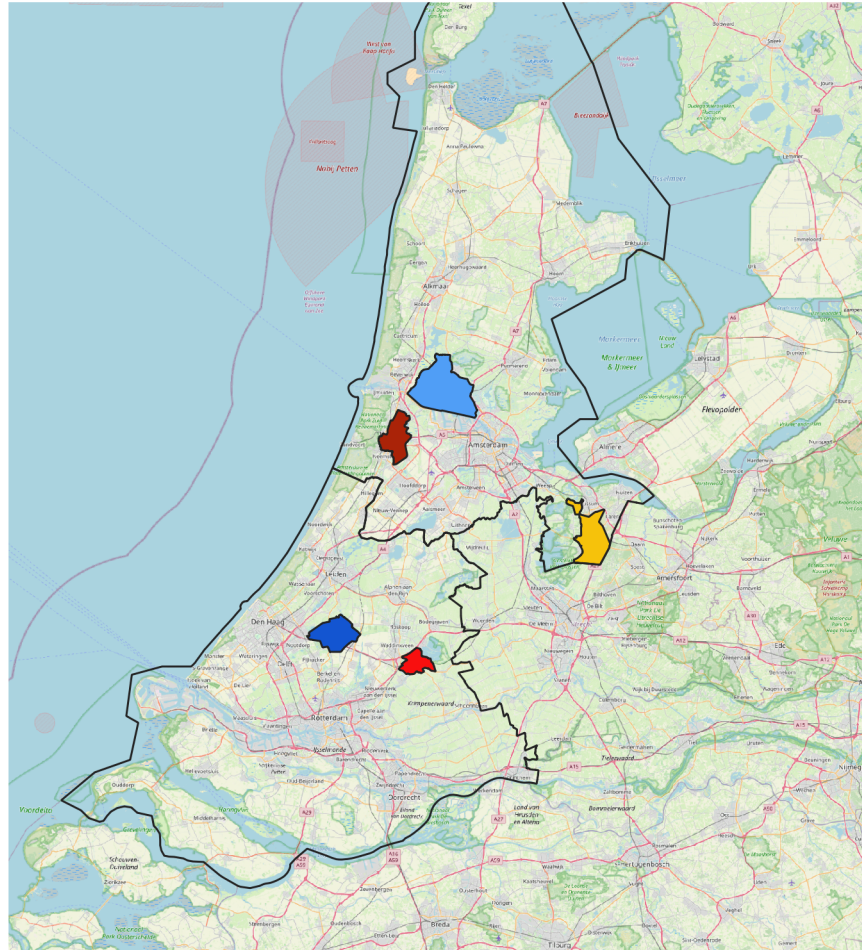
1.5 Scope

This research has selected for "middle-sized" municipalities in the Netherlands based on two conditions. First, the municipality is engaged in open data development, having either an early or more mature stage of governance. Municipalities that are still in a conceptual stage are unlikely to have the knowledge from trial and error processes, and will have little use to the research (Sjoukema et al., 2017). Second, the municipalities are located in the Randstad area. This densely populated area features four of the five largest municipalities in the Netherlands (G5), as well as a large number of municipalities that belong to the 'G40 Network'. The G40 is a network of self-described middle-sized municipalities in the Netherlands (Stedennetwerk G40, 2022).

The Randstad features both 'middle' and 'large' municipalities, which makes it suitable for the comparison and its effect on open data governance that this research aims to explore (Welle Donker et al., 2018). This research has selected five middle-sized municipalities in the Randstad, the same number of municipalities that was used in the previous study on the open data governance of large municipalities (Welle Donker et al., 2018). The selection was based on two criteria:

1. The municipality has a range of roughly 50.000 to 150.000 inhabitants.
2. They provide a supportive function to larger municipalities nearby

The middle-sized municipalities of this research are: Gouda, Zaanstad, Zoetermeer, Haarlem and Hilversum. The municipality of Gouda is technically not a part of the Randstad. The middle-sized municipalities featured in this research are: Gouda, Zaanstad, Zoetermeer, Haarlem and Hilversum. Although the municipality of Gouda is technically not a part of the Randstad, it is one of the largest municipalities in the Groene Hart, and has a supportive function to nearby municipalities in the Randstad. This is further explained in Chapter 4. The middle-sized municipalities and their borders, as well as the provincial borders of South Holland and North Holland are visualized in Figure 1. It also shows the position of Gouda inside the Groene Hart.



Legend

- Gouda
- Zaanstad
- Zoetermeer
- Haarlem
- Hilversum
- Provincial borders

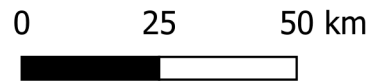


Figure 1: Dutch middle-sized municipalities and provincial borders (Figure by author)

This research has approached open data and spatial data as synonymous with each other. The reason being that spatial data forms the dominant data type within open data. The same approach was applied in previous research (Welle Donker et al., 2018). This is further illustrated in Figure 2.

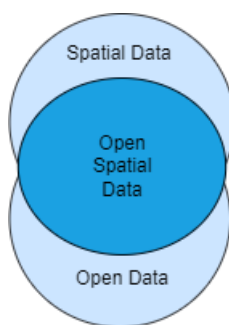


Figure 2: Open Spatial Data

1.6 Research limitations

There are two main limitations on this research. The first limitation is the exclusion of middle-sized municipalities outside the Randstad area. Thus, this study may overlook certain factors that could affect open data governance, such as regional culture. However, these municipalities may have a more significant regional function as compared to their counterparts in the Randstad. Therefore, they may be less suitable for this research to begin with (Stedennetwerk G40, 2022). The second limitation is the inability to fully apply the concept of data ownership into the scope of the research. Although there is a need for additional scientific literature on open data ownership, it would take considerable amount of time to do an in-depth exploration for each municipality (Johnson et al., 2017). This research has a literary overview on data ownership in Section 2.6 and 2.10. It was assumed that the municipalities have already covered their issues with data ownership. And have done so as part of their decision to release their data as open.

The scale of the municipality and its consequent effects on open government policies are the focus of this research. However, time is another element that influences the governance maturity of open government data. Some of the municipalities in the Netherlands have started their open data activities before any policies were imposed, whether from the national government or from the EU. Thus, municipalities have different starting points, and vary in terms of experience and maturity in their open data governance.

2 Literature review

2.1 Introduction

This chapter provides a categorization for the "middle-sized" municipalities in the Netherlands. This is followed by an overview of advantages attributed to the structural characteristics of middle-sized municipalities, and their theorized effects on open data governance. The chapter continues with an overview of the historical of open data initiatives through three different approaches. These are the developments of open data for: (1) economic growth, (2) government transparency, and (3) government efficiency. Afterwards, the various elements that comprise open data governance are given. These are divided into a number of sub-sections. This chapter lays down the theoretical aspects that have been used to develop the indicators for open data governance assessment in Chapter 3.

2.2 Defining the middle-sized municipalities

Municipalities need a set of criteria to be classified into a size-category. The Dutch government classifies any municipality with average population of 100.000 people to be middle-sized (Centraal Bureau voor de Statistiek, nd, 2019). Previous research had municipalities that fell in a range of population range of 50,000 to 100,000 people classified as middle-sized (Graafland, 1993).

However, the middle-sized municipality does not necessarily have to be defined by an arbitrary population range. If a municipality acts subservient to a large municipality nearby, it could still be considered middle-sized, even if it falls outside of the defined inhabitant range. Moreover, some municipalities have a large population but lack a dense urbanized core. Instead, they consist of different smaller towns that share a single municipal administration. This is often the result of decades of municipal redivisions, as the amount of municipalities in the Netherlands has reduced from 646 in 1993, to only 342 in 2023 (CBS, 2022).

Some municipalities may have the population numbers to be classified as middle-sized. However, they may lack the urban density or economic function that is typically present in in such municipalities.(Midsize NL, 2016).

Therefore, this research uses a loose definition for middle-sized. To an extent, they need to meet the following criteria:

1. The municipality has a range of roughly 50.000 to 150.000 inhabitants.
2. They provide a supportive function to larger municipalities nearby

2.3 General qualities of the middle-sized municipalities

Previous research has identified three different inherent qualities of middle-sized municipalities. These qualities are: (1) a greater efficiency than both small-sized large-sized municipalities, (2) a decreased level of governmental fragmentation as compared to large municipalities, and (3) a lower threshold for civic engagement compared to large municipalities.

Local government efficiency is often calculated through the cost-per-capita of municipal services. Previous studies have shown that efficiency increases parallel with population up to 25.000 inhabitants. After 25.000 inhabitants are reached, there are no significant changes up 250.000 inhabitants. After the 250.000 mark, local government efficiency starts to drop again. The efficiency tops in "middle-sized" municipalities, and results in an 'inverted u-shape' pattern (Avellaneda and Gomes, 2015; Dhimitri, 2018). This pattern is visualized in Figure 3.

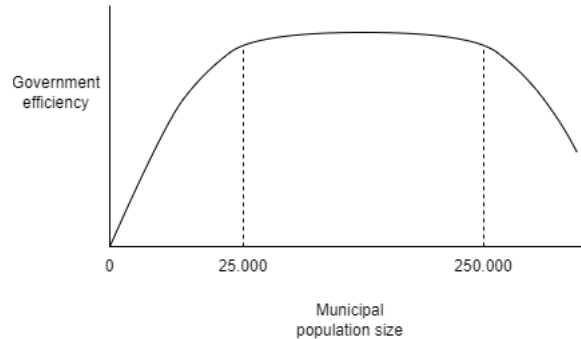


Figure 3: Impact of population size on local government efficiency (figure by author)

Previous research on the implementation of geo-IT structures in Dutch municipalities in the 1990s, found out that fragmentation within an organization can be a significant barrier (Graafland, 1993). Large municipalities experienced issues in developing general strategies, appointing leadership roles and handling the cooperation between the different government departments as a result of internal fragmentation (Graafland, 1993). Large municipalities have advantages and disadvantages when it comes to the implementation of OGD initiatives. The number of available and skilled government employees who can work on open data tends to grow along municipal population growth. However, a larger number of employees is more difficult to manage, especially when multiple departments are involved. When the staff cannot be effectively managed, a risk for failure arises (Zuiderwijk et al., 2018; Jakob and Krcmar, 2018).

In comparison, small municipalities have other issues, as they tend to struggle with finding skilled personnel and resources (Graafland, 1993). Although smaller municipalities view transparency and civic engagement as positive outcomes of open data, they also doubt their own ability to successfully implement and sustain open data activities to achieve said goals (Zuiderwijk et al., 2018).

This is especially the case for municipalities with a population size smaller than 35.000. These municipalities are uncertain on whether or not the resources at their disposal are sufficient to successfully complete an OGD initiative. Middle-sized or large municipalities on the other hand tend to have sufficient resources. Thus, for these municipality categories, the motivational barrier for resource management appears to be mostly absent, especially in regards to human resources (Zuiderwijk et al., 2018).

Large municipalities tend to have more issues when it comes to engagement with their citizens. This can be explained through the negative relation between the municipal population size and its external political efficacy (EPE). The EPE is the perception citizens have on the responsiveness of the government their demands and desires. The EPE is thought to have a critical role in fostering wide-scale participation of citizens in the political decision making process (McDonnell, 2020). In the context of open government data (OGD), previous research has shown that the largest Dutch municipalities encountered issues regarding the communication with their citizens and their inability to fully involve them in the process of implementation and using open data (Welle Donker et al., 2018).

2.4 Open Data development

Throughout the past decades, policies for open government data have been (re-)shaped with different intentions. The earlier sub-chapter described three motivators for open data development. Each of these have led to organizations worldwide to contribute in a continuous and parallel development of open data policies. These can be categorized into economic growth, increased government transparency and government efficiency (Welle Donker et al., 2018).

2.4.1 Open Data for economic growth

The acknowledgement of open data for its many purposes spurred the European Union to shape a number regulations to facilitate its future development and impact (European Commission, 2022a). Enabling third parties to re-use government data to facilitate economic growth has been an ambition of the EU since the introduction of the Directive 2003/98/EC of the European Parliament and of the Council of 17 November 2003 on the reuse of public sector, also known as the PSI Directive.

The PSI Directive has gone through multiple adaptations. The revision of 2013 was to clarify and match the definition of "open data" to the current and commonly accepted standard. This means that governmental documents are made accessible and reusable for any purpose, commercial or non-commercial, unless protected by third-party copyright (The European Parliament and the Council of the European Union, , 2013). The PSI Directive was also amended in 2018 to comply with EU privacy regulations (data.europa.eu, 2018). In 2013, the PSI Reuse Act was transposed in the Netherlands as the Wet Hergebruik

van Overheidsinformatie (Who). This law has been implemented to release government data as 'open, uneles', to facilitate private third party reuse.

The latest change, Directive (EU) 2019/1024 of the European Parliament and of the Council of 20 June 2019 on open data and reuse of public sector information (recast) came into force in 2021. It repealed the PSI Directive, replacing it with the Open Data Directive. The Open Data Directive enforces EU member states to release as much government data available as open, while also limiting public bodies in how they charge third parties in their reuse for anything other than the marginal costs of data dissemination.

The Open Data Directive emphasizes governments to prioritize the release of "high-value data sets" as open. These data sets are thought to foster the creation of more profitable goods and services, and boost the level of technical innovation within the EU (The European Parliament and the Council of the European Union, 2019). The Open Data Directive categorizes high value data sets into 6 different themes, those being: geospatial, earth observation and environment, meteorological, statistics, mobility and companies, and company ownership data sets. In addition, they need to be available for free in machine-readable formats, and accessible via APIs.

The Association of Netherlands Municipalities (VNG) has also developed a framework for Dutch municipalities to prioritize the release of "high-value data sets". However, the municipal assessment framework prioritizes the release of data sets that facilitate government transparency. They were not intended to foster economic growth and innovation. For example, the VNG framework prioritizes the locations of sport facilities, public events, public art, and the local trash bins. They have a more clear use for citizens, rather than developers or companies.

The Open Data Directive had to be transposed by the EU member states as a national law by July the 17th, 2021 (European Commission, 2022a). However, the Netherlands had not yet implemented the Open Data Directive in 2022 (European Commission, 2022b). The Raad van State (Council of State) recommended that the proposed bill should not be submitted to the House of Representatives until adjustments would be made. It was initially presumed by the Council of State that the Open Data Directive would enforce educational institutions to release their research data as open, as these institutions are financed by the national government. This would have been in conflict with the fundamental right to (intellectual) property. However, in a following rapport of 2023, the Council of State was informed that the release of data by these institutions would occur through a voluntary delegation clausal. To avoid introducing unnecessary regulations, the government deleted these provisions (Raad van State, 2022). The Council of State also claimed that the Open Data Directive might be in conflict with regulations around the gathering of personal data. The reuse of personal data should, by default, not be included in any sort of possible re-use. As of yet the government has stated to feel compelled to follow the original advice.

In 2023, the European Commission has referred to four countries, including the Netherlands, to the Court of Justice of the European Union. These countries have failed to yet transpose the new regulation of open data into national law.

2.4.2 Open Data for transparency

The release of open government data (OGD) as a tool to improve government transparency and civic engagement has been integrated as a key aspect in the development of governmental data strategies for over a decade (Welle Donker et al., 2018). This did not only happen in isolated governments processes, but also through international collaborations, such as the Open Government Partnership (OGP). Open data development has not only taken place in isolated governments, but also through international cooperative initiatives like the Open Government Partnership (OGP), which proudly features The Netherlands as a founding member. This initiative was established in 2011 by former US president Barack Obama and former UK prime minister David Cameron to increase government transparency worldwide (Open Government Partnership, 2020). Members of the OGP initiative are required to develop their own vision for open data and government transparency, and needs to be attained within a two-year period. The vision is formalized as plans of actions. These plans describe the existing strengths, weaknesses, barriers of open data. As well as the required methods for solving existing issues, goals for the future, and the steps that need to be executed to meet these goals (Open Government Partnership, 2020).

In 2013, the Ministry of the Interior and Kingdom Relations of Netherlands (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, BZK) released the Vision Open Government (Visie Open Overheid). This document stated that the Netherlands has to make amends to meet the increasing demand for public information and government transparency (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2013). This ambition has been conceptualized through the phrase "Open, unless" (Open tenzij), which gives the public the right to access government information, unless there are considerate and law based governmental interests that can justify a denial of access (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2013). The 'open, unless' phrasing was embodied within the Access to Public Information Act (Wet openbaarheid van Bestuur, WOB), which was the law that provided access to government data at the time.

Openness has turned into a core aspect of the Dutch state. As a result, the OGP action plan of 2020-2022 for The Netherlands emphasized the creation of open data communities to facilitate increased data use (Open Government Partnership, 2020). In 2022, the Open Government Act (Wet Open Overheid, Woo) replaced the Wob. With the enforcement of the Woo, governments in the Netherlands can no longer have a passive role in open data release, which was done through data requests. Instead, they have to actively release government data as open, while also adhering to regulations on government interests and the protection of sensitive data.

2.4.3 Open Data for government efficiency

The original PSI directive was intended to foster new data reuse possibilities. It was not only intended to enable reuse for private third parties, but also to for the bodies in the public sector, with the intention to make them more efficient and effective (Welle Donker et al., 2018).

The EU had already paved a way to facilitate reuse of public sector information through the INSPIRE Directive (Van Loenen and Grothe, 2014). The INSPIRE Directive has developed regulations for standardization and implementation of spatial data infrastructures, to make spatial data more easily known (findable, recognizable), attainable (available) and usable (manageable, reliable) (Van Loenen and Grothe, 2014). These regulations have also facilitated the development of a higher maturity level of open data Welle Donker and Van Loenen (2017).

The INSPIRE Directive received acknowledgement for their contribution to open data by the Association of Netherlands Municipalities (Vereniging Nederlandse Gemeenten, or VNG). The VNG is a non-binding advisory organ, with the goal of improving the efficiency and effectiveness of local governments. It serves as an active force within the Dutch open data movement (VNG, 2020). The VNG consider Open Data to be a key instrument in improving local governments. The VNG views open data to be a key tool for improving the strategic and operational processes of local governments. The VNG released report, which called for an increased effort of data sharing among the Dutch municipalities. It was proposed that this would be realized through data deals between private and public organizations. This would enable data to have a more seamless fit and reduce redundancy. In addition, the VNG also advocated the creation common centralized data-portals among the municipalities (VNG, 2020; Open Government Partnership, 2020).

2.5 Open Data governance

Governance is a commonly applied term, both in academic research and managerial circles, to refer to the act of governing and controlling the direction within an organization. This is often done in a non-standardized fashion, with a large variety of approaches on what "governance" should be (Hufty, 2011). Governance can be approached as the interaction and decision-making of agents, which are involved with problem solving for an institution, not limited by time or space (Hufty, 2011).

Data is generally considered to be strategic asset. Therefore, it needs to be managed through effective data governance to prevent duplication, support effective usage, and guarantee its quality (Plotkin, 2014). Data governance has a variety of approaches on what it should and should not be. Nevertheless, previous studies have shown re-occurring elements that define governance (Plotkin, 2014).

Previous studies have shown that data governance can be defined as the collective set of practices within an organization. These practices are involved

with the maintenance and distribution of data, and is encapsulated by the norms, regulations and goals of the organization. This is done in an effort to reach a specific set of goals and to benefit stakeholders. Thus, effective data governance concerns itself with identifying its stakeholders, and engage with them through a collaborate process (Paskaleva et al., 2017).

A distinction needs to be made between data governance and data management. Data management generally refers to the logistical and technological aspects of data control, maintenance and publishing. This is done through the use of standards, portals, metadata and APIs. It is an operational construct and is shaped by organization practices. These latter practices are part of data governance, as is showcased in Figure 4.

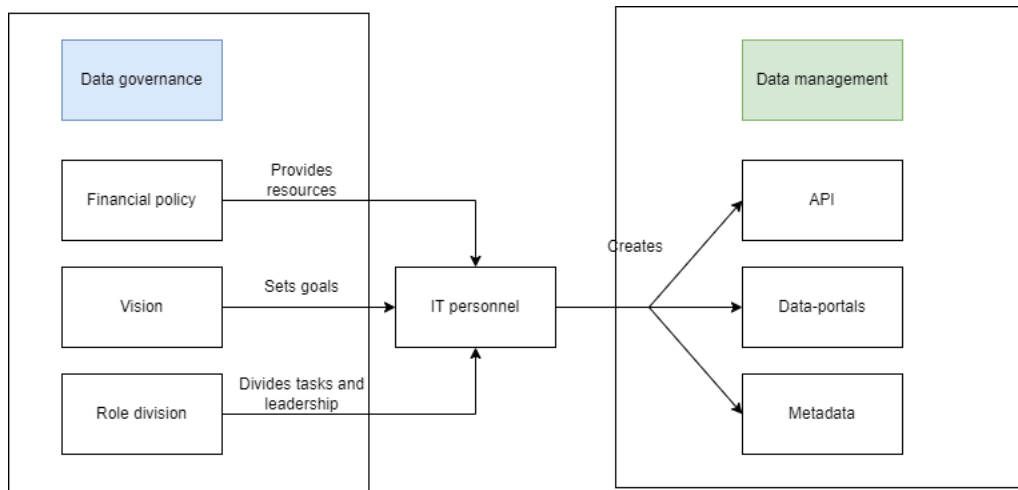


Figure 4: Data Governance vs Data Management (figure by author)

Data governance creates plans of action, provides a division for task and labor, creates a budget, and to identifies the stakeholders to shape the direction and goals of the project to common goals (Plotkin, 2014). Data governance applies for the assigning of staff for data distribution, providing a task division, laying down clear goals, and creating transparent leadership. Data management on the other hand, is directly involved with the operational side of data distribution. It occupies itself with creating APIs, geo-portals and metadata.

Stakeholder management is an important part of data governance. It relates to identifying the stakeholders, understanding their characteristics and engaging them in a collaborate process. It also studies their dependencies to the project outcome, which is a crucial step to shape common goals and to create a meaningful impact of open data release.(Paskaleva et al., 2017; Vancauwenberghe et al., 2018).

2.5.1 Towards open governance

Over the past decades, spatial has gone through substantial technological developments. However, spatial data governance has not evolved at an equal pace with the technological developments, resulting in a gap between technology and governance. This gap has become more evident with the rise of open data, and has become more problematic as the increased emphasis on openness and wider stakeholder involvement adds additional complexity to already outdated data governance practices (Sjoukema et al., 2017; Zuiderwijk and Janssen, 2014).

Open Data is a relatively new area to governance studies. Spatial Data Infrastructures on the other hand, already have a significant body of research to create efficient governance practices (Rajabifard et al., 2002). One particular governance practise was advocated in the research by Masser et al. (2008). This study advocated governmental SDIs to involve a greater amount of non-governmental stakeholders in government policy making through the use of spatial data, which would result in a "spatially enabled society". It was theorized that this would yield numerous societal and economic benefits, similar to what is attributed to open data (Masser et al., 2008; Johnson, 2017).

The core idea of open data is that, unless there are justified restrictions, government data should be accessible to anyone in machine-readable formats. The concept of the spatially enabled society spatial however, envisions spatial data as a way to have non-governmental stakeholders involved in government policymaking, which would improve societal democratization (Masser et al., 2008; Johnson, 2017). Nonetheless, more recent studies have advocated open government data to also contribute to increased participation of citizens in policymaking. The research by Gonzalez-Zapatal and Heeks (2015), approaches open government data a combination of the following elements;

1. Government data; the fact that governments are among the largest collectors of data, and need to explore how this resource can best be managed.
2. Open Data; the focus on enabling the public to have a greater accessibility of data than before.
3. Open government; how government decision making and actions can be made transparent and more participant to citizens.

As can be seen in Figure 5, the three elements come together through open government data.

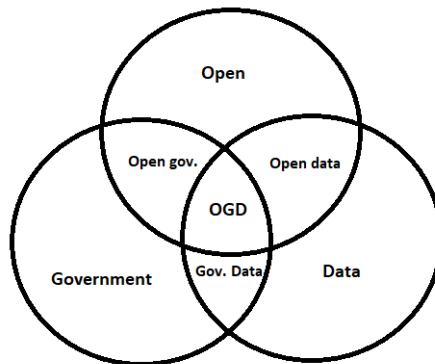


Figure 5: Open Government Data elements (Gonzalez-Zapatal and Heeks, 2015)

A growing body research supports governments to adjust their open data projects and to shift focus on identifying (non-)governmental stakeholders, so they can participate with OGD through open data governance (Vancauwenberghe and van Loenen, 2018). Open Data governance enables parties from the private sector, the public sector, and citizens to be brought together in an effort to advance data-driven innovations. It also well facilitates the participation of citizens in government decision-making (Kassen, 2022). Democratizing open data governance is theorized to provide governments with an even higher level of transparency and trust than data release by itself (Benitez-Paez et al., 2018). Stakeholder management is a key aspect, as multiple different parties, with different desires and ambitions need to be unified with a common goal (Vancauwenberghe and van Loenen, 2018).

Despite the existence of multiple studies on the hypothetical benefits of open governance in open data, there is a lack of research on real practices. This applies especially to empiric evidence on the effect of involving multiple non-governmental stakeholders in open data (Kassen, 2022). In most cases of open data governance, the government still takes a central and authoritative role within the governance of spatial data initiatives. Other parties are generally not given as much of a voice as recommended (Van Loenen and Grothe, 2014). In general, the majority of open data projects are ran by the governments themselves. They designate themselves to be responsible for setting up a strategy, creating a division of roles, and becoming both facilitator and enabler of data reuse (Benitez-Paez et al., 2018).

Nevertheless, some countries like Sweden have a strong historic traditions of civic participation in government decision-making. These are generally the countries that have spearheaded the involvement of non-governmental actors in open data. Instead, they also actively involve private third parties, local civic organizations and scientific institutes in shaping open data governance (Kassen, 2022).

2.6 Planning open data

When lacking long-term planning, pre-existing governance issues around open data become increasingly problematic (Conradie and Choenni, 2014). For example, when governments do not develop long-term plans, they tend to create chaotic networks of data owners. This applies even more so when governments involve private third parties in data collection and storage. These private parties can hold a legal right for data ownership, and have the right to share data to the public, as it would harm their own interests. Because data owners have a final say in data release, governments need to focus on developing standardized agreement formats that guarantee centralized data ownership and facilitate data release (Conradie and Choenni, 2014).

Another thing that governments need to focus on is developing a modern type of leadership and coordination. Leadership should not be defined by conflicting interests, but should instead find common goals and norms. Such modern leadership approaches have proven to be fruitful in tackling managerial issues. However, while governments in the Netherlands have made steps to modernize their leadership, it is still not up to the desires of civic servants (Schillemans and Bjurström, 2020). Conflicting management can manifest itself as a focus on short term thinking, with departments competing for their share of the government budget. Appointing an open data champion, someone engaged with developing open data on behalf of both the government as a whole, as well as the general public, can partially solve this issue. Data champions will try to make the different departments and staff come together to find common open data goals and realize them (Plotkin, 2014).

When departments operate with a high level of autonomy, they may cause issues for effective management of people and data (Welle Donker et al., 2018). A high level of autonomy can result in staff working for a specific department (e.g. environmental management, infrastructure, economic development), rather than the organization as a whole. This results in a fragmentation of human resources, which creates barriers for successful organization wide implementation plans (Graafland, 1993). This fragmentation also applies to data. To guarantee the quality of data, a significant amount of time and resources is often required. As a result, highly autonomous departments may feel unwilling to share their data with others if it does not result in their own benefit (Harvey and Tulloch, 2006).

Departments vary in their demands for specific data sets to execute their core tasks. This varying demand makes data sharing more complicated if they are lacking adequate coordination with each other (Qureshi and Rajabifard, 2008). This issue can be tackled in two different ways. First, communication between departments needs to be direct and clear. Second, central hubs for centralizing data and communication need to be created (Masser et al., 2008). In the study by Graafland (1993), middle-sized municipalities were more likely to have a central IT department compared to both small and large municipalities.

Open data can begin as either a top-down or bottom up process (Welle Donker et al. (2018)). It was stated by Graafland (1993) that municipalities implemented geo-IT structures through a bottom-up process were more likely to be successful

if they later transitioned to a formalized top-down approach upon reaching a certain level of maturity. This raises a question on whether the same may be true for open data implementation.

2.7 Financing open data

Releasing government data as open requires substantial commitment. This commitment involves an investment in acquiring people with skills, training employees and creating an infrastructure where data can be uploaded, maintained and published (Ubaldi, 2013). Dutch municipalities are funded through multiple channels. The majority of the municipal budget is derived from the so-called Municipal Fund, which is provided by the national government. The received budget depends on a number of parameters, such as the amount of inhabitants and the geographical size of the municipality. Although the budget is derived from the national government, the local governments have a significant level of freedom in their choice for spending (Rijksoverheid, ndc).

Through the constitution of the Netherlands, municipalities are able to raise their own taxes, which provide roughly 1/6th of the municipal budget Rijksoverheid (nda). The majority of municipal tax is derived from property tax (Onroerendzaakbelasting, or OZB), and is calculated as a fraction of the property value (waarde van onroerende zaken, or WOZ). Each local government has the autonomy to regulate their own OZB. However, the OZB is kept in check by unions of property owners to prevent significant tax increases (Rijksoverheid, ndb). A municipality with a more affluent population would have more available resources available, as the result of higher income from property taxes, and decreased municipal costs on solving social issues. Thus, such municipalities may be more likely to have a financial buffer to develop open data.

Over the past decade, Dutch governments used cost-benefit analyses to create business plans for open data policies with a high level of autonomy (Ubaldi, 2013). However, the Open Data Directive puts increased strain on national governments to release their data, specifically high-value data sets. While these data sets are the responsibility of national governments, local governments may want to follow by example. Other regulations like the Data Governance Act (DGA) are expected to have a greater impact on municipal efforts to release data as open.

Open Data requires mapping out finances. Local governments should not limit themselves to planning the budget for creating open data, but also plan for future growth and sustainability. Starting open data without a solid financial plan may prove dangerous to their long term success. This is evident as poor resource planning and available budgets are among the most cited barriers for open data release Benitez-Paez et al. (2018).

2.8 Cooperation within open data governance

When governments contribute more as an open data producer, they also benefit as a user. The creation of a single focal point (e.g. web-portal) allows for efficient communication and cooperation between different departments (Mergel et al., 2018). By sharing data on a single open platform between the different branches of local government, staff from particular department no longer need to go through an authorization process for their required data. This contributes to an increased efficiency of the governmental process, as public servants become less constrained by time and effort for data acquirement (Mergel et al., 2018; Zuiderwijk and Janssen, 2014).

Open Data can also encourage (partially) paper-based departments to digitize and publish their existing records on a shared data platform. This brings forth additional positive effects. First, there will be a larger amount data available to the general public, which can improve the governmental transparency Mergel et al. (2018). Second, the greater amount of data allows non-governmental parties to apply data for research purposes. This could encourage a greater participation of citizens in the political decision making process and theoretically better the policy-outcomes (Safarov et al., 2017; Mergel et al., 2018).

As a data consumer, the most common reuse of by the local government themselves has shown to be particularly prominent for the "basisregistraties" (Key Registers) and "kernregistraties" (Core Registers). The Key Registers are a collection of registrations on subjects that include (but are not excluded to); addresses of buildings (BAG), topography (BGT) and property boundaries (BRK). A national body, such as a National Facility, collects the data provided by local governments and combines the data into a national key registry. A key registry is a registry that is officially designated by the government and contains high quality data. All government agencies are required to use the key registers in the performance of their public duties without further investigation (digtaaloverheid.nl, 2023; Welle Donker et al., 2019).

These registrations are important. By sharing already known data within government, the government can operate more efficiently and improve services. Thus, data that is collected once can be reused many times. For example 90% of all tasks of the municipality of Amsterdam require their use in the process (Gemeente Amsterdam, 2023). The collection of local government registrations can be joined together and hosted on national platforms as open data.

For core registrations, the same principles apply as for basic registrations. However, this applies only at the municipal level. It is not the law, but the decision of the municipal council that determines mandatory use. The data of core registrations primarily serve a local and municipal information need (Kadaster, nd; Pinkroccade Local Government, 2020). Not only does the sharing of Register data sets enable reuse for multiple purposes, it also enables different departments to control each other for the quality (Welle Donker et al., 2019).

Developing a legal framework and multi-level strategies are two of the major steps a local government needs to do to create a sustainable OGD initiative. If

executed correctly, they can act as a guideline to effectively assess legal issues around data sets, and examine regulations before publishing data as open (Safarov et al., 2017). In practice however, more often than are ambitious politicians stranded, as they try to implement OGD portals but face multiple technical or organizational barriers in the process. They often lack the awareness of these barriers in hindsight, and do not have the knowledge to deal with these barriers either. As a result, they fail to develop useful strategies that can effectively instruct public servants in handling open data. This applies especially in regards to the requirements for handling issues related to data security, data privacy and development of portals (Zuiderwijk and Janssen, 2014).

2.9 Participation within open data governance

When local governments develop open data governance, they are often too strongly focused on data publishing. Meanwhile, the success of such initiatives are largely dependent on creating a meaningful usage of their data, as well as involving users, including citizens in their governance Benitez-Paez et al. (2018). Instead, local governments engaged with open data need to understand the significance of their external users, and how their feedback can be used as a mechanism for constant improvement. When the perspective of users are not properly taken into account, a gap can arise between the expectations of OGD, and what it actually brings when open data portals are realized (Janssen et al., 2012).

Civic engagement is considered to be critical aspect of any functioning democratic society. This is expressed in fundamental examples, such as: the ability to vote, meeting in public spaces and establishing public organizations who create a mutual interaction between government and citizen (Johnson, 2017). Open government data can contribute to civic engagement in a multitude of ways. First, the increased transparency provides citizens a more extensive overview on government activities, which puts a greater pressure on government accountability. Second, it allows citizens to more easily participate in decision making processes. This also provides a valuable feedback mechanism to the government (Johnson, 2017; Mergel et al., 2018).

Aside from political purposes, citizens can also use OGD for their own practical day-to-day purposes. One example would be to facilitate the search of suitable parking spots for the disabled. These can data sets be shared by citizens through digital communication platforms like social media (Janssen, 2011). Not only are citizens data consumers, they can also become producers. There are a multitude of ways citizens can contribute to the data production, either passively or actively (Vancauwenberghe and van Loenen, 2018). Passive data gathering can be achieved by tracking citizen movement, and using the data to understand patterns and the associated behaviour (e.g. occupancy of parking lots through sensors). This type of collection is often done by the government itself or by private third parties the government contracts (Johnson, 2017).

However, citizens can also become engaged with active data production. For example, governments can create platforms that promote voluntary geographic

information. This encourages citizens to participate with open data, by providing additions or alterations to existing data sets through an integrated feedback mechanism. However, such participation requires citizens to possess a device like a phone or computer with access to the internet participate in open data. This might lead to some citizens like the elderly or the poor to not be able to be involved in open data (Vancauwenberghe and van Loenen, 2018; Johnson, 2017). In addition, some previous research suggest that that there is an unequal usage of OGD, with marginalized groups less likely to participate (either due to lack of access, awareness or motivation) in the groups than more affluent citizens (Johnson, 2017). However, other research noted that there is no correlation between OGD participation and the socio-economic position of the user. Therefore, an additional focus on solving potential socio-economic inequalities of citizens as users and producers should not be a governance priority (Benitez-Paez et al., 2018).

In order to engage citizens with OGD, a government needs to do more than simply publish data on a platform. The presumption that a government only needs to focus on data release, which was more common in the earlier days of OGD, has shown to have little effect on the actual reuse amongst the general population. Instead, a government should be concerned with facilitating and coordinating the use of data with its citizens (Mergel et al., 2018). This requires governments to make effort in understanding their users. This applies especially to citizens, as they are more likely to partake in government activities if they believe that their contribution can have a significant impact (Benitez-Paez et al., 2018).

2.10 The legal framework for open data

Publishing open data, while also upholding the privacy citizens is sometimes presented as a set of colliding moral duties. In this collision, governments are expected to actively engage in the fulfilment of multiple duties (Floridi, 2014; Borgesius et al., 2015). On one hand, there is a need to improve the welfare of society and its members, which can be achieved through engagement with open data. On the other hand, governments are responsible to uphold human rights, on both the individual and group level. An example of the latter prevents OGD derived applications to be used in the (in-)direct discrimination of socioeconomic groups and their members (Floridi, 2014). Thus, it is of utmost importance that these different duties are harmonized with one and another (Borgesius et al., 2015).

2.10.1 Protection of personal data

The word 'privacy' is often used as a colloquial term. It refers to both the respect of private life, as well as the right to have personal data protected. And while personal data protection has its origins in protecting private life, these two can be seen as separate but related rights. This is due to the fact that data protection is akin to a legal framework, that regulates computing and

networking, rather than being tasked to protect the private life of an individual (Dalla Corte, 2020). An example of such protection comes from the EU, which is implemented as the "General Data Protection Regulation" (GDPR) in 2018. This agreement aims to protect the right to information privacy for all natural persons. This is done by binding all member states to a single legislation, which defines personal data as information that relates to an identified or identifiable living individual. The legislation has a standard procedures to handle such data (Ministerie van Justitie en Veiligheid, 2018).

When different pieces of information are collected and used to identify a person, it can be considered personal data. When the personal data is rendered anonymous in such a way that the individual is no longer identifiable, it will no longer be considered personal data. The process of anonymization must be irreversible if the data owner truly desires to anonymize the data. In the Netherlands, the GDRP is instituted as the 'Algemene Verordening Gegevens-Bescherming'(AVG). The AVG replaced the previous "Wet bescherming persoonsgegevens" (WBP). While similar in nature to the WBP, the AVG extends the definition of personal data through the inclusion of locational information. However, this only applies to the location of individuals, not objects or places (Ministerie van Justitie en Veiligheid, 2018). Moreover, the AVG enforces accountability on the data holder. The data holder is required to justify and explicitly state what kind of information is collected and maintained. There must also be an assurance given that the data is not used for any purpose beyond its given reason (Ministerie van Justitie en Veiligheid, 2018).

Governments are given autonomy to assess data themselves and for their own open data usage, as long as it adheres to regulations of the AVG (Welle Donker et al., 2018, 2019). This legal framework does not only assess which data sets can be made public, but also to what degree data needs to be modified before any publishing. An example includes the aggregation of open spatial data to a neighborhood level, in order to avoid infringement of personal information (Welle Donker et al., 2019).

2.10.2 Data ownership

Another legal barrier for open data release is data ownership. This applies especially to the public sector, since they are obliged to know who is responsible for the specific data. These public bodies are required to identify data owners and consult with them on whether or not their data meets the criteria for open data release (Vilminko-Heikkinen and Pekkola, 2019). Local governments have a history of top-down management. As a result, data was not shared between departments until recently. This makes it difficult for the local governments to create an overview of data ownership. This is made even more complicated as certain departments can be a main user of certain data, but are not necessarily the owner. Therefore, these fuzzy boundaries of data ownership can act as a barrier for releasing open government data (Conradie and Choenni, 2014).

A different challenge with open data and ownership comes with the involvement of non-governmental actors, specifically the private sector. Governments

can fund companies to collect and deliver data that can be used for their research or policy making (Okediji, 2020). However, this requires local governments to negotiate with these parties to lay down data ownership in formal agreements before data collection even begins (Okediji, 2020; Duch-Brown et al., 2017). Data creators are generally reluctant to share their collection. The argument for this behaviour comes from the fact that data collecting is a costly endeavor and as a result, companies fear that data sharing can result in a loss to their income (Duch-Brown et al., 2017). Thus, governments must formalize agreements on ownership first. A second challenge is the potential influence of the private sector in the release of open data. Since data is a valuable source to private businesses, they may try to persuade governments to only publish certain type of data sets. These data sets would be the ones that propose no threat to their activities. In other cases, such parties may also push governments to release high-value data sets that they themselves can use for their activities. However, as OGD is funded by all tax-payers, governments cannot prioritize the release of data sets that only benefit a small group of users. Each released data set must have some form of benefit to all potential users (Johnson et al., 2017).

3 Methodology

This section presents the applied methodology of the research through a number of phases. The section begins with the construction of the framework that has been used for this research. This is followed by a description of the methods that have been used for data collection. The chapter ends with an explanation of how the research has conducted the data analysis and the validation process.

A number of middle-sized municipalities in the Netherlands were selected for assessment. Each municipality was scored according to the indicators within the framework and given its own section. These sections are followed with a single section on the current state of open data governance in large municipalities in the Netherlands, which is then followed by a summary of the governance of all the middle-sized municipalities.

In the initial exploratory research, contacts were made with the representatives of the open data initiatives in the municipalities of Gouda, Zoetermeer, Haarlem, Hilversum and Zaanstad. The participants of the respective municipalities were used for the interviews. During the correspondence, it was stated by several municipalities that the communication and operational procedures between the departments within the municipality were mainly carried out in an informal way, and was self-described as a strength of the middle municipality.

3.1 Developing the assessment framework

Governance assessment frameworks are a useful tool, which can be used for multiple purposes. First, they can provide a benchmark for insight on the current state of the open data within an organization or government. Second, they allow comparisons to be made between different sectors and countries (Welle Donker and Van Loenen, 2017; Zuiderwijk and Janssen, 2014). Third, the results that were gained through the use of assessment frameworks provide an overview on possible pitfalls and existing barriers. Thus, they give insight on possible improvements in regards to both data quality and quantity (Welle Donker and Van Loenen, 2017).

Governance assessment frameworks have gone through a noticeable developments. The earliest frameworks were primarily used to a study the number of available data, which were used as benchmarks of open data success. However, from the mid-2010s and onwards, more holistic frameworks that would also go more in-depth on the performance of open data governance were used to assess OGD initiatives (Zuiderwijk and Janssen, 2014; Kassen, 2022). These frameworks integrate the governance elements that were previously discussed in Chapter 2. These frameworks often include governance elements such as developing a long-term vision, ensuring financial security, providing clarity on data ownership, creating an appropriate task division and assigning clear leadership roles (Welle Donker and Van Loenen, 2017).

The Open Data Maturity Model was released in 2015 by the Open Data Institute. It was created to assess how organizations perform in regards to publishing and consuming open data (Open Data Institute, 2015). The Open

Data Maturity Model studies the state of open data within an organization through five different themes, through five different progress levels. The five level assessment has been used in previous research on the state of open data governance of the five largest municipalities in the Netherlands (Welle Donker and Van Loenen, 2017).

3.1.1 Levels of open data maturity

Previous research applied five levels to assess the maturity of local open government data (Welle Donker et al., 2018). However, this research uses three levels instead. The choice is grounded in the previous exploratory research with the employees of the municipalities. From the preliminary interviews it became clear that municipalities do not have the complexity yet to be categorized in five different stages. Instead, the municipalities are better divided into three levels, which are: initial, intermediate and advanced.

1. **Initial** maturity describes municipalities who have published their data as open, but have not yet implemented the fundamental principles of open data governance.
2. **intermediate** maturity describes municipalities who have fundamental governance elements in place, but without clear long term goals or active control and monitoring.
3. **advanced** maturity describes municipalities which have made open data and its governance an integral and key part of the organization. They have clear defined goals for open data, they monitor progress and they build on their experience.

This research uses the Open Data Maturity Model of the Open Data Institute as a base framework for open data governance assessment. However, because the original model was created in 2015, it lacks assessment indicators for themes important to modern open data governance, such as: a focus on open governance, involvement of citizen users and inter-municipal collaborative efforts for open data development (Kassen, 2022). Therefore, this research has modified the Open Data Maturity Model in order to create an assessment framework, which can assess the middle-sized municipalities for the contemporary standards of good open data governance. Like the original Open Data Maturity Model, the modified assessment framework uses five themes. These themes are shown in Figure 6.

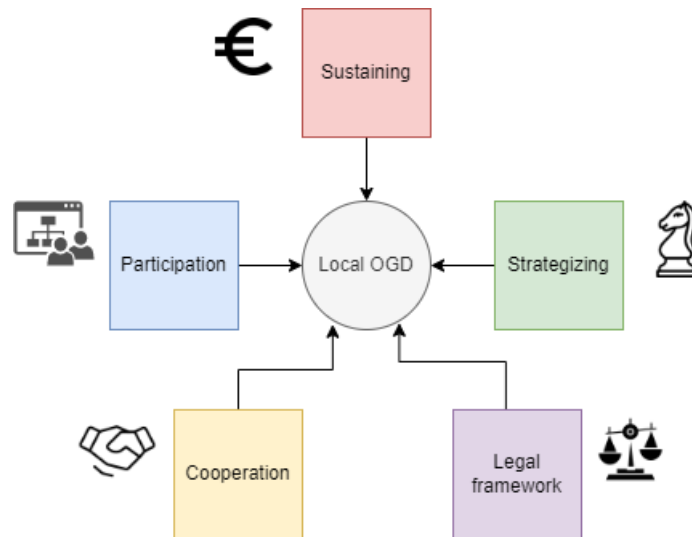


Figure 6: Local Open Data Assessment Framework

Strategizing, sustaining, legal framework, cooperation and participation are the five themes of this research. From these themes a number of indicators were created to assess the open government data governance of the middle-sized municipalities. The full assessment framework including themes, indicators and progressive levels are provided in Table 3, on the Appendix on p.110. Table 4 on the Appendix on p.111 provides an overview of the hypothetical characteristics of middle-sized municipalities and how these interact with the five themes. This relates to the presumptions that have flown out of the literary study of Chapter 2.

3.1.2 Strategizing open data

Open Data governance requires a clarity on vision, leadership and division of roles, which requires a formalization of practises into (open) data strategies. This research categorizes these undertakings as Strategizing. This is visualized on Figure 7. A municipality with a mature vision has open data integrated as a key development within the organizational activities as a whole. To achieve a mature visions, the municipalities need to set up clear goals, which are constantly monitored and altered along the journey. They also need to be fully transparent. This transparency applies both internally to staff and externally to the public. Municipalities with mature open data governance have formalized their vision into a strategy. By developing a strategy, the organization can create an efficient and clear task division for open data activities. Municipalities reach full maturity when they are actively engaged setting up new functions within their organization for open data development, and managing adequate personnel to fill these positions. The staff requires leadership, but not in a traditional hierarchic form but rather through finding common norms and goals, defined by a process of democratization, with clear transparency and accountability.

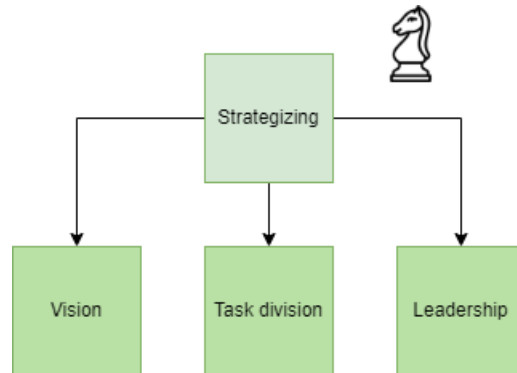


Figure 7: strategizing

3.1.3 Sustaining open data

By using long-term oriented resource management, organizations can improve the sustainability and economic impact of their open data. This will ensure that the available resources are spent on assigning the right people, items and places. This is grouped as Sustaining, and is shown on Figure 8. Financial overview is the active monitoring and controlling of all resources related to open data. A municipality with mature open data governance is expected to make considerable efforts to maximize efficiency of their open data operations. Data set evaluation relates to the prioritizing of data sets. The Open Data Directive mandates national governments of the EU member states to prioritize the release of data sets that are considered to have a high value. However,

local governments do not yet have to prioritize the release of these high-value data sets. Nevertheless, these municipalities are wise to develop an evaluation framework for data set impact if they want to anticipate for the future.

The municipalities in the Netherlands have been provided a high-value assessment framework from the VNG. However, these municipal high-value data sets are not the same as the "high-value" data sets that have been created for the Open Data Directive, which are based on economic impact. Moreover, the municipal framework was created as an advisory framework and has not been updated since 2017. (Overheid.nl, 2017). Therefore, this research has applied the high-value definition of the Open Data Directive, and its usage by municipalities to assess a full maturity of governance.

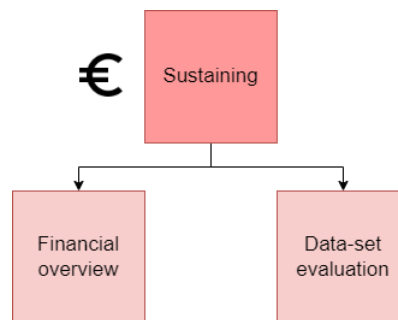


Figure 8: Sustaining

3.1.4 Legal framework of open data

The legal framework comprises two different facets, data sensitivity and data ownership. This is visualized in Figure 9. The AVG has set up standard regulations, which municipalities need to be adhere to when they want to release open data. However, the way these regulations are handled in open data activities can differ per municipality (Welle Donker et al., 2018). An organization that has reached full maturity will have multiple people controlling data sets before release, through a use of standardized assessment frameworks.

A lack of awareness on data-ownership can act as a barrier for data publishing. Therefore, mature organizations are actively engaged developing clear agreements regarding data ownership internally, and externally with private third parties. Local governments often contract third parties for data gathering and storage. Thus, applying standardized agreements on ownership is recommendable for the success future release.

3.1.5 Cooperation of open data

Cooperation is the collaboration of middle-sized municipalities and their open data governance on two different levels. These levels are internal collaboration between the different departments, and external collaboration between different

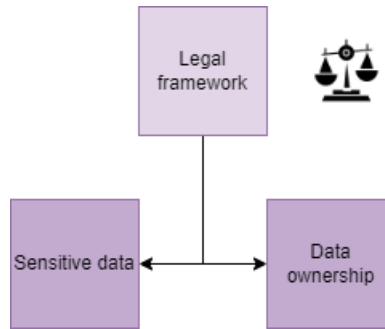


Figure 9: Legal framework

municipalities. This is visualized in Figure 10. This research approaches internal cooperation as the extent a municipality attempts to spread knowledge on open data within the entire organization. And to what extent it offers (informal) training for employees within the organization. Fully mature municipalities acknowledge the importance of open data. Thus, the staff must have a recent and adequate knowledge base. This requires training of staff members, which is part of the general data strategies.

External cooperation refers to the level in which the municipalities engage in collaborative projects with other municipalities. Fully mature municipalities are actively involved with other municipalities to share knowledge, develop common portals and standardize their data. Municipalities with a full maturity do so in a formalized fashion.

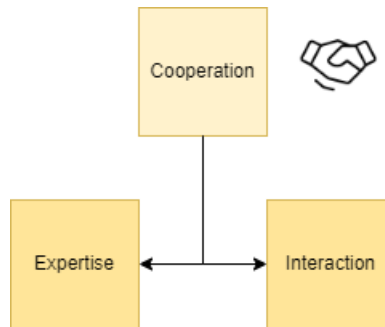


Figure 10: Cooperation

3.1.6 Participation of open data

The open data governance aspect of Participation is one of the most complex themes. Therefore, four indicators were used to assess the theme. These indicators are visualized in Figure 11. Municipalities need to engage with their citizens. Early stages are primarily concerned with publishing. However, fully mature municipalities will have users identified, categorized and used in an active engagement to monitor their needs and desires.

To increase the user base, the municipalities can promote their open data. Municipalities in an early stage are not engaged in outward promotion. Fully mature municipalities are actively involving themselves in all sorts of media platforms and social events to raise awareness.

To gain the feedback from the users more efficiently, the municipality can build a community of users. A fully mature municipality will have active digital and real life events to bring together the different users of their open data. By doing so, the users can share knowledge and engage in training sessions, bootcamps and hackatons to become even more involved with open data.

Open governance is the last indicator of the research. It measures to what extent users are actively involved in open data, not only through providing feedback, but also to have active sessions with the government actors in charge of the open data to have a multistakeholder approach towards open data development.

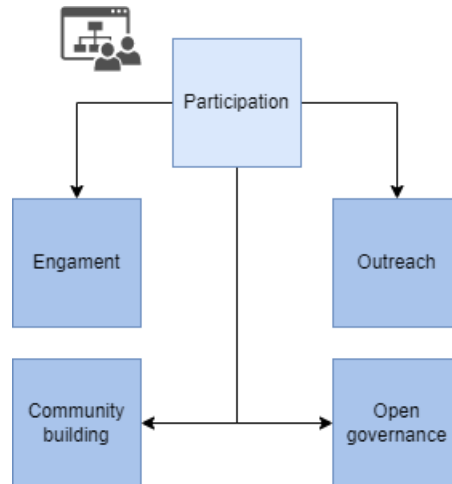


Figure 11: Participation

3.1.7 Reading guide for assessment and scoring

Each municipality is described in a separate chapter. Each chapter starts with a brief overview on the location and history of the municipality, the population size and its average property value. This is followed with an introduction the current state of its open data. This provides overview of the available portals, history of open data, and a description of the organizational structure.

In each section, the themes are given their own sub chapter. Each municipal chapter ends with a summary of the open data governance, which is visualized through a spider chart. The spidergram is visualized on Figure 12.

An indicator can have a score that ranges from 1 to 3 (initial, intermediate, advanced). Municipalities can get a mixed score if the elements of either maturity level is not fully there, such as intermediate-advanced (2.5 points). Some themes have more indicators than others. Thus, the summarized scores of themes are rounded to half numbers. For example, if the theme of legal framework has one indicator that scores initial (1 point) and one advanced (3 points), the theme average is intermediate. If a theme has an indicator that scores initial (1 point) and one that is intermediate (2 average points), the average score of the theme will be initial-intermediate (1,5 average points).

If the theme of participation scores initial on three indicators, and advanced with one indicator, the average would be 1.25. This would then be rounded downwards to closest half number, which in this research would be 1. If a theme with three indicators has an average score of 2,33, it would be rounded up to 2,5 points.

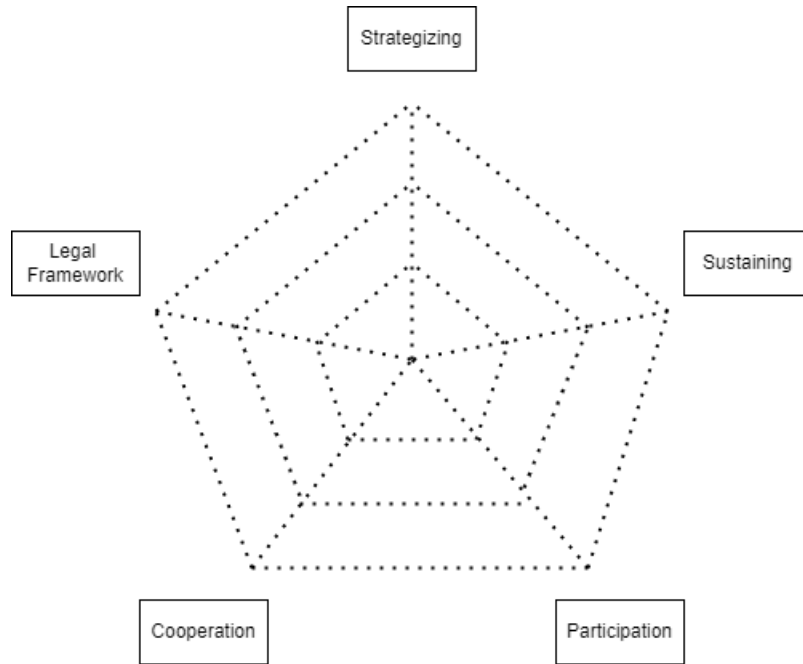


Figure 12: Open Data governance scoring

3.2 Data gathering and analysis

Data gathering was conducted in two steps. First, a series of semi-structured interviews were held with the selected middle-sized municipalities. The use of semi-structured interviews was also applied in previous research (Welle Donker et al., 2018; Janssen et al., 2012). These interviews were conducted with government employees involved with the open data development of their municipalities, and have a clear overview on its history and future. Their functions range from data-owner, project manager, data governance manager or geo/GIS experts.

The second step combined correspondence with the G5 municipalities of the previous research, and desk research (Welle Donker et al., 2018). The previous study was conducted in 2018. To get an accurate overview of developments since the release of that research, any article, paper related to their open data had to be released 2018 for the use of this research. This would create a more accurate representation on the state of open data governance in these large municipalities (Benitez-Paez et al., 2018).

This research is focused on the open data activities of middle-sized municipalities. The maturity level of the large municipalities provide a tool for comparison, but is not focus of the research. Thus, the earlier described assessment framework was not applied to assess the large municipalities. The results of the middle-sized municipalities are summed up in Chapter 10.

3.2.1 Data validation

After the data collection had been completed, the process of data evaluation and validation commenced. This included a series of e-mails and additional interviews. The validation process enabled the government employees, who had participated in the first round of interviews, to provide their results.

If a staff member from the first interview round had left the organization, a suitable replacement of similar position would be used for the validation process instead. The participants were able to reflect on the results, and provide additional input on the development of their open data since the initial interview. The functions of the participants, the dates of the first interview sessions, and the dates of the validation interviews are visualized in Figure 13. Three out of five municipalities were able to conduct a validation session.

Municipality	Initial Interview		Validation Interview	
	Function	Date	Function	Date
Gouda	Geo-Coordinator	November, 2020	Geo-Coordinator (same)	June, 2023
Zoetermeer	Data-Architect(old)	November, 2020	Data-architect(new)	July, 2023
Zaanstad	Geo-Administrator	November, 2020	Geo-Administrator (same)	July, 2023
Hilversum	Geo-Coordinator	November, 2020	-	
Haarlem	Geo-Coordinator	June, 2023	-	

Figure 13: Interview and validation session times

4 Gouda

The municipality of Gouda is located in the province of South Holland, as seen in Figure 14. The municipality is internationally known for its cheese, which positively affects the Dutch tourism sector (VVV, 2023). Rapid urbanization in the 1960s led to the Dutch government planning two different zones: the Randstad and the Groene Hart. The Groene Hart was not to be urbanized but instead used for agricultural purposes, recreation, and preserving the natural beauty of the Netherlands. The Groene Hart restricts the urban sprawl of the Randstad, as well as that of Gouda. Situated in the heart of the Groene Hart, Gouda serves as the central transport hub for Randstad commuters. With a population of 74.000 in 2022, Gouda is one of the most densely populated municipalities in the Groene Hart, playing a significant regional economic role. Gouda has reached its municipal construction limits, leading it to focus on (re-)construction within its boundaries due to Groene Hart building regulations (Stichting Groene Hart, 2021). The average property tax value (WOZ) was approximately €323.000 in 2023, ranking lower than the average WOZ value of Zuid-Holland (€360.000) (CBS, 2023).

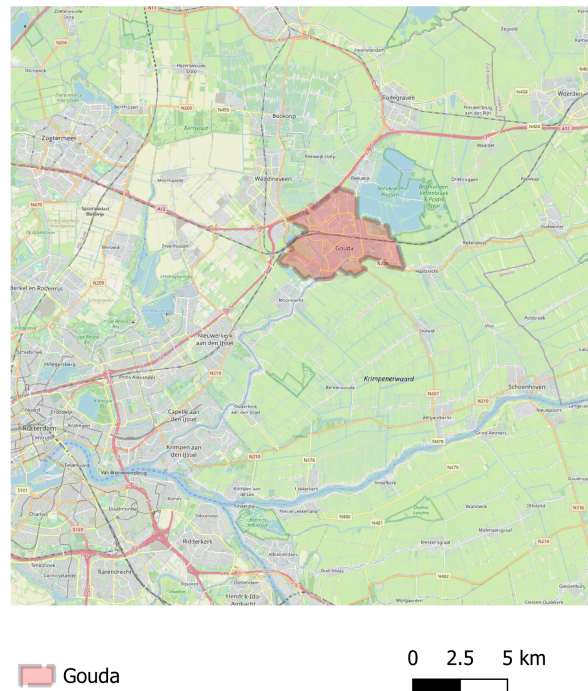


Figure 14: Municipal borders of Gouda (Figure by author)

4.1 Background of open data in Gouda

The interview was conducted with the team-coordinator of the geo-information team. This team consists out of two employees. The same coordinator also participated with the validation process. Two reasons were given why the municipality of Gouda started to open its data in 2012. First, it was to enable private third parties contracted by the municipality to have an easier access to necessary data sets for their work. Second, the municipality of Gouda published open data on the ground of the “open unless” principle. Initially, the open data release was started by a small group of enthusiastic individuals, including the coordinator. These people had an innate interest in the potential of open data and its applications. Thus, it was decided that the large swath of in-house data was to be opened. Gouda has two different open data portals, the GIS Gouda Portal and Gouda in Cijfers. Both of these include spatial data, as shown on Figure 15.

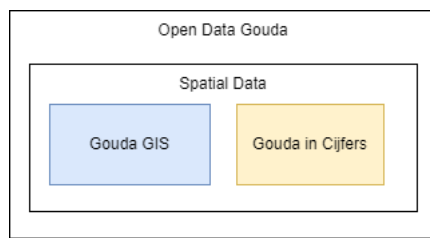


Figure 15: Open Data portals of Gouda

The Gouda GIS portal features five different themes, each with multiple data sets as can be seen on Figure 16. The portal leads to an interactive viewer, where the data sets can be downloaded using the attribute filter. The themes include: basiskaarten (administrative data sets), beheer openbare ruimte (public space data sets), bouwen (construction data sets), cultuurhistorische kaart (cultural-historical data sets), and klimaatatlas (climate atlas). Each theme offers several thematically related data sets, along with tools for drawing, buffering, or creating an overlay.

4.2 Gouda in Cijfers

Gouda in Cijfers provides access to (geo-)statistics about the municipality. The homepage of the portal features a number of themes, covering topics such as population demographics and economic data. Each theme provides a range of pre-made dashboards, encompassing maps, graphs and numerical information that can be downloaded. The portal also offers access to raw data sets (data-bank). Users can select data sets with corresponding maps, pie charts and graphs for territorial units.



Figure 16: Open Data Gouda Portal

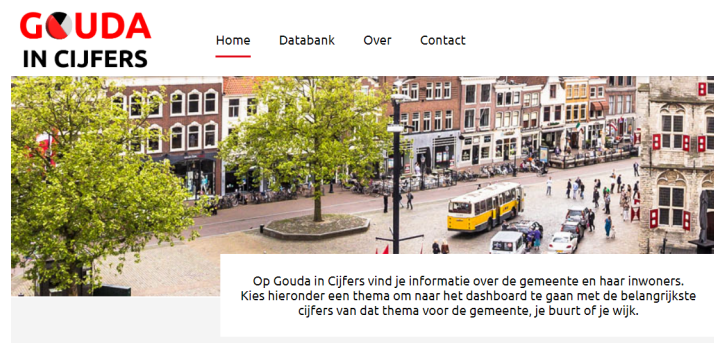


Figure 17: Gouda in Cijfers

As depicted in Figure 17, the portal includes a comprehensible manual and a contact link. However, the contact does not refer to the Gouda GIS e-mail. Gouda in Cijfers is developing using Swing(Mosaic), a geo-statistics company based in the EU, specialized in data visualization.

4.3 Strategizing open data in Gouda

Gouda did not initiate open data through a formal process. Instead, it started as an informal bottom-up process by individual staff members, predominantly from the geo-team, to gradually release data sets. This process encountered little to no resistance within the administration, provided the civil servants responsible for the data sets were informed and had given their permission before release. The team-leader emphasized that starting open data with release is sometimes more effective than establishing policy in advance

The viewer is developed using open-source software by B3Partners. The existing data sets are updated every single night. The release of new data sets depends on the available time and resources of the staff. Interestingly, there is a strong informal monitoring by the geo-team to understand the demands and desires within the municipality. Any issues are stated to be quickly dealt with. This interaction is a two-way street, as those staff members who want to have data released as open, are expected to deliver accurate and actual data, and in an appropriate format (shapefile). Although some aspects of vision are similar to an advanced phase, there is no conscientious effort from the municipality to develop open data, let alone use it to strengthen the organization.

And even though there are no published open data strategies, the geo-team leader made it clear that there is one defined goal. The data of Gouda must be centralized on a single viewer, to prevent duplication and make government activities more efficient. Therefore, the vision can be placed in its intermediate stage.

4.3.1 Task division and leadership of open data in Gouda

The role division is clear defined as the geo-team is generally small. Engagement with employees from other departments and assignment of tasks happens in an informal, but straight forward fashion. Therefore, task division can be placed within the intermediate phase.

The team-coordinator of the geo-team has an all round function, and plays a central role within the open data governance. The team-coordinator is also the information manager within several other departments. This enables fast and informal engagement with multiple departments to monitor demands and provide advice. The advice includes digitizing and centralizing data under a single platform, which can then be opened to the general public. Since the central position is active in engaging with open data and spreading awareness on its potential within the organization, the geo-leader has taken a position of informal leadership. Although informal, there is a clear responsibility for

the task within the open data project. Therefore the leadership can be placed within the intermediate phase.

4.4 Sustaining open data in Gouda

Little information was given on the governance of resource management. The coordinator mentioned that to have more resources available than other departments, which can be used in projects like open data. However, there is conscientious policy for funding of open data from the municipality. Therefore, the financial overview is placed in the initial phase. Moreover, the release of data sets is based upon availability, quality and sensitivity. The data sets that are eligible for release are not assessed for their economic value, nor is any other standard prioritization format used. Therefore, data evaluation is in the initial phase.

4.5 Legal framework of open data in Gouda

The municipality of Gouda has an informal approach to the assessment of sensitive data. While the geo-team adheres to the AVG, there is no use of standard formats. Instead, the geo-team uses its own knowledge and experience to handle sensitive data. Handling the AVG regulations proves to be a complex factor. Thus, the majority of the published data sets are guaranteed to provide no issues regarding sensitivity. As these data sets have no personal information, there is no need for a complex AVG assessment. The downside of this process is that certain data sets will likely never be published as they are too complex regarding sensitivity. Thus, the level of sensitive data governance is still in the initial phase.

4.5.1 Open Data ownership in Gouda

Through informal fashion, the geo-team is actively engaged with keeping an accurate network of data-producers and users. According to the team-leader, there were some minor issues around accuracy with the earliest published data sets. But due to the central and interdepartmental position of the coordinator, these issues were easily mitigated to the responsible data-owner. While data-ownership is clear within the organization, there is no effort to standardize agreements for future endeavors. However, the interview made clear they may attempt to do so in the future. Thus, Gouda has an intermediate maturity for data ownership.

4.6 Cooperation of open data in Gouda

The geo-leader has collaborated with the VNG in the past, in a project dedicated to standardize municipal data. However, this project was short lived. While there is a large enthusiasm to work with other municipalities, these mutual enterprises rarely come to fruition. The only successful collaboration with public



Figure 18: Manual GIS Gouda

bodies is done with the Dutch state, as the municipalities are responsible for providing accurate data on the BAG and BGT. The attempts to made contact with other municipalities places Gouda in the intermediate maturity level for interaction.

The expertise on open data is concentrated within the geo-team, which has been involved with the open data project since its conception. However, the geo-leader stated to be actively involved in helping the entire organization in understanding the value of open data. Moreover, small meetings have been organized, and this information has been used to make the open-data accessible and usable to employees. The importance of the employees was emphasized in the interview, as they are a main user of the local government data. Therefore, the expertise can be placed in an intermediate level.

4.7 Participation of open data in Gouda

During the interview, the geo-leader stated that there were some efforts in the past to identify users by monitoring the log-ins of employee accounts. However, it was stated that this provided little to no added value. No such thing was done for external open data users. However, efforts have been made to create communication channels with potential users and provide aid in facilitating their needs. In the viewer, a button links to the mail of the geo-team. Moreover, the viewer contains an elaborate hand guide to provide assistance to users, which is also shown in Figure 18.

The manual has an elaborate description of the themes and data sets. It also provides an instruction on the available tools within the viewer. Therefore, the engagement of the open data is in an intermediate maturity level.

Gouda has a focus on releasing accurate data sets. During the interview it was stated that, although a small local news article has been published, there is no engagement with users. Rather, the focus is placed on ensuring data quality. If the quality is not up to the user standards, communication channels are provided to give feedback. Therefore, the outreach is currently in an initial maturity level.

Gouda is rather familiar with several civic groups who use their open data. One of these groups is the cultural-historic association of Gouda. This organization is comprised out of a group of volunteers, engaged in the preservation of the cultural heritage in the municipality. The association was described to consist primarily out of senior aged citizens, who have no experience with GIS. However, as the association provides a valuable addition to the government and its inhabitants, the geo-team has conducted a series of workshops to familiarize its members to work with GIS and open data. Familiarity of local users and sharing knowledge places Gouda in the intermediate maturity level for community building.

4.7.1 Open Data governance in Gouda

Throughout the interview, it became clear that the geo-team plays a central role for the municipal open data. Only a small amount of information could be extracted on how the users contribute to the development of the open data in Gouda. Since the municipality has not yet formalized its vision, data release is done upon request from employees, in accordance to the ability of the geo-team. There is a lack of transparency on future releases, as well little to no involvement of citizens in the shaping of the municipal open data development. Thus, the open governance is placed in the initial maturity level.

4.8 Open Data in Gouda summarized

Strategizing is placed in the intermediate level. The open data governance of Gouda is defined by informal practises (Figure 19). Nevertheless, the municipality of Gouda has successfully set up a viewer and has received positive feedback from its users. Gouda is in its intermediate phase for strategizing. There is a clear vision, centralizing data for employees under a single viewer. But it still lacks active monitoring and transparency. This can be attributed to the small size of the geo-team. The staff operate as a central node within the organization. And has clear cut leadership and tasks. However, there are some constraints on resources and staff.

Sustainment is placed in the initial level. While the geo-team has sufficient money for a bottom-up approach to open data development, there is no explicit and active funding for open data from the municipality. Neither has the geo-team of Gouda developed an assessment framework on high-value data sets, which be attributed to the constraints that come with being a small team.

The legal framework can be placed between the initial and intermediate maturity level. The geo-team of gouda makes no use of standard assessment frameworks for sensitive data. However, there is a strong body of knowledge present in the geo-team. Moreover, there is an active engagement with data owners for centralization. However, formal agreements are not yet in place.

Cooperation of Gouda is in the intermediate phase. There is some active effort to collaborate with other municipalities, although it largely failed due to external factors. This was attributed to the general inefficacy of the unifying

municipal platforms like the VNG. While Gouda has no formal training for open data, the geo-team provides on the fly knowledge exchange for any of the civil servants or contractors who use their data sets.

Participation of Gouda can be placed between the initial and intermediate level. While there are some engagements with local groups, so far this only occurs on a small scale. External users can provide input through the communication channels, however they are not actively approached to provide feedback or asked to contribute in shaping the direction of open data.

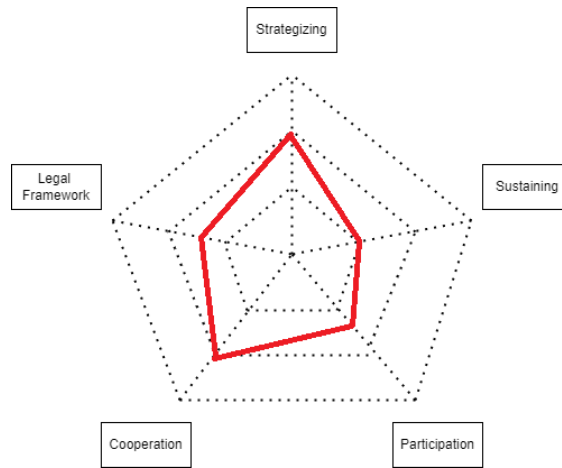


Figure 19: Score Gouda

5 Zoetermeer

The municipality of Zoetermeer is located in the province of Zuid-Holland, north of Rotterdam and east of The Hague. It borders the Randstad and the Groene Hart, as can be seen on Figure 20. Zoetermeer was named after the now mostly dry lake, the Zoetermeerse Plas. In 1962, Zoetermeer was appointed to be a designated municipality for urban growth (Groeikern). These municipalities went through large-scale construction projects to facilitate the growth and housing of the Dutch population in a controlled manner. These urban development transformed Zoetermeer from a small town with fewer than 10.000 inhabitants, to a middle-sized municipality with approximately 125.000 inhabitants. While Zoetermeer used to primarily house commuters for The Hague, many of inhabitants now work and recreate in their own city. The property value (WOZ) of Zoetermeer averaged around €357.000 in 2023, which is slightly below the provincial average of Zuid-Holland (€360.000) (CBS, 2023). Today, the built area of Zoetermeer has largely reached the municipal borders. Therefore, the municipality is building inwards by deconstructing the dwellings built in the 1960s, to make way for new high-rise buildings.

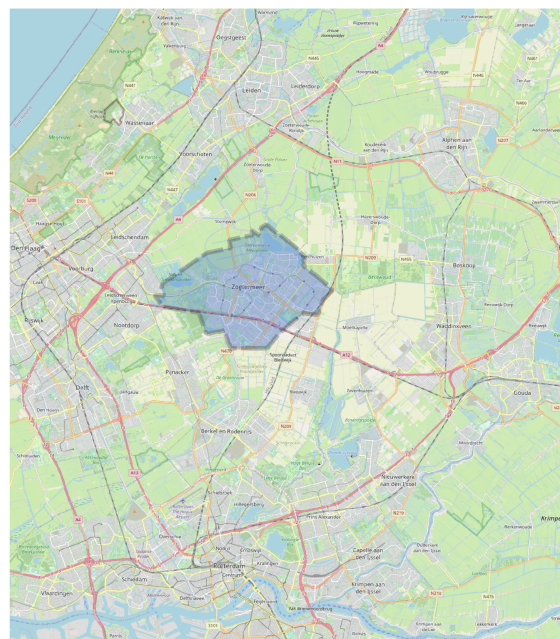


Figure 20: Municipal borders of Zoetermeer

5.1 Background of open data in Zoetermeer

The initial interview was conducted with a data architect, who had left at the time of the validation interview. The first data architect had previously worked as an advisor within the business intelligence team of Zoetermeer, initially as an intern. This internship position was created by the coordinator of the business intelligence team. The goal was to discover the requirements for creating an open data platform. The data architect stated that as an intern, the majority of time was spent on setting up meetings and gathering information from data owners and civil servants to agree with releasing their data as open. The actual creation of the portal took only a fraction of the effort. Nevertheless, the structure of Zoetermeer, described by the data architect as a "super-flat organization," ensured that few barriers were encountered.

The second validation interview was conducted with the current data architect. This new architect started working as an advisor, under the guidance of the old data-architect. When the first data-architect left the organization, the advisor became the new data architect. At the time of the validation interview, Zoetermeer had not yet actively pursued new personnel to fill the vacant I-advisor role. The open data portals in Zoetermeer are Open Data Zoetermeer, Stadsatlas Zoetermeer and Zoetermeer in cijfers. All the portals feature open spatial data, as is shown on Figure 21.

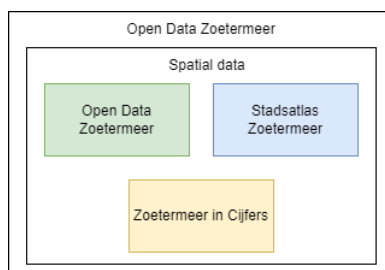


Figure 21: Open Data portals of Zoetermeer

5.1.1 Open Data Zoetermeer

As of 2023, Open Data Zoetermeer hosts a number of thematically organized data sets. The portal includes 17 different themes, which range from voting booths (Bestuur) to municipal landmarks (Cultuur & Recreatie). However, as depicted in Figure 22, only 7 out of the 17 themes contain actual data sets. The themes without any data sets are marked in grey (e.g. Migratie & Integratie). Accessing a data set will link to a viewer with a web map. These map interfaces provide information on the date of data collection, the time of the most recent update, and a link for downloading the data.



Figure 22: Open Data Zoetermeer Portal

5.1.2 Stadsatlas Zoetermeer

In addition to the thematically organized data sets, the open data portal of Zoetermeer also provides a link to the Stadsatlas Zoetermeer, shown on Figure 23. This viewer allows users to access a number of spatial stories about the municipality. However, the portal does not offer an option to download layers. Each data set includes a brief summary of approximately two paragraphs with background information on the data. The spatial maps serve as a complementary tool to help users, alongside their respective text, about a particular topic of interest. One story map example is about the historical development of the city.

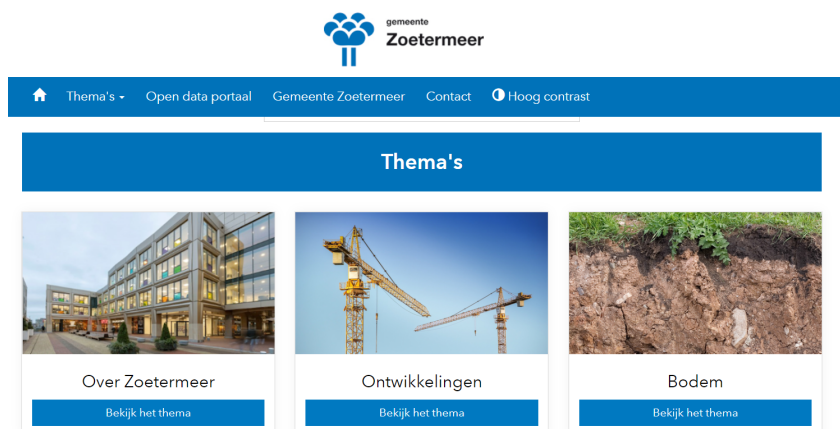


Figure 23: Stadsatlas Zoetermeer homepage

5.1.3 Zoetermeer in Cijfers

Finally, Zoetermeer in Cijfers provides geo-spatial information. Developed by the same company as the one in Gouda, the portal provides dashboards with feature graphs, maps, and numbers. The dashboard information can be downloaded, and raw data can be accessed and downloaded as well. Zoetermeer in Cijfers has a total of 6 thematical dashboards. It also features a section that hosts official governmental rappers, related to the information provided on the portal. Figure 22 shows a dashboard of the portal. Visualizing the number of the jobs within the city borders on the bottom left corner. On top are the additional features like contact info and rappers.

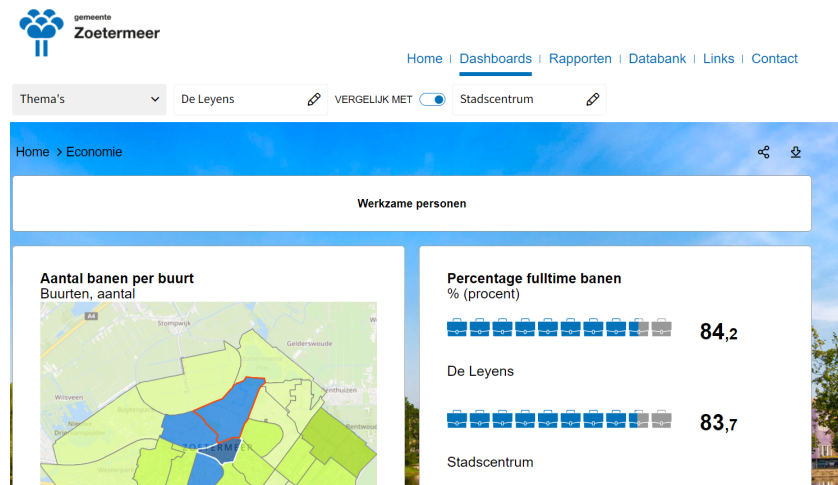


Figure 24: Zoetermeer in Cijfers

5.2 Strategizing open data in Zoetermeer

Zoetermeer initiated with open data based on the principle of societal responsibility. The leading philosophy was that anything funded by the public, should be accessible to the public. At the time of the internship, the first data architect assessed the different departmental visions, and how they weigh against the organization-wide open data vision. This was done through a stakeholder approach. Through the use of presentations the data architect tried to convince the department leaders to participate in the open data vision. These presentations were accompanied by a motivational banner that said "gathered in the city, is for the city". As there were no conflicts encountered, and communication with departmental heads went smooth, a common vision was quickly established. The new approach for data was to be "open unless".

In the first interview, open data was described to be part of a general data strategy. From the beginning, open data was set up as a top down process, with a focus on creating a formal strategy from the get go. This would provide a foundation to fall back on and reduce the risk of potential threats that could damage the future of the municipal open data. While Zoetermeer has developed open data strategies for years, they are not publicly released. Zoetermeer is undergoing open data development through several phases. In the first interview, it was stated that one such goal in the next phase would be to create a linked open data.

The new data-architect remarked that open data development is still important to Zoetermeer. Recently, there has been an effort to update the available data sets every quarter of the year. Although there are some plans for expansion, there is a lack of available staff for realization. The departure of the previous data-architect had created a vacuum in staffing. This was partially resolved by promoting the former advisor to data architect. But the role of advisor, which is now a vacant position, has been primarily responsible for the development of open data. Moreover, the new data-architect mentioned to struggle with restarting the project, as information has been left scattered within the municipal system. The new data-architect perceived the municipality to be not actively engaged in monitoring the process of open data activities. Therefore, vision is placed in the intermediate maturity level.

5.2.1 Task division and leadership of open data in Zoetermeer

Zoetermeer started open data as a top down process, which included role division and the creation of functions intended for open data. Figure 25 depicts how the positions have changed over the years. At the time of the first interview in 2020, the I Advisor role was vacant. In the period after the first interview (2021-2023), a new I advisor(B) was employed under the direction of the first data-architect(A). However, after the departure of the first data-architect(A) in 2023, the I Advisor (B) became the new Data Architect(B). The I Advisor has an operational role, while the Data-Architect has a more strategic role. The Data-Architect directs the Advisors in the course of action. At the time

of the second interview, the I Advisor position was vacant again. Since the I advisor is primarily tasked with creating, expanding and maintaining open data, a vacuum has developed. The open data in Zoetermeer is affected by the departure of important open data champions, leading to a standstill. The municipality is unsure on how the issue needs to be tackled. The creation of a new data steward position has been proposed to restart open data development. Therefore, the task division is placed between the intermediate and advanced maturity level.

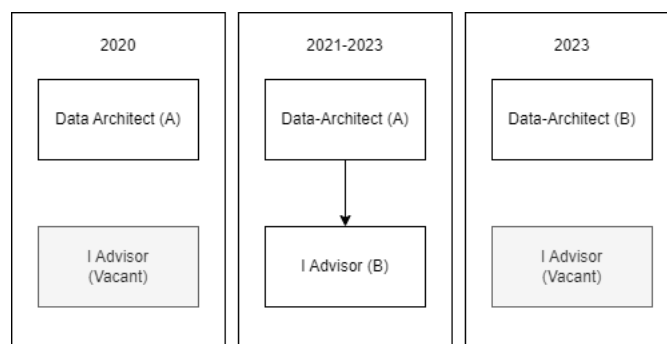


Figure 25: The positions involved with Open Data Zoetermeer

The formal structure of open data in Zoetermeer is apparent in both operational and managerial positions. There is a clear division of tasks, roles and responsibilities but with a strong democratic element. The first data-manager noted that while only working as an intern, there was a strong level of mutual respect and understanding within the government. The new data architect stated that there is a flat and easy-going communication within the municipality, and that those in a manager position are eager to listen about any input for innovation, as well as willing to foster ambition. There was a clear line of communication channels for open data. Zoetermeer offers a lot of freedom for civil servants to fill in their various activities, such as open data, to their own timing and capabilities. Therefore, the leadership can be placed in advanced level.

5.3 Sustaining open data in Zoetermeer

There was zero budget for open data activities during the initial phase. When the data-architect was employed as an intern, the financial restraints made him unable to perform a large scale user analysis. However, this was noted to be only a minor issue. There is budget available for more personnel. There needs to be a data-architect involved on a manager level, there is a need for someone on the operational level, a position similar to the internship role years prior. It was implied that there is some awareness about budgeting, and that data gathering with private parties is part of the general business analyses within the

organization. Therefore, the financial overview can be placed in the intermediate level.

The data-architect mentioned that municipal "high-value" data sets were used in the initial stages of the open data activities. The first data-architect mentioned that there is an awareness on the impact of certain data sets. One given example was how the data set for parking-information could be used by third parties to create goods and services, spurring innovation within Zoetermeer. On the other hand, the second data-architect had never heard of the European Open Data Directive, nor its associated high value data sets. Thus the data set evaluation is placed within the intermediate level.

5.4 Legal framework of open data in Zoetermeer

In the interview, the data-architect elaborated the chain of data set publication. One of the involved agents within the chain is a so-called privacy officer. This individual is tasked to discover any information that might violate current laws and internal policies regarding privacy. The privacy officer is given a standardized format. Zoetermeer developed its own decision tree, to find any issues within a certain data set. Publication of data occurs through a chain of people. First the data-architect checks for inaccuracies and concerning privacy matters. Afterwards, it is sent to the privacy officer for a second opinion on the interpretation. Then, it is sent to an in-house expert. This is followed by an approval by the manager of the data-architect, who will finally send it to the council for information management. In case there is a political sensitivity it will need a second opinion by the municipal council. While the chain does help the prevention of releasing sensitive data, it has been described by the new architect as a factor that makes data release slow and difficult process. The elaborate structure of publishing and privacy checking places Zoetermeer in the advanced maturity level.

Data ownership is an important topic within the data governance of Zoetermeer. According to the data-architect, "data is worth gold". As a result, the municipality is attempting to change ownership of data from third parties, which have been funded or have collaborated with the municipality, to their own organization as much as possible. An example given was a private company that rents multiple car parks the city. The data generated by these car parks is owned by another entity, and as a result the municipality had to arrange a separate contract. Thus, creating a framework for handling data ownership is a necessity. However, the municipality has yet to develop such a framework. However, it is an ambition for the next phase of data governance in Zoetermeer. Therefore, Zoetermeer is placed in the intermediate level for data ownership.

5.5 Cooperation of open data in Zoetermeer

The data-architect stated that Zoetermeer has engaged in a multitude of collaborate efforts with other municipalities. Zoetermeer collaborated with Delft to gain a better understanding on how to improve data management, data models

and data quality. Part of this was done by testing the models of the municipalities and see how they corresponded with actual data. Some other non-specified municipalities have participated in sessions on how to improve the presenting of data to external users. The municipalities of Utrecht, Delft and the ministry of Interior and Kingdom relations have worked together to share best-practices. Some efforts were made to join data sets together or host them on a singular platforms, but generally led to no fruition. This was attributed to the inability of small municipalities to provide the time, manpower and resources required to successfully meet the goals of such projects. Therefore, the interaction level of Zoetermeer can be placed in an advanced level.

The structured, albeit flat character of Zoetermeer is visible through its knowledge base. Releasing a new data set has shown to follow an elaborate, but effective chain of approval. During the interview, there was no clear answer whether internal users were given any training. The departments have their own experts, but they come together to develop open data. It was not clear if these experts were handed some form of training or information to have their collaboration run more effectively. Therefore, the expertise of Zoetermeer is still in an initial level as the body of knowledge is contained within the data-experts.

5.6 Participation of open data in Zoetermeer

There is a strong awareness of data users within the municipality. Before the open data portal was designed, the data-architect executed a cost benefit analysis, which included a diverse range of possible municipal open data users. This analysis weighted the feedback of multiple user groups against the plan to develop open data. The successful execution of the business case helped to convince the staff members of the municipality to agree with the creation of an open data portal.

For external users, there is an overall awareness, but not a detailed one. The data-architect read in multiple reports that the main external users range from developers, journalists, researchers and students. Citizens who occasionally stumble upon open data are a minority. No further research was done, as it would imply that the government would gather personal information. Since the added value was not worth the legal effort of gathering such data, it was not researched any further. The website of Zoetermeer includes multiple channels for users. One for general contact and one to register a data leak, as can be seen in Figure 26. Therefore, the level of engagement of Zoetermeer can be placed in the intermediate level.

At the time of the first interview, there was little information given on how the municipality of Zoetermeer promotes its data to the outside world. However, it was mentioned that Zoetermeer is referred as an example by other municipalities on how data can be opened. Aside from other municipalities, there was no indication of any interaction with users. The level of outreach can therefore be placed in the initial stage.

The same can be said for community building. There was little mention regarding Zoetermeer and setting up a community of users. Although the mu-



Figure 26: Communication channels open data Zoetermeer

nicipality is somewhat aware of its users, there is no effort made to tie them to their open data. Therefore, the level of community building is also placed within the initial level.

There are no publicly available data strategies for Zoetermeer available. While the internal users were involved with the initial stages of developing an open data portal, no such information exists on external users. Despite the lack of active engagement from users, there is a consideration for their desires. Based on the type of general users, Zoetermeer has created multiple scenarios on how the data can best be published, and to have its quality guaranteed. In addition, there is a specific focus on the potential desires of the inhabitants of Zoetermeer. However, the lack of transparency and avoidance of active civic engagement places Zoetermeer in the initial level.

5.7 Open Data in Zoetermeer summarized

Zoetermeer is in the advanced maturity level for strategizing. The municipality has a strong formalized vision for its data governance. Open Data is an element within general data governance, but does not exist as a separate entity. According to the data architect, the middle-sized structure of Zoetermeer has contributed to the development of a formalized vision. This was attributed to Zoetermeer lacking "true" or rather, isolated departments. This makes it easier to find common goals, and preferred methods within the different entities of the organization. During the interview, the governance maturity level of Zoetermeer was stated to be on a similar level to Delft.

Zoetermeer is in the intermediate level for sustaining. There is an awareness of valuable data sets but are not assessed on a high-value framework of the Open Data Directive, but that of the Dutch municipalities. Moreover, the municipality is conscientiously funding open data.

Zoetermeer can be placed in between the intermediate and advanced level for legal framework. It has formalized a chain of control to minimize potential threats around data sensitivity. The municipality is engaged in settling data-ownership issues through the creation of standardized formats. However, these are currently still in development.

Zoetermeer has an intermediate score for cooperation. On one hand, the interview indicated that Zoetermeer has a history of extensive collaboration

with other municipalities. On the other hand, civil servants are generally not given any sort of training to become familiar with open data.

The governance aspect of participation can be placed in the initial level. Participation is a weak point of Zoetermeer compared to the other areas. While awareness exists on the general external users types, there is little engagement with them. In addition, users are generally not providing any sort of critical feedback to shape the development of the municipal open data activities.

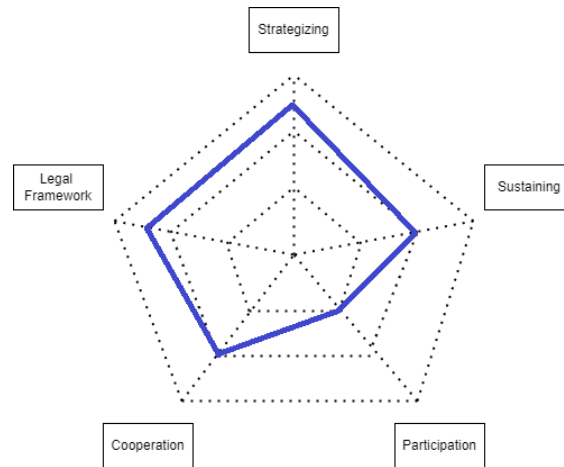
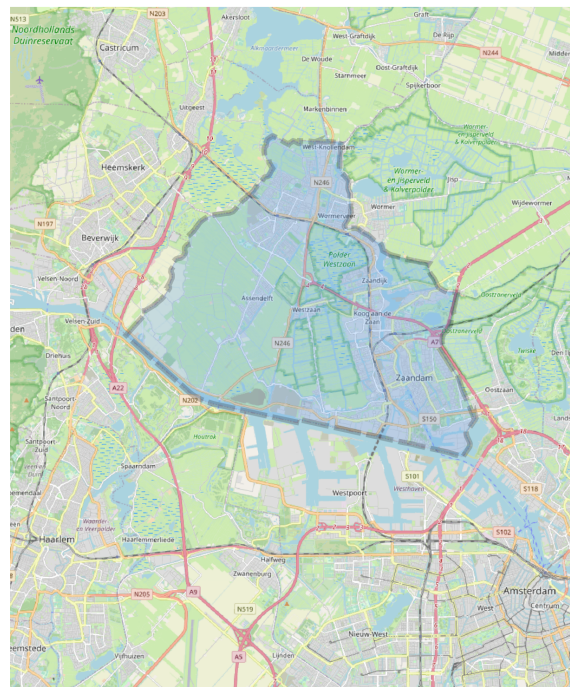


Figure 27: Score Zoetermeer

6 Zaanstad

The municipality of Zaanstad is located in the province of North Holland, north of Amsterdam, as can be seen on Figure 28. Zaanstad was created as a merger between the historical town of Zaandam and the smaller towns of Assendelft, Koog aan de Zaan, Krommenie, Westzaan, Wormerveer and Zaandijk. Historically, Zaanstad was the center of the Zaanstreek region. This region is defined by its windmills, which were used for milling wood. Lumber is evident in the local traditional architecture, and is internationally recognized as an example of traditional Dutch architecture. As a result, the municipality of Zaanstad receives a large selection of tourists every year. The proximity to Amsterdam is a large contributor to the population growth of the municipality, as there are approximately 156.000 inhabitants in 2022. The WOZ (average property value) is €368.000 in 2023, which is lower than the average WOZ of Noord-Holland (€461.000) (CBS, 2023). Unlike Gouda and Zoetermeer, the built environment of Zaanstad has not yet reached its municipal borders.



 Zaanstad


0 2.5 5 km


Figure 28: Zaanstad municipal borders (Figure by author)

6.1 Background of open data in Zaanstad

The interview at Zaanstad was conducted with the administrator of the geo-information division. This is part of the centralized IT-department of Zaanstad. The administrator claimed to have primarily developed the data portals with QGIS, PostGIS and geo-servers. Zaanstad started with open data in 2008, and has had a portal running since 2010. The portals have changed over the years. At one point, there was a change to open source but this was later reversed to a close sourced portal by a different company. Currently however, the municipality is mix of operations with open-source software again. The release of open data in Zaanstad was a gradual process. The municipality has gathered and stored a large quantity of digital data over the years, which were initially stored on disks. However, the municipality decided it would be more cost effective for third party users, such as government contractors, to access data through a web service. This one of the motivators to release data as open to the public. During the interview, it was claimed that Zaanstad hosted approximately 200-300 data sets at one point. The quantity of data was described as an "overkill", and in need of structuring. Thus, Zaanstad is engaged with data professionalizing. This process would reduce the quantity of data, but improve the user experience.

Local spatial data is not only published on the portals by Zaanstad, but also on the national geo register, a centralized register of spatial (meta) data. The administrator claimed that his predecessors were one of the first to be actively involved with the release of local data on a national platform. The main motivator for opening data on a new portal was of a technical origin. Zaanstad had a need for more data control, which would require adherence to modern standards. Avoiding data duplication and not having users to go to multiple internal portals were described as the key motivators for the development.

Open Data in Zaanstad is provided through multiple portals. The municipal archives provide non-spatial data, such as historical documents. These documents are primarily intended to be used for large statistical analyses, not individual family research. Spatial open data in Zaanstad is hosted on three different platforms. These are Zaanstad in Cijfers, Zaanstad Atlas and the Data-pakhuis. The Zaanstad Open Data portals are illustrated in Figure 29.

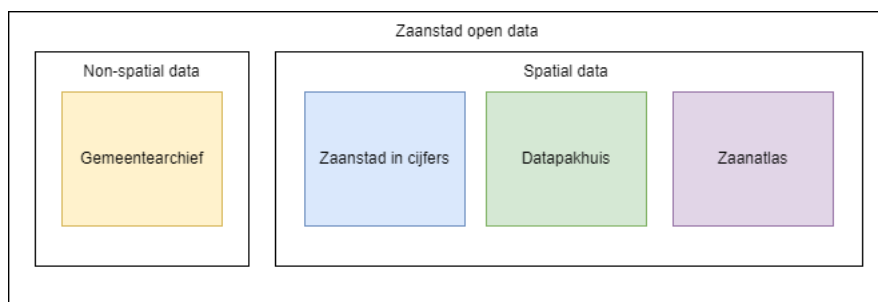


Figure 29: Zaanstad Data Portal overview

6.1.1 Zaanstad in Cijfers

Zaanstad in Cijfers allows access to statistics about the municipality, which are divided in twelve different themes. Each theme includes a list of released reports and have been categorized according to the theme. These subjects range from population growth to poverty (energy) and include maps, graphs and tables for different scale levels such as neighborhoods.

Zaanstad in cijfers has an integrated dashboard. Data sets can be selected and filtered for their attributes, date and scale (neighborhood, municipality, etc.). The data can be visually presented through graphs, charts or with a map. As can be seen on Figure 30, an example of the dashboard can be made by selecting a household type within the municipality, and neighborhood by different years. The dashboards enables the download of raw data, as well as generated maps or chart. The portal also has a separate section that links to the Zaanatlas, the Datapakhuis and the WMS/WFS geoservers of Zaanstad.

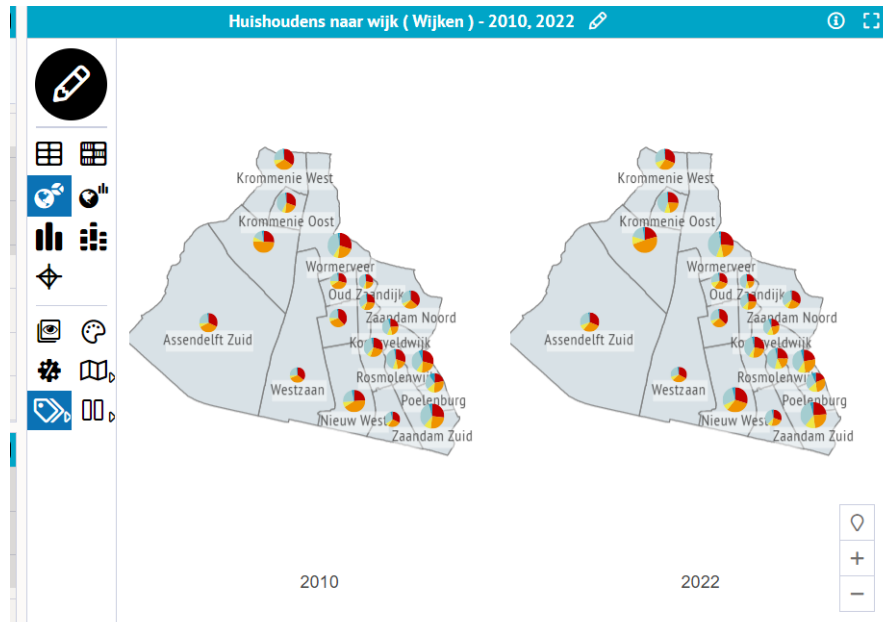


Figure 30: Zaanstad in Cijfers

6.1.2 Zaanatlas

The Zaanatlas has its data categorized into 24 themes. Each theme includes a varying number of data sets. As can be seen on Figure 31, some of the data layers in the Zaanatlas are closed off (symbolized by a lock) to the public. These layers require a log-in access and often feature sensitive information, such as the location of gas pipes and electric circuits around the municipality. Data layers without a lock can be freely added to the viewer. These can be downloaded from the geo-servers. Within the viewer itself, the user can use various tools to measure, pinpoint locations and can be visually adjusted to the users liking.

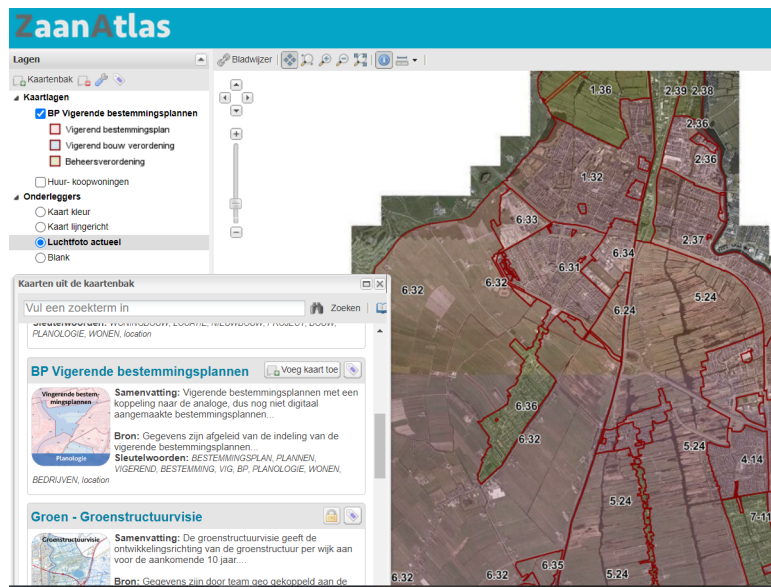


Figure 31: Zaanatlas

6.1.3 Data Pakhuis

The administrator stated that Zaanstad has developed a data pakhuis (data warehouse). The data warehouse provides a small introduction section and features sixteen different themes of spatial data. The portal includes both open and closed off data sets and a search bar. The portal has an integrated data request option, which allows users to fill in a request to access a data set. The portal is available in both English and Dutch. Accessing any data set provides information on the amount of pageviews and the date of most recent update.

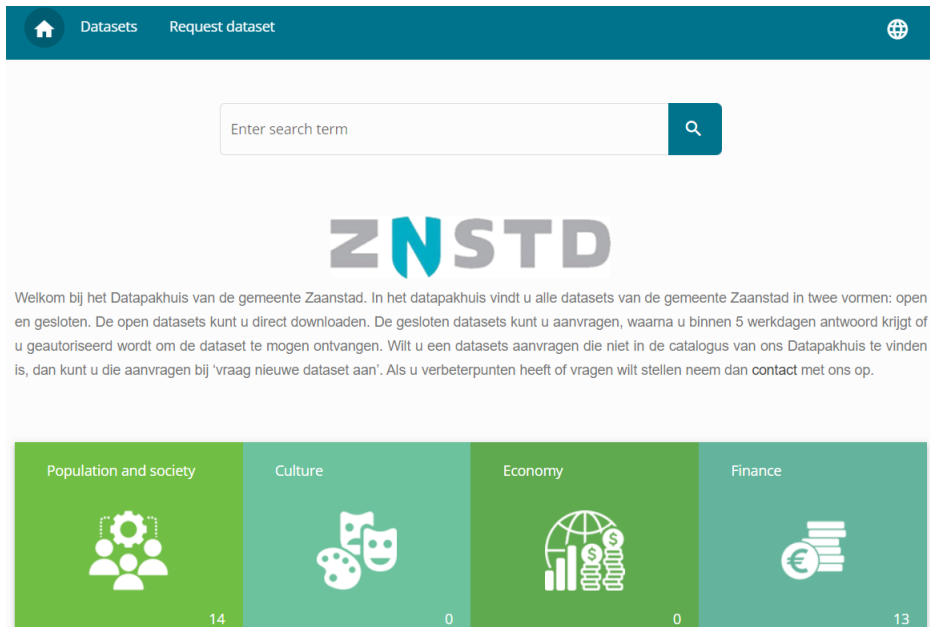


Figure 32: Zaanstad Data Warehouse homepage

6.2 Strategizing open data in Zaanstad

Zaanstad has engaged with open data for over a decade, with multiple development phases. The administrator stated that there is a great amount of emphasis placed on user experience, for internal and external users, and that they can avoid unnecessary hindrance in accessing their required data.

The vision of open data governance can be placed in the intermediate stage. During the interview, the administrator stated that Zaanstad was developing a more advanced open data governance. While the municipality had an informal approach to open data in the past, they switched to a more formal approach to data governance and management, meaning that the municipality is engaged with improving, monitoring and controlling their existing data. As was stated earlier, the quantity of data on the portals is large and in need of restructuring.

The administrator stated that Zaanstad will be more strongly engaged in producing an (open)-data strategies. However, his position within the government could not give more details on any sort of future planning. Zaanstad has not published their data strategy for the public to see. Based on the interview closed data and open data seemed to be heavily intertwined, as they are provided on the same portal.

The task division can be placed within an intermediate phase. Currently, the data governance in Zaanstad happens primarily through a formal process and is conducted from the centralized IT department. There are a multitude of people involved, such as project managers, IT personnel and specialists who can provide expertise on the content of the data sets. These individuals work as a virtual team, and are an organized through project management techniques like scrum, in order to keep up with tasks, and meet deadlines and standards. However, it was not mentioned if any functions within the municipalities have been specifically created to handle open data. However, the administrator noted that the development of open data was a key element of his own function.

Zaanstad in the advanced maturity level for leadership. Since data governance in Zaanstad is structured in a formal fashion, specific teams were created to assure that data quality was kept to up to desired standards. The centralized IT department has a leadership position for open data. While the municipality experienced some difficulties in the past due to the central positioning of IT and open data, it started involve more and more stakeholders from within the municipality has time went by. The administrator noted that physical containment of the municipality within a single greatly facilitates to start a chat with the people who are needed in tasks, or to organize meetings for open data development. Moreover, the data required for open data is perceived to be only limitedly scattered within the municipality. The lack of layers of authority within different departments makes it easy to retrieve data, to inform staff members and to request interaction with staff of the whole organization.

6.3 Sustaining open data in Zaanstad

The financial overview is in an intermediate phase. There is an awareness of the costs of open data in Zaanstad. The administrator noted that as a middle-sized municipality, there is more budget and people available for open data compared to small municipalities. For example, it was emphasized that the current geo-portals are hosted on expensive private third servers, which the municipality can afford to pay. However, the administrator also stated that there was no individual in charge of allocating a huge budget to fund open data. Rather, open data is considered to be the result of internal processes within the whole organization. Although Zaanstad makes use of closed-source services private third parties, there is a preference for open-source options if feasible. This means that it has to benefit both the user experience, while also being economically sustainable. However, use of open-source alone cannot be done for the current scale of operations. Thus, there is a mixed use of closed and open source programs within the open data of Zaanstad.

The data set evaluation is in the intermediate level. The virtual team of Zaanstad combines IT and subject specialists who try to assess data sets before any sort of publishing, as thoroughly as possible. The data sets are prioritized for their purpose, and necessity on whether they should be published only internally or also externally, with a set of standardized procedures to do so.

6.4 Legal framework of open data in Zaanstad

The handling of sensitive data can be placed in an advanced maturity level. When the AVG was enforced, Zaanstad made sure that the existing open data sets would adhere to new regulations and was done through a formal procedure. The release of open data was described as a slow but steady process, with the AVG having a considerate role. Since violations are taken seriously by Zaanstad, a multitude of people were appointed to handle data sensitivity. However, the overall difficulty of adjusting (open) data to the regulations were not as severe as initially expected.

Data ownership can be placed in an advanced maturity level. Zaanstad has done an elaborate research on data owners, in order to prevent potential AVG related issues. Communication channels with data-owners have been created to gain their input before any data is released as open. The municipality has engaged with issues on data-ownership and open data for years. Currently, they have reached a level where these processes are formalized. Zaanstad is a leading example on how to centralize data into a single platform. There is a centralized cooperation agreement of data-owners within the municipality.

6.5 Cooperation of open data in Zaanstad

The administrator categorizes the primary user base of open data in two types, internal and external users. The internal users are employed within the municipality and the external users are primarily staff of neighboring municipalities. Zaanstad is part of the greater Schiphol security zone, which also includes the municipalities of Amsterdam and Almere. This large cooperative zone has a close collaboration with each other, to ensure the safety for the large area around the Schiphol International Airport. There are multiple benefits to data sharing within the regional collaboration group. For example, fire departments can use data sets from multiple municipalities in their activities. The administrator noted that the majority of the already released data was opened so it could be used for government employees within the cooperative region.

There is also collaboration with other municipalities, both inside and outside the Netherlands. The Data Pakhuis development led to Zaanstad to become a leading international example on (open) data centralization. The municipalities that have collaborated with Zaanstad are primarily small sized and middle-sized, but also occasionally large sized. There have also been sessions held, specifically for a collaborative effort to standardize administrative data, which included meetings on how to implement geometry columns in open data sets. Zaanstad has been in the process of developing a Smart City by using knowledge

from neighboring municipalities to improve their policies. The administrator emphasized the importance of inter-municipal cooperation and that the sharing of open data knowledge would positively affect open data as a whole. Thus, Zaanstad is placed in the advanced maturity level for interaction.

The expertise of Zaanstad is in the initial level however. The Zaanatlas was created as the initiative of one employee. This individual had set up the initial version, built up a knowledge base, and eventually shared his knowledge with other employees. However, the municipality is not actively involved with making employees within the municipality more aware of open data, or have them become better with handling open data. Some informal training has taken place, but not on a significant level.

6.6 Participation of open data in Zaanstad

There is a general awareness of open data users. The administrator noted that there are a noticeable amount of educational institutions, private companies and citizens with who have an interest in GIS are able to find open data from Zaanstad for their own purpose. Moreover, it was noted how easily these same users are able to get in touch with the staff members involved with open data. There is also an awareness on the existence of users who have no specific interest in spatial data as a whole, but want to use the data for a variety of things. For example, citizens and politicians who want to have information on the location peat soil within the municipality to solve problems related to "grond-politiek" (land policy).

All open data platforms have a contact link integrated within their portal. The contact option for Zaanstad in Cijfers and the Data Pakhuis provide a general form, which enables users to fill out information. This form specifies if the data is requested by an individual citizen or by a company. The Zaanatlas however, provides a direct link to the mail of the geo-information division. If a company likes to have a closed layer to become available, it will be discussed within the organization on whether or not it can be opened.

For a while, the Zaanatlas kept track on how often their data was viewed and used. However, it was stated that data tracking had a negative impact on the data performance, and created unnecessary technical complexity within the portal. As a result, it was scrapped. Nonetheless, the administrator noted that tracking might be brought back and more fleshed than before, so it can be used in a next phase of professionalizing. This can be seen by accessing data sets in the Data-Pakhuis, which provides an insight on data views, the most recent updates and gives users the ability to rate the data set through a five star system. This is visualized in Figure 33. Therefore, the engagement can be placed in an intermediate level.

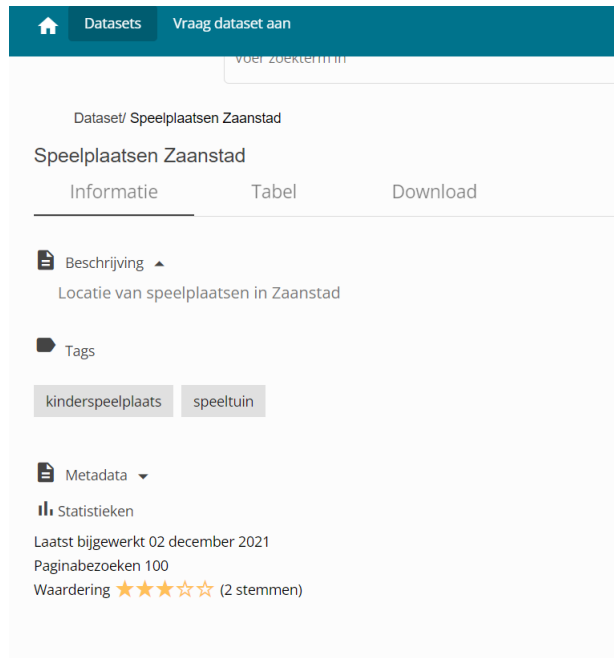


Figure 33: Data-Pakhuis user information

Zaanstad is in the initial level for outreach. The municipality is not engaged in any sort of active efforts to raise any sort of outward awareness on the existence of their open data. The administrator noted that it is not part of the core task set of the municipality, including the IT department, to do so. The focus of the department is to provide high quality open data, not to raise awareness. In addition, this would require a larger amount of staffing which would cost more money.

The community building of open data in Zaanstad be placed in the intermediate level. The municipality does make some effort to monitor usage of their data sets. In addition, there are some features integrated within the portals so that users can provide their input on the services. During the interview, the administrator noted that the municipality generally has close contact with its users, specifically with the companies who heavily rely on their data to create goods and services.

Open data governance is placed in the initial maturity level, as there are no publicly available strategies about the open data developments of Zaanstad. While there is some engagement with the users, they are generally not involved with the development of open data strategies.

6.7 Open Data in Zaanstad summarized

In Zaanstad, the open data governance aspect of strategizing is placed in the intermediate-advanced maturity level. The vision of Zaanstad has an intermediate maturity level, as is the task division. However, there is a clear and transparent democratic aspect to leadership which places it in the advanced level. The sustaining of open data in Zaanstad is in the intermediate phase. The financial overview, as well as the data set evaluations are in the intermediate maturity level. The legal framework is in the advanced maturity level. Both data sensitivity and data ownership are strongly formalized through frameworks to ensure a healthy development and future of open data in the municipality. The cooperation of open data in Zaanstad falls in the intermediate level. Zaanstad has a strong history of collaboration with other municipalities for open data development, which can be placed in the advanced level. However, there is no active spread from within the municipality to share knowledge and skills about open data to staff, placing expertise in the initial level.

The participation of open data in Zaanstad falls in between the initial and intermediate level. Some rudimentary attempts were made to gain feedback from external users, which placed the engagement in the intermediate level. However, there is no active involvement with creating a community, outward promotion or involvement of citizens in the shaping of open data, which places all these three indicators in the initial maturity level. The average scoring of Zaanstad is visualized in Figure 34.

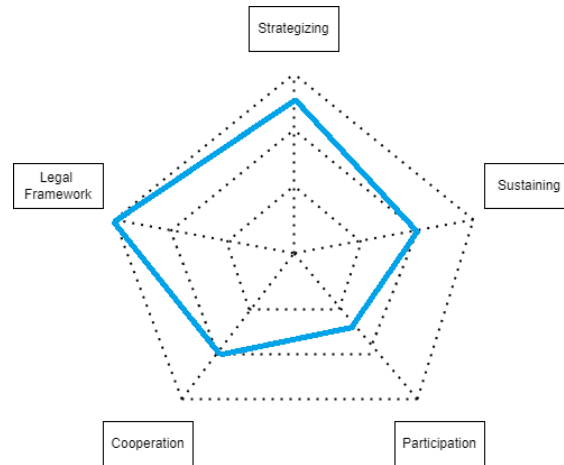


Figure 34: Average score Zaanstad

7 Hilversum

The municipality of Hilversum is located in the province of North Holland, south-east of Amsterdam, as is shown in Figure 35. Hilversum is part of the Gooi region. While historically a farming region, the introduction of one of the first railways in the Netherlands with a connection to Amsterdam led to a large influx of well-to-do citizens moving Hilversum. Hilversum was planned around the Garden City principle, with ample green spaces for recreation. The south of the municipality has a number of nature reservations. Nowadays, Hilversum is known to be home to multiple national and multinational media organizations. Hilversum had a population of approximately 91.000 inhabitants in 2022, making it the most populous municipality in the Gooi Region. The municipality is also part of the Greater Amsterdam Metropolitan area. With an average property tax around €454.000 in 2023, Hilversum ranks slightly below the average of North Holland (€461.000) (CBS, 2023).

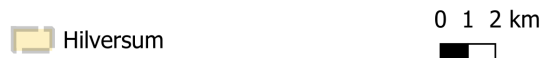
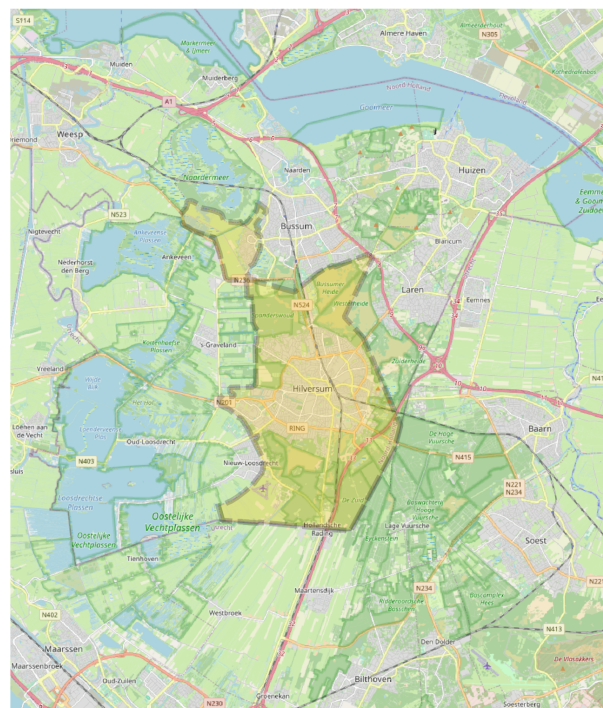


Figure 35: Municipal borders of Hilversum (Figure by author)

7.1 Background of open data in Hilversum

The interview was conducted with the coordinator, who works within the cluster-geo team of the municipality. This team consists out of 10 people. They are engaged with the maintenance of key and core registers, solving municipal GIS issues, and the development of open data portals. According to the coordinator, Hilversum had started open data " few years ago", although no specific date given. During the initial phase, open data development was carried out by the coordinator and a former co-worker in an informal setting.

Hilversum did not initiate open data conscientiously. Rather, the municipality had made a deal with private third party (Civity), to create a data platform. The data platform would host multiple data sets, which employees could use to transfer updated data to national portals every night. This engagement ended when Hilversum decided to develop a Smartcity program and developing an independent open data portal was part of that. After ending their previous contract, Hilversum has worked together with Esri in their open data developments.

As of yet, Hilversum has three open data platforms. These are: The Gooi & Vecht Historisch portal, the Hilversum in Cijfers portal, and the Open Hilversum portal. The Gooi and Vecht Historical portal is linked through the municipal website of Hilversum, which provides access to historical data. The portal mentions that the available data is collected and maintained by a group of volunteers. These portals are visualized on Figure 36.

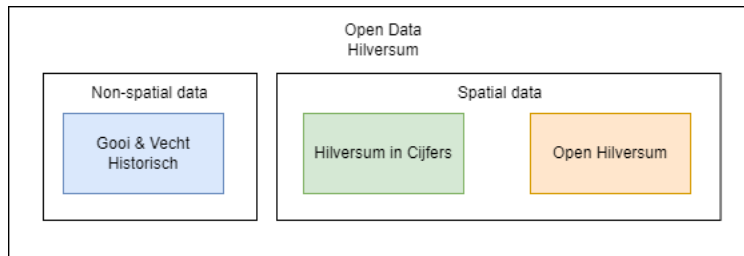


Figure 36: Open Data portals Hilversum

7.1.1 Hilversum in Cijfers

The portal of Hilversum in Cijfers portal includes a search bar and features a link, which enables users to contact the responsible municipal staff through email. the portal provides a dashboard that features a total of 14 different themes, which have pre-selected data sets put together and visualized. Hilversum in Cijfers also features a data bank, which includes a small tutorial on data handling. An example of a data set is shown on Figure 37. The dashboard enables statistical data to be visualized into customizable maps. These can be downloaded, either as an image or with its attributes as a CVS file. In addition, the portal features a news section, with updates about the portal and the statistical activities in Hilversum.

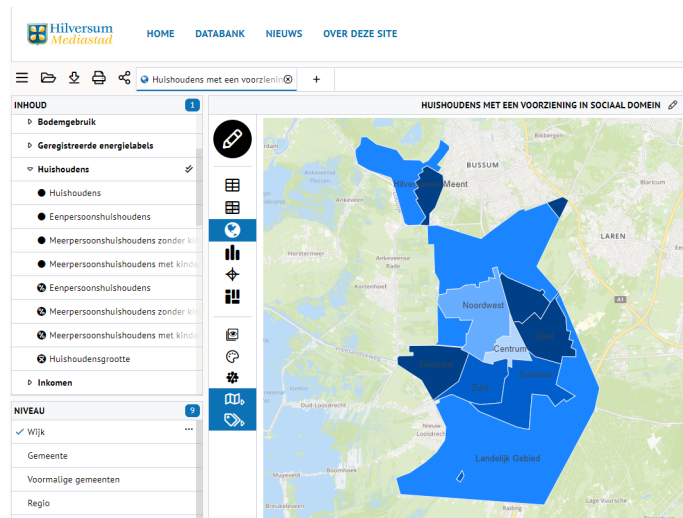


Figure 37: Example of Hilversum in Cijfers data set

7.1.2 Open Hilversum

The home page of the Open Hilversum portal features multiple sections to explore open data. These sections feature different themes, maps and a database (open data). Each section has a small introduction to inform users about their purpose, as is shown on Figure 39.

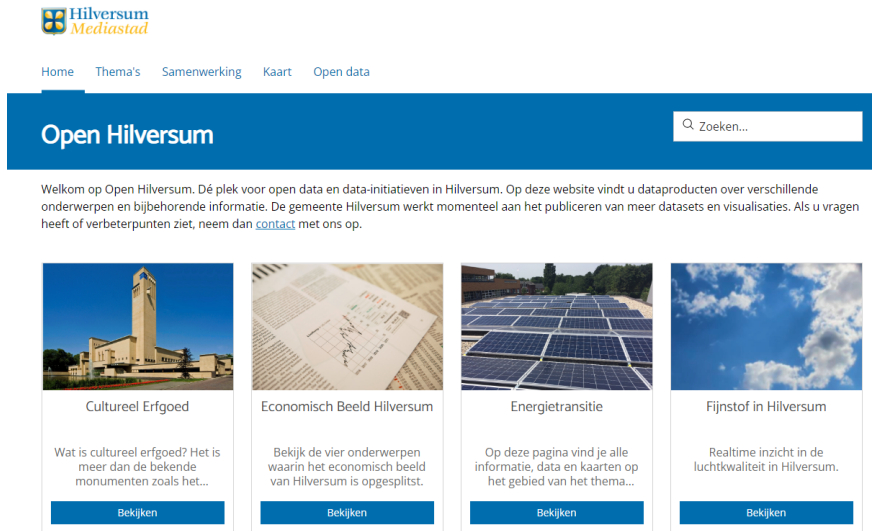


Figure 38: Open Hilversum homepage

The thematic section has 11 different themes, each including a small introduction for the users and for their purpose and use. The themes themselves also have sub-themes, which include a variety of (story-)maps, data, general topic information, and a number of dashboards. Some of these dashboards are integrated from other portals such as the Hilversum in Cijfers. In other cases, the sub-themes and story maps re-direct to the homepages of the municipal departments of Hilversum. For example, cultural heritage has a total of eight different sub-themes. These sub-themes provide information on the history local cultural heritage and provides an explanation on how citizens can contribute if they wish to do so. Through the story maps, users can visualize texts alongside dashboards and maps.

The map section is an interactive map and features a variety of layers which can be toggled on and off. The gives users access to basic tools like buffering, intersecting and creating polygons. The result from the data layers and their alternations can be downloaded as a picture. The layers cannot be downloaded from the map itself. The database (open data) features multiple data layers, which can be found by searching and selecting by data type. Each data set features information on its most recent update. Accessing a data layer within the database is visualized with a small interactive map.

7.2 Strategizing open data in Hilversum

Hilversum initiated open data on a single principle, and that was that government data which is funded through the government should belong to the public. According to the coordinator, Hilversum has a strong bond with its citizens, which was exemplified through voluntary projects for preserving beauty and greenery within the municipality. The volunteers benefit from access to high quality maps and spatial data to more effectively carry out their activities, and the municipality benefits from the work done by these civic groups. Moreover, these groups also gather data for the municipality to use. Hilversum is set to make as much data available as possible. However, as there are some limits to the municipal capacity, some data sets may be queued, unless someone or some group specifically asks for these data sets to be released. In addition, Hilversum has reshaped open data as part of a smart city initiative to create an even stronger bond between government and citizen.

At the time of the interview, the shift towards a smart city was not yet turned into formalized data practices but were in process of doing so. The completion of these practices is evident by a number of documents. In 2020, Hilversum enacted the I-Visie. This document describes the goals, framework, principles and tools that the municipality applies in order to create a data-driven government. Open Data is explicitly mentioned as part of this vision, and as a part of the smart city program. The goals are shown on the left of Figure 39. These goals include datafication (dataficering) and Slimme/Digitale Stad (Smart City). These aspects have been turned in some aspects of the open data portal, which are translated into the themes of mobility, climate adaptation, energy transition. In this vision, open data is described to become transparent, reliable and privacy oriented. This is done by using singular records and applying standards. The municipality sees open data as a development with increasing future importance which will require monitoring. Thus, open data and its current platforms are integrated within the Smart City Hilversum initiative.



Figure 39: I-Visie (Hilversum, 2020)

During the interview, it was noted that Hilversum was in the process of creating functions for the municipal open data. In the I-Vision, multiple new functions are to be assigned for facilitating open data growth. In the *Uitgangspunten Notitie Programma Datagedreven Transitie 2022-2025* notitie *Transitie naar Datagedreven Sturing*, the I-Visie is rated as a success, with all goals met. Therefore, a new phase commences for the 2023-2025 period. This contrasts with the statements which were made in the interview years earlier, where vision was described to be in a more experimental phase. The documentation shows that Hilversum has made significant gains for their vision. As the documentation has a clear transparency, the vision for Hilversum can be placed in the advanced level.

In the interview, the coordinator noted that the municipality had set up a special smart city team, which also encompasses all matters related to open data. The 2023-2025 phase proposes the creation of new roles for Hilversum, which also affect open data. The new proposed roles vary in their tasks. The roles can be of a technical kind to ensure data quality, as well as to improve the visibility of the initiative and foster citizen contributions. At the time of the interview, there was already an employee engaged with civic integration, albeit part time. The creation of these new roles places Hilversum in the advanced level for task division. As open data is an integral part of the Hilversum Smart City initiative, the coordinator noted that he is responsible for dividing tasks, to ensure the quality of the initiative. During the interview, the coordinator emphasized the importance of ambitious individuals within the local government. Especially the ones want to make a positive impact, as they are the driver of change. Hilversum shows transparency of leadership, and encourages its staff to bring their own contributions. Moreover, the coordinator stated that the Smart city team has regular meetings with each other. However, it was not clear to what degree the leadership itself was democratic. There is a high (public) transparency on leadership, as well as a low threshold for communication and interaction between managers and staff. Therefore, the leadership can be placed in the advanced level.

7.3 Sustaining open data in Hilversum

It was stated that finding adequate and available staff for data management can be challenging. The same would be to ensure a certain budget. Thus, the coordinator recommended municipalities to first start an open data initiative before designing an allocated budget. Once started, the organization can observe the progress over time. This was the case of Hilversum during the time of the interview, as open data proved to function without needing a fully formed financial plan. Nevertheless, the formalizing the financial aspects of open data is shown in the 2022-2025 program. Since the goals of I-vision have been reached, a new budget allocation would be necessary. The budget (€75.000 over a 4 year period 2021-2024), for Open Hilversum is shown on Figure 40. As Hilversum provides transparency on its open data budget, and claims to monitor said budget, the financial overview is placed in the advanced level.

5.2 Programmafinanciering en verantwoording

Om het programma succesvol te laten zijn is in de diverse begrotingsjaren (personele en materiële) aanvullend budget nodig. Resumerend is dat;

	Jaarschijf 2021	Jaarschijf 2022	Jaarschijf 2023	Jaarschijf 2024	2025 en verder
Investeringsprogramma 2021-2024 Datagedreven werken	€100.000,-	€100.000,-	€100.000,-	€100.000,-	0
	Financiering voor ondersteuning van de juiste technieken zoals hosting dataplatform en 'Open Hilversum' €75.000,- en materiaalkosten en tools €25.000,-.				
Begroting 2022 (incidenteel)		€250.000,-			
Voorjaarsnota en Begroting 2023 en verder			€400.000,-	€400.000,-	€400.000,-
			Financiering op structureel borgen van kennis en uren van dataexpertise €350.000,- en €50.000,- voor kennisontwikkeling, netwerkondersteuning en communicatie		

Figure 40: Finance overview data policy Hilversum 2022-2025

The coordinator stated that data set evaluation is a difficult feat to achieve. At the time of the interview, the geo-team had applied the municipal high-value data set from the VNG to assess data sets, in order to prioritize data publishing. There was no mention about assessing data sets through the high-value by the Open Data Directive. Nevertheless, the coordinator said that business cases are required for open data. As the demand for data grows within society, it is the responsibility of the government to ensure the needs and demands of citizens, as well as companies. Thus, the data set evaluation is placed in the intermediate level.

7.4 Legal framework of open data in Hilversum

The coordinator emphasized that privacy concerns are the only issue, which require extensive consideration, when publishing data sets. Every data set has to be tested on potential issues regarding privacy. However, it is considered deemed an easy effort. Hilversum uses the standardized framework for data sensitivity assessment, which was developed for the Rijkswaterstaat. The existence of a privacy officer was mentioned during the interview. This person judges on whether data sets need further anonymization. The coordinator mentioned that civic servants in general are well-trained to handle privacy sensitive data. Privacy is an important element within the I-Vision document. The 2023-2025 vision document states that privacy, responsibility and ethics are central elements within the program. These key elements are realized by providing new training for staff to handle sensitive data. The document also mentions the

including of 10 citizens of Hilversum in shaping policies directed to handling sensitive data. Although this part is still in development, the policies have been formalized. Thus, Hilversum is placed in the advanced level for sensitive data.

The coordinator stated that the interaction with data owners has evolved over the years. When the open data initiative was only a two man operation, there was a lot of misunderstanding on how data could be published without asking for permission of data-owners. However, this practice was replaced by collaborations with data-owners, as they provide unique insights on the data and its potential usage. The open data portal, in collaboration with Esri, features the metadata about the owner of each data set. The coordinator stated that it is easier to have a third party involved, that can ensure transparent ownership to users. Hilversum features a multitude of projects, which are organized by the inhabitants who gather data. Before endorsing any activity, the municipality needs to have all agreed to publish the gathered data as open. Thus, the data ownership can be placed in the advanced level.

7.5 Coordination of open data in Hilversum

At the start of the open data initiative, Hilversum used a platform hosted by Civity. The company hosted open data platforms for several other municipalities and encouraged data standardization, with the goal of creating linked data. The project included the municipality of Utrecht, the regional government of Utrecht and the municipality of Zaandam. However, due to the differences in available resources, the project was abandoned. The creation of inter-municipal standards was noted to be a difficult challenge, as local governments have a long history of creating their own unique data governance and management practices. These are thought to better fit existing internal processes. In addition, there is an unwillingness to change an existing routine to a new one. The national government was remarked to need to provide a valuable role in facilitating inter-municipal cooperation, which already happens to an extent with the BAG. The coordinator noted that it is very likely that Hilversum has worked in collaborate efforts for open data in the past and will do so in the future. Hilversum is part of the Greater Amsterdam Metropolitan Region, which has some collaborative efforts on various (open) data activities. In the I-visie, there is an emphasis on change towards a data-driven government through the use of Smartcities and open data, which would happen in collaboration with the VNG, and the G40. For the 2022-2025 phase, Hilversum intensifies knowledge exchange with multiple existing collaborations to increase its body of knowledge. The extent of the execution is unknown. Thus, Hilversum can be placed in the intermediate phase.

The coordinator stressed the importance of collegiality, allowing input from multiple perspectives to improve internal municipal processes. It was not clear how the municipality tries to involve its civil servants to better handle open data. However, the goals were to create a data-driven government, by automating and simplifying processes, to create a more personalized interaction with the inhabitants of the municipality (Hilversum, 2022) and the 2022-2025 period

builds onto the previous course. Knowledge and skills are stressed as key elements, that are needed to have the upcoming phase successfully completed. Thus, Hilversum is placed in the intermediate level for knowledge exchange.

7.6 Participation of open data in Hilversum

In 2021, Hilversum won The Special Achievement in GIS award. This event was hosted by Esri to reward organizations that created a unique way of using GIS for civic purposes. Hilversum was rewarded for using GIS to create a healthy, safe and sustainable urban environment and using Open Data to increase civic participation. The mayor of Hilversum noted that the award will motivate Hilversum to turn itself into hub for innovation through cooperation with its citizens and local entrepreneurs.

Civic participation as a key element for open data is reflected in the Open Hilversum portal. As can be seen on Figure 41, Hilversum stimulates any sort of civic initiative that involves open data, with contact info available for anyone who wishes to make contribution or has a general request. There are four civic initiatives featured on the platform, which are hosted on the municipal website. The coordinator stated that the Open Hilversum Platform is built to be a platform for initiatives, where citizens can apply to create an initiative themselves with the help of the municipality. Once approved, these citizens and local organizations are given access to Esri-software and necessary hardware (E.g. sensors). At the time of the interview, the coordinator noted that a significant amount of time, money and effort had been put into creating an open data platform to stimulate civic participation.

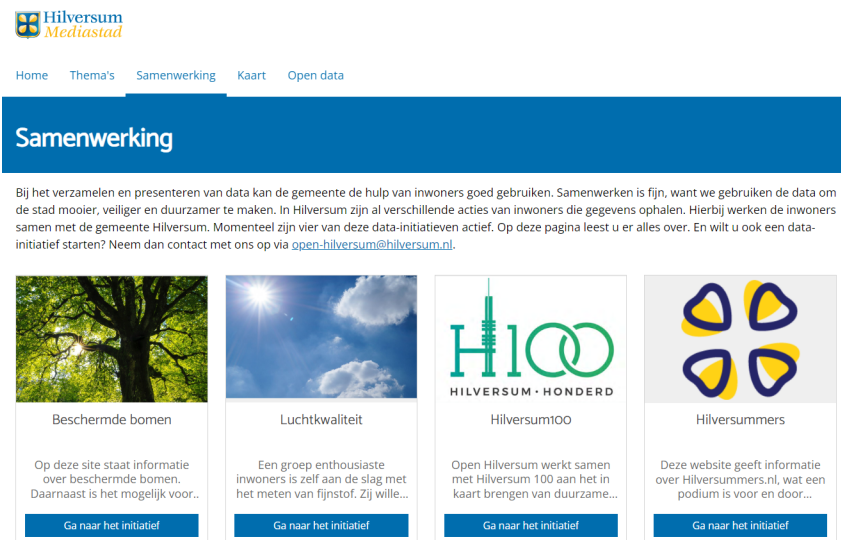


Figure 41: Citizen participation in Open Hilversum

The coordinator stated that there was initially no extensive research performed on data users. However, this seems to apply only to users outside the municipality, as the focus of Open Hilversum is to stimulate involvement of citizens with (open) local data. It was stated that the municipality is familiar with individual users and local organizations, who consume and produce open data. Examples given were citizens involved with the registration of protected trees, and those who check on the air quality. Both initiatives are featured on the platform, as can be seen on Figure 41. There is a strong emphasis on providing local users their needs. The demands of users within the municipality are actively monitored. So while there is little knowledge of users outside of the municipality, there is a strong base of knowledge on the users within. Thus, Hilversum is placed in the advanced level for engagement.

The portal does not only provide access to the civic portals, but they also serve as a way to showcase what the municipality has done. Examples include how Hilversum has involved involve citizens with their local government through data, for the bettering of their living environment. In addition, Hilversum is also engaged with the outside world through participating Esri events and competitions, one which they had won. Hilversum does promote its open data, both in the physical and digital world and in the interviews, it was mentioned that Hilversum trains some of their users in a formal way. Thus, the municipality be placed in the advanced level of outreach.

At the time of the interview, the municipality already had an employee to facilitate the civic initiatives and their integration within Open Hilversum platform. In the 2022-2025 period, there will be an increase of staff engaged with these activities, in order to foster the creation of a data community within the platform. The digital platforms of the civic initiatives are featured on the Open Hilversum portal. Therefore, Hilversum can be placed in the advanced level of community building.

7.6.1 Open governance in Hilversum

Involving citizens is a primary element in the data strategy of Hilversum. The coordinator noted that as a result of its size, Hilversum and other middle-sized municipalities have a different work capacity compared to large municipalities. The coordinator noted that G5 municipalities can have around five employees engaged in open data, which is not feasible for Hilversum. Thus, a middle-sized municipality benefits from involving citizens who wish to make a contribution to (open) local data.

The 2022-2025 vision showed Hilversum has conducted meetings with different stakeholders. These stakeholders are citizens, local organizations and those described as "ambassadors". These ambassadors are local citizens who want to contribute to clever digital solutions for current issues in the municipality. These also include solutions for open data. Moreover, Hilversum created a panel with 10 inhabitants, and were asked to give new insights on open data. Since the effects of the panels were viewed as a positive experience, they will be continued in the future. On the Open Hilversum data platform, some sub-themes

emphasize the collaboration with citizens. The high transparency and inclusion of citizens in open data places Hilversum in an advanced stage for open governance.

7.7 Open Data in Hilversum summarized

All indicators for strategizing are in the advanced level for Hilversum. This places strategizing as a whole in the advanced level.

Hilversum can be placed between intermediate and advanced for sustaining. The financial overview is in the advanced level. The overview is transparent to the public and includes active monitoring. However, the data set evaluation is in the intermediate phase. While Hilversum does create business cases for their data sets, the municipality uses a municipal high-value assessment framework. The high-value assessment framework from Open Data Directive is not used. Moreover, the coordinator noted that data-evaluation is still primarily a matter of guessing.

The legal framework of Hilversum is in the advanced level. As both indicators are also in the advanced level. More recent updates on the handling of sensitive data and data ownership were discussed in the recently published government documents.

The cooperation of Hilversum is in the intermediate phase. As the interaction and expertise indicators are both in the intermediate phase. Hilversum is not yet engaged in large formalized open data exchanges with other local governments.

Hilversum has achieved the advanced level for participation. All the indicators are also in the advanced level. There is a high level of engagement with citizens and organizations. The municipality actively tries to put open data outward to its citizens and is actively trying to improve this process even further. The municipality tries to build a community by hosting civic initiatives who consume and voluntarily produce local government data. And lastly, citizens are directly engaged in shaping the course open data in Hilversum. The final score is shown in Figure 42.

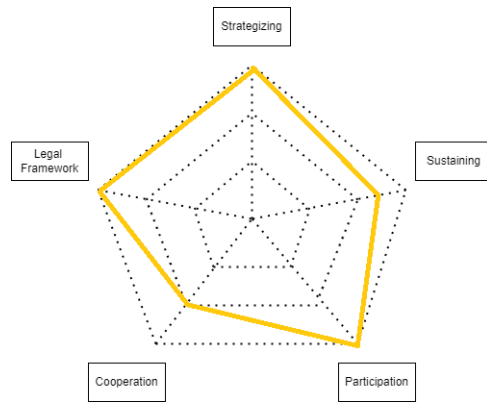


Figure 42: Hilversum final scoring

8 Haarlem

The municipality of Haarlem is the provincial capital of North Holland, and is located west of Amsterdam, as can be seen on Figure 43. Haarlem experienced rapid urban development in 19th century, as a center of industrial textile production. These industries contributed to the construction of the first train track in the Netherlands, connecting Haarlem with Amsterdam. The municipality has historic and current economies ties with Amsterdam, and provides essential services to smaller municipalities nearby through Haarlem Metropolitan Area, which includes Heemstede, Bloemendaal en Zandvoort. In 2023, Haarlem reached roughly 165.000 inhabitants, and the metropolitan area reaches around 230.000 inhabitants. In 2018, Haarlem and Zandvoort initiated an governmental merger. Zandvoort retained its independent municipal council and bench of mayor and aldermen, but relegated its administration to Haarlem. The average property value (WOZ) is estimated to be around €480.000 in 2023. This is above the provincial average of North Holland (€461.000) (CBS, 2023).

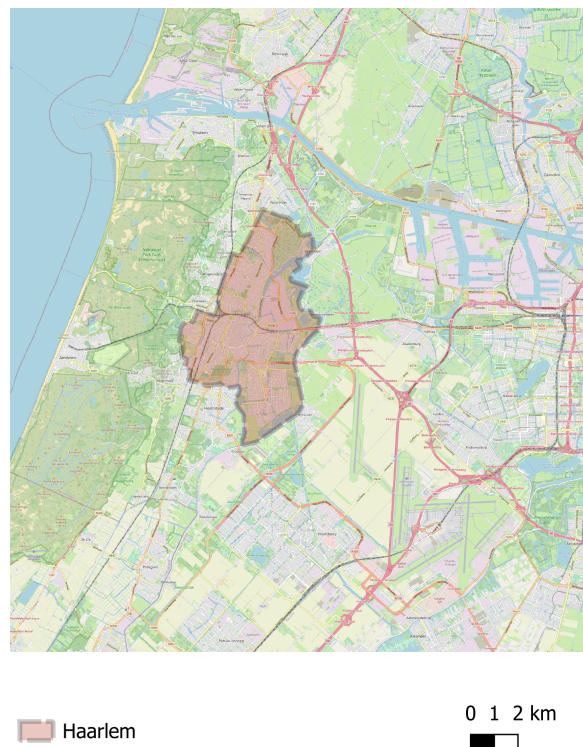


Figure 43: Municipal borders of Haarlem (Figure by author)

8.1 Background of open data in Haarlem

The municipality of Haarlem has a Data Informatie Analyse (DIA) division. This division gathers, maintains and enables the municipality to work in data-driven fashion. The division consists of 25 employees, which can be divided into a data management team (bronbeheer) and the Data Expertise Center (DEC). Fifteen of the 25 employees within the division are part of the DEC team. This includes both data engineers and data scientists, as well as three senior advisors. The interview was conducted with one of these senior advisors, who also works as the coordinator within the team. The DEC team was set up in 2015 to create an open data platform as one of their initial tasks.

Haarlem has an organizational merger with the municipality of Zandvoort. Therefore, the open data portal of Zandvoort is shaped by the same civil servants as those of Haarlem. The coordinator stated that there was a conscientious choice to have the platform of Zandvoort shaped into the same style as Haarlem. Both municipalities make use of the same open source mapping instruments and are part of the same data-landscape. However, the actual data itself belongs to the respective owners within the government of Zandvoort. As the coordinator stated that data that has been gathered by a municipality must retain the ownership. The open data platform of Haarlem includes Kaart Haarlem, Thematic Maps, geo-services and Haarlem in Cijfers. All but the latter are also provided on the Zandvoort open data platform. Zandvoort in Cijfers has its independent platform. The geo-landscape is visualized on Figure 44.

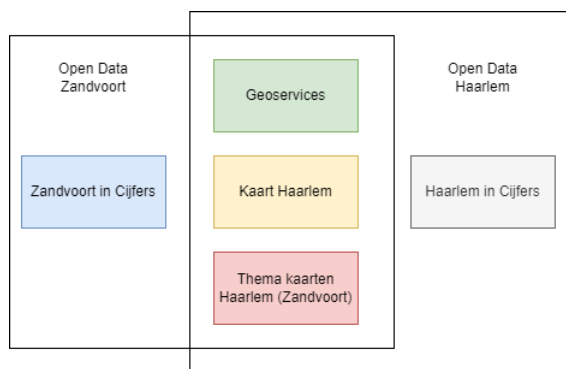


Figure 44: Open Data Haarlem & Zandvoort

8.1.1 Open Data Platform Haarlem

The Kaart Haarlem has been created with MapGallery and features data from both Zandvoort and Haarlem. Some of the data sets from the two municipalities are merged together into single data layers, as can be seen in Figure 45. The data layers can be downloaded in a multitude of formats. The map portal has a contact info link, which leads to the same email link as the general open data platform. Each data set is accompanied with some background information for the users. Google maps is integrated within the portal, enabling users to see data objects in street view pictures. The portal has the option to save and share the map with selected data layers for later use. The portal also features a link to the theme.

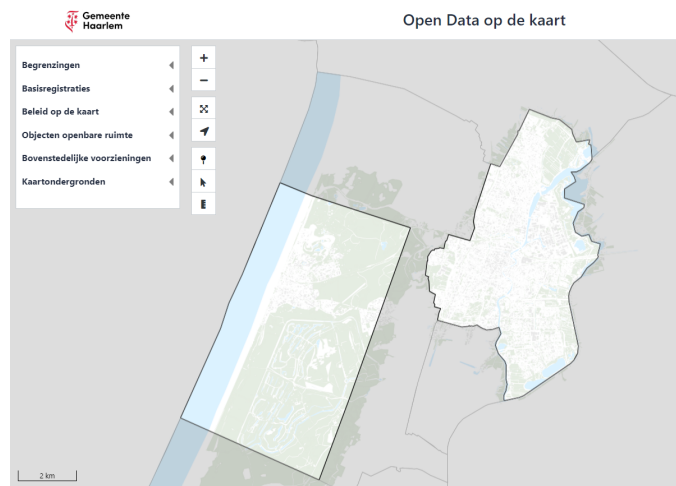


Figure 45: Open Data Haarlem & Zandvoort

The Open Data Platform hosts the thematic map portal. The portal hosts 20 different themes, which redirect to Kaart Haarlem with a number of layers related to the specific theme. The geo-servers feature a WFS that is intended for developers. Haarlem in Cijfers is made with Swing Mosaic. The portal has a total of 15 different themes. The homepage includes a small tutorial in pdf format on how to engage with the data, as well as a contact option for email.

8.2 Strategizing open data in Haarlem

With the creation of the DIA in 2015, the initial open data platform was created through collaboration with MapGallery. According to the coordinator, the Woo, as well as its precursor the wob, enables citizens to request information such as spatial data sets. To facilitate the process, the municipality decided to create an open data platform. With access to data sets provided, citizens could find the information they required. The first open data initiative was of small scale, and

forms the base of the thematic maps on the Haarlem open Data Platform. The Wet Hergebruik Overheidsinformatie spurred the municipality to reinvest in open data. This led to the municipality releasing a guide on open data in 2017. The guide provides a strategy on the formalizing of processes, plans, resources and staffing to create an open data platform. The guide can be accessed digitally, and provides insight on how data is assessed before it can be opened, and which requirements it needs to meet.

The open data platform in its current form was created shortly after the release of the guide. The open data platform has been running in its current form since 2019. According to the coordinator, the municipality is aware of the Open Data Directive and its implications on local open government data. However, the necessary investments and required processes still need to be researched and formalized. Nevertheless, the municipality is engaged in monitoring the current state of their open data platform. Thus, the vision in Haarlem can be placed within the advanced level.

The 2017 guide featured a task division for open data, which is featured on Figure 52. The coordinator noted that there is a clear task division and understanding of expectations among the employees within the DEC team. The coordinator also noted that there are regular sprint sessions with the representative of the MapGallery. The representative works once every two weeks on the open data platform, together on a mutually shaped road map. While open data was only a part of the activities of the DIA when it was set up in 2015, it can be argued that some specific functions were created with the intention of shaping open data. Thus, the task division can be placed in the advanced level.

The coordinator is also involved as the product owner of the open data platform. During the interview, it was not clear to what extent leadership is democratized. However, there is a clarity of tasks and accountability. Thus, the leadership can be placed in the intermediate-advanced level.

8.3 Sustaining open data in Haarlem

The coordinator noted that the introduction of open data has an economic benefit for the municipality. Open Data allows the municipality to operate more efficiently and effectively. Since the WOB and the WOO enable citizens to request individual data sets, staff and resources would have to be allocated to facilitate their requests. However, by publishing data online, much of the potential requests can be redirected towards the open data platform of Haarlem, saving the municipality workers precious hours. Moreover, Haarlem is engaged with many third party contractors who make use of the open data platform on a multitude of devices to work more efficiently.

As the team of the coordinator was tasked to create an open data platform in 2015, managing budget and creating a financial overview was part of their initial strategy. The financial resources of the team were derived from two different projects within the municipality. These programs were the data management initiative and the data-driven government initiative. The coordinator noted that Haarlem is a government with an annual budget of half a billion. This

implies that if an initiative request a specific allocated budget, it would have to be above 100.000 euro. However, the cost of creating and maintaining an open data platform would not reach this number. Thus, to financially secure open data, it became part of different programs. Haarlem makes use of open source instruments to maintain their open data. This was a conscientious choice, as the municipality wanted to prevent a vendor-lock with Esri. Although there is no specific allocated budget, it is an integral part of other programs. There is a clear transparency and monitoring of resources, Haarlem can be placed in the intermediate-advanced level for financial overview.

Haarlem has been involved in the development of a framework for the assessment of municipal high-value data sets. The framework has been applied in the open data of the municipality. The staff at Haarlem is aware of the Open Data Directive, and how this would alter the definition of "high-value", as compared to the previous national definition on a municipal level. The coordinator noted that one of the biggest issues in open data on the municipal level is the lack of cooperation between the municipalities. This leads to a lack of governance, which is needed to standardize data, models and value definitions. The municipality of Haarlem uses the municipal assessment framework for high value data sets. However, they have not yet done the same by for the Open Data Directive high value framework. There is little knowledge on the economic impact of open data beyond awareness of increased municipal efficiency. Moreover, there is no consulting with users to estimate potential economic impacts. Thus, Haarlem is placed in the intermediate level for data-evaluation.

8.4 Legal framework of open data in Haarlem

During the interview, the coordinator noted that the municipality of Haarlem had developed their own framework for the assessment of sensitive data. The framework was featured in the 2017 documentation on open Data in Haarlem (Appendix Figure 51). The coordinator noted the effectiveness in regards to the collection and publishing of open data. Moreover, within the data expertise team, there are also two employees active in cleansing data for any potential sensitive data or risk. Although, this only happens in rare instances. The coordinator noted that, while working for the Woonzorg Project, there was a difference between the way municipalities aggregate data for the purpose of anonymization. The coordinator continued to stress the importance of standardization, as there is currently a lack of when it comes to assessment frameworks. Thus, the sensitive data can be placed in the advanced level.

The open data documents from 2017 stressed the importance of placing the municipality in a central position in regards to data production, data usage and data publication. Thus, also creating an organizational and legal framework for data-ownership. Haarlem deems this essential for open data governance, as only data that is owned by Haarlem itself can be published as open. Thus, the coordinator noted that there is an active stance to ensure that any data, which is gathered by third parties through funding from the municipality, is owned by Haarlem. By creating clear ownership, Haarlem wants to ease the process of

publishing open data. Therefore, the data-ownership of Haarlem can be placed in the advanced level for data ownership.

8.5 Coordinatinon of open data in Haarlem

Aside from its cooperation with Zandvoort, Haarlem has also engaged in collaborative projects with other local municipalities nearby. The coordinator gave the woonzorgkaart as an example of such cooperation. The woonzorgkaart is a map viewer. It provides layers related to demographics, housing, proximity to healthcare clinics and potential obstacles around an independent lifestyle for elderly citizens, as can be seen on Figure 46. The viewer functions as an instrument for those who work health and elderly care and encompasses information from the region Kennemerland (Bloemendaal, Haarlem, Heemstede and Zandvoort) & IJmond (Beverwijk, Heemskerk and Velsen).

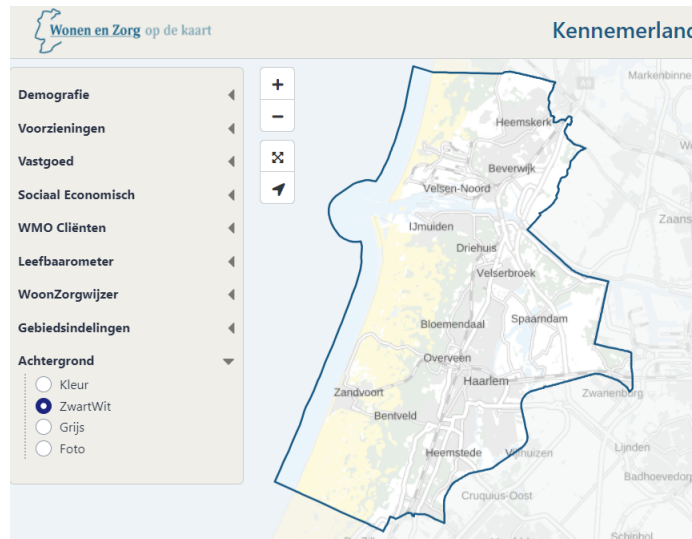


Figure 46: Woonzorg viewer

As Haarlem is the largest among those municipalities participating in this collaboration, it has taken a central role. Due to their size, the small municipalities do not have the in-house expertise to facilitate such open-data projects. Instead, these municipalities send their data to Haarlem, whose civil servants integrate the data within the viewer. The coordinator described Haarlem to be the "big brother" within the collaboration. Furthermore, Haarlem has also collaborated with the municipality of Utrecht for knowledge exchange. This was to create layers that are related to the governmental planning within their respective territories. Thus, the municipality of Haarlem can be placed in the advanced level for interaction.

The Data-Driven Haarlem document features a chapter on the importance

of knowledge and skills among civil servants within the municipality. The document stresses the need for civil servants to gain "data-awareness" and "data-competence". Thus, the organization needs to inform civil servants on how to become aware on the potential of data. As well as the impact of using it to reach the goals of all stakeholders to make use of data-driven applications within their activities. The Data-Driven Haarlem document recommends the municipality to assign data-specialists to help the servants guide through the initiatory uses of the applications, if need arises. The municipality was also advised to organize general workshops for staff, in order to improve their data awareness and skills. The coordinator mentioned the goals, and provided a small insight on how this has been realized. The coordinator stated that every first Tuesday of the month, an introductory course is provided. This course is open to all employees who wish to gain better understanding of data-driven work and GIS programs. Moreover, there have also been individual sessions with members of the local municipal council and aldermen. The formalization of training within the municipality places data-expertise within the advanced level.

8.6 Participation of open data in Haarlem

The coordinator noted that there is little knowledge on users as a whole, as there are restrictions on gathering information about them. Nevertheless, there is awareness of certain user groups with whom Haarlem has close contact with. The Haarlem open data platform has a contact button, which re-directs to the staff responsible for the platform. The coordinator stated that an average working day starts by reading the mailbox to see if there are new requests or conversations. It was reported that there is a daily contact with all sorts of users, which can be divided into different types and respective interactions. The first user group are private contractors, tasked with projects for the municipality. They are encouraged to give their own advice or data within the open data platform.

The second user group are a variety of local organizations. Provided examples were sport associations, nature preservation groups and monument heritage groups. The coordinator emphasized the close connection with these groups, as they make use of open data for their own purposes. The open data platform of Haarlem is actively engaged in making adjustments to facilitate the usage of their data by these groups.

The third user groups are individual users. These users have contributed to the shaping of the open data platform since the start and are described as highly educated and tech savvy people, with a strong background in GIS. These particular users are noted to sometimes have an even more in-depth knowledge on GIS, open data, or User Experience than the staff themselves, and have given valuable advice to the benefit of the open data platform. But while Haarlem has integrated engagement of groups, there was little mention of engagement with local citizens. Thus, the engagement can be placed in the intermediate-advanced level.

The coordinator stated to be actively involved in spreading awareness of

the Haarlem Open Data platform to the outside world. This happens through publishing articles and posts on social media, specifically LinkedIn. Aside from articles, there was also a strong engagement with national data platforms, where the coordinator organized a variety of training sessions. However, Haarlem has no explicit policy on spreading awareness of their open data. Thus, outreach is placed in the intermediate level.

The coordinator has experience with organizing workshops and training sessions on a national level, as well as interacting with internal users for training. However, the coordinator noted that this does not apply to external users, as it is not part of the responsibilities of their team, nor has the municipality made plans to change this in the future. Since the coordinator has interacted with training to external users, open data in Haarlem can be placed in the intermediate level for community building.

Haarlem has a clear transparency on their open data activities, methods and goals. This is evident by their published documents, which corresponds with the statements made by the coordinator. Although some users, of different types, have given their input on the course of the open data, this is not yet transformed into formalized process. At the moment, there is no full integration of users within the decision making of open data. Thus, the open governance is placed in the intermediate level.

8.7 Open Data in Haarlem summarized

The municipality of Haarlem has an advanced level for strategizing, and all indicators are also in the advanced level. This can be attributed to the top down approach, which used a new division for the development of open data. Haarlem falls in the intermediate level for sustaining open data. The municipality provides transparency about their budget, specifically on the allocated number for open data. However, there are no efforts made to create a new data evaluation assessment framework in accordance to the guidelines of the Open Data Directive. The legal framework can be placed in the advanced level. Haarlem has created their own filter for sensitive data early in their open data activities. There is a clarity on the specific responsibilities for handling sensitive data within the whole release process. The same also applies to centralizing data ownership. Haarlem is engaged with multiple parties who collect and produce data. All data funded by Haarlem belongs to the municipality. Haarlem scores advanced in the coordinating of open data. There is a strong collaboration with other municipalities. This applies not only to Zandvoort, with whom the municipality shares an administrative function, but also with other municipalities in the region of Kennemerland and IJmond. The internal sharing of knowledge and training for staff has been a key element of open data from an early stage. These goals were present at the time of the interview, as the coordinator noted to be engaged in providing courses on various levels. Haarlem has an intermediate level of participation. Only the engagement could be placed in the intermediate-advanced level, with the other indicators in the intermediate level. While the coordinator shares knowledge with external users. It is not a formal

task that falls within the function activities. There is no explicit formal policy on showcasing the open of Haarlem to the outside world, though it does happen to some extent. Last, users are not yet fully integrated within the decision making of open data. The averages are visualized on Figure 47.

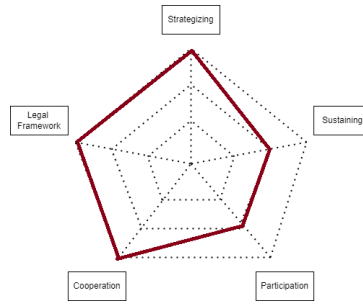


Figure 47: Average score Haarlem

9 The G5 municipalities

This chapter will provide an insight on the development of open data governance in the G5 municipalities (Den Haag, Amsterdam, Utrecht, Rotterdam and Eindhoven). The large municipalities have gone through changes since they were assessed for their open data governance in the last research (Welle Donker et al., 2018). Thus, the developments since 2018, as well as the future plans are described in this chapter. The previous research indicated that although large municipalities appeared quite mature in some governance aspects but faced some issues on their open data governance Welle Donker et al. (2018). There was a clear lack of communication and participation between the government and its citizens. Despite some effort to create communication channels and methods for civil integration.

This research applied a combination of desk research and correspondence, which was done either through email or digital interviews. The focus of this research is not on the large municipalities, but on the middle-sized municipalities. This chapter serves as a tool for comparison to better place the state of open data governance of middle-sized municipalities, specifically for the aspects of cooperation and participation. Thus, the municipalities are not assessed through the three level framework, as was done in previous chapters.

9.1 Den Haag

Den Haag started with open data activities through "open unless". This was initially done without a formal strategy, which made data release a slow and expensive process (Welle Donker et al., 2018). To improve the process, Den Haag integrated open data as part of their Digitale Steden Agenda (DSA). Since 2016, open data had become part of the municipal data-driven government program. In a correspondence with the municipality of Den Haag, it was stated that the implementation of the AVG had significantly impacted the open data activities of Den Haag. The consequences of an infringement of the AVG, are said to outweigh the duty to release data. Civil servants have become increasingly cautious, and open data developments have slowed down. Data-owners often refuse their data sets to be published, as they fear potential conflicts with the AVG.

The 2020-2022 data strategy presents open data as an key aspect of their data-driven government program. The document states that the municipality will be anticipating to work according to the Environment & Spatial Planning Act (Omgevingswet). There is no explicit mention on the effect of the Data Governance Act. However, the municipality is emphasizing the active stance to guarantee high quality data that can be reused by third parties.

But while there is no a lack of ideas about the future of open data in Den Haag, they have not translated into any concrete goals. Despite the required infrastructure already being in place, there is little development going on. And while upper management has integrated open data as a key in their governmental strategies, there is little actual development on the operational level going on.

The 2020-2022 strategy aims to foster data sovereignty for their citizens. Citizens need to have access to their own personal information, with digital autonomy. However, the strategy provide little insight on how open data will achieve these goals, and how citizens can contribute. The municipality has also released a collection of data success stories. But again, open data is showcased as an instrument to improve internal efficiency.

There is some engagement with the citizens. As Den Haag has created data-labs, offering courses and activities for local organizations. The employee involved in the data-labs also used to be involved with the VNG. Participating in session to improve inter municipal cooperation. However, these projects had withered away over time. Den Haag is in the process of setting up a new information team. This team is tasked with developing new open data strategies. The WOO was a key factor in the creation of the team. Methods and goals for the release of spatial data will also be included within the new strategy. Since the WOO has more power than previous factors that spurred open data, the IT admin noted that it will likely have a positive impact on the future development of open data in Den Haag. The new regulation will enable the administrator to convince data-owners more easily to release their data in the future.

9.2 Utrecht

Utrecht was relatively late to implement open data compared to the other big Dutch municipalities. The rapport by Welle Donker et al. (2018), presented Utrecht as a municipality that strongly performs in terms of their quantity of open data sets, but performing poorly when it comes to open data governance. Participation performs poorly, with communication channels largely underdeveloped. And interaction with local open data users only occurred sporadically in an informal setting. While the municipality attempted to work together with other municipalities and government bodies, it did not result in any substantial development for their open data program.

Public articles and strategies on open data in the municipality of Utrecht, within the 2018-2023 period are scarce. The existing documents on the state of open data in Utrecht are primarily focused around the quantitative output of the portal, with little to no mention on governance. Moreover, while municipality released a report, which celebrated the achieved successes of their open data program in the 2015-2018 period. Any mention of the plans, goals and governance for open data after this period appears not to be found.

However, propositional paper (Visie Digitale Stad), lays down a number of ideas and required processes for the municipality of Utrecht to become a "Digital City". The initial ideas for the digital city were initially constructed in 2021, with a regular yearly update. The actual realization of these steps is to be planned in 2025. Utrecht, is also developing a digital twin platform together with Amsterdam. This platform provides free to use tools for all municipalities in the Netherlands to turn their existing 2D records of the built environment into 3D models.

9.3 Rotterdam

The previous study on open data governance had Rotterdam described as an early adaptor (Welle Donker et al., 2018). However, it was noted that after departure of two prominent open data champions within the CIO office, the open data activities had stagnated. In a correspondence with the municipality of Rotterdam, it was stated that in 2017, open data was primarily driven by a data-driven program. As of 2023 and in the upcoming years, the focus has shifted towards the creation of the digital city. This is to be realized by 2025. The program includes the creation of a digital twin. The digital twin is a 3D model of the entire city, and includes all physical objects of the built environment.

It was made clear that the municipality has made significant progress to realize a number of projects related to the digital city. This applies to the creation of the digital twin, but also the creation of their Open Urban Data Platform. Rotterdam aims to have the platform finished by the end of 2023. Once the platform is online and ready, it will be filled with relevant data sets, both open data sets as well as protected data sets. The municipality of Rotterdam has hired a number of new employees to ensure the project will be a success. This includes among others, a new chief data officer. The data officer will be responsible for developing new strategies. This involves setting up task division, creating plans for continuous growth and developing the necessary procedures to attain the data goals.

The Open Urban Data Platform functions as the infrastructure that connects the data for the digital twin. The digital twin will host a multitude of apps that citizens can use in their daily life. This includes new developments such as augmented reality. Augmented reality has a vast range of potential usages. For example, citizens can use augmented reality to see a finalized version of construction projects as they pass by a building site. The digital city will enable citizens to have an increased participation with urban development. Citizens can use apps to pinpoint locations, and provide feedback on what kind of new developments they desire. An example of this is the planting of trees, which is also shown in Figure 48. In the new program, citizens are taking a more central position in government decision making, through open data. By acting as data users, data suppliers and providers of feedback.

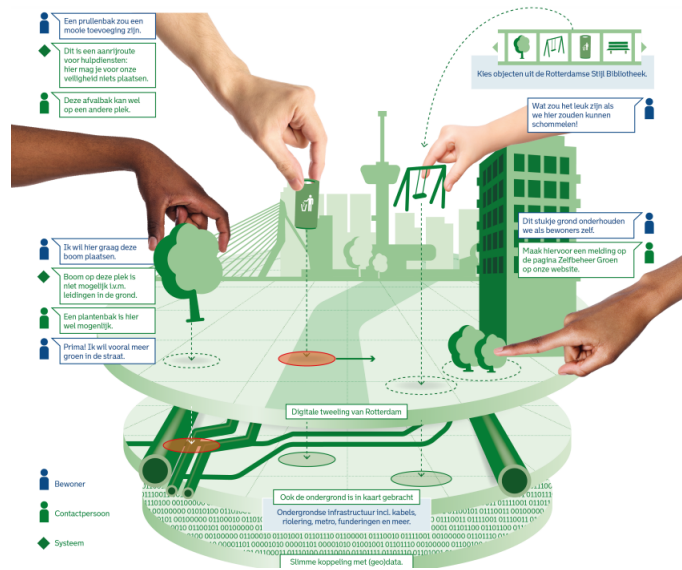


Figure 48: Rotterdam Digital City (Rotterdam, 2023)

9.4 Amsterdam

At the time of the release of the AMS research, Amsterdam was considered to be at the forefront in the publication and usage of local open government data. In the past, Amsterdam organized hackatons to involve citizens in open data. However, the results were not received with a mixed review. There was too little attention given to governance aspects such as coordination of stakeholders and standardization (Welle Donker et al., 2018).

In 2023, Amsterdam is still using open data to create an inclusive and digital city. The municipality is currently developing a digital twin. A core value of the digital twin resides in the idea that the citizen takes a central position. Inhabitants of Amsterdam have the right to share their data in a safe and effective manner. Thus, open data has to be accessible and available as much as possible. However, open data is no longer the independent municipal development, as it was in the experimental phases.

The citizen plays a central role. The program is therefore also branded as the inclusive smart city. These inclusive values are materialized by creating open data dashboards that can be tailored to the desires of the users. The digital twin program in Amsterdam integrates citizens in government decision making. The municipality is asking young citizens to participate in the creation an augmented reality of their own neighborhood. And as mentioned before, the municipality of Amsterdam is working together with the municipality of Utrecht on developing a national twin platform.

9.5 Eindhoven

In the AMS study, Eindhoven was described as a leading example of open data (governance). This was attributed to Eindhoven having a higher data maturity level than the other big municipalities (Welle Donker et al., 2018). The municipality had already organized a multitude of discussions on the future of open data governance. These discussions would include a variety of topics, such as improving the handling of sensitive data and how to better involve stakeholders. Data ownership was one of the challenges that Eindhoven still had to deal with. However, the correspondence with the municipality clarified that data-ownership is no longer an issue for open data in Eindhoven. As service level agreements have become an integral part of data collection and data release.

For the current open data portal, it was noted in the correspondence that Eindhoven had created both communication channels, as well as initiatives for civic integration of open data. However, they remain largely underutilized. There are no active sessions with citizens to improve the direction of open data. Nevertheless, it was noted that the municipality is always open to any suggestions made by external users. But while open data on itself is currently not heavily involved with citizen participation, this can change in the future. As Eindhoven is developing a digital twin, similarly to Rotterdam and Amsterdam. The goal of the digital twin is to increase citizen participation, and involve them in the decision making process of the government. This is especially the case for future spatial planning.

The Eindhoven Digital Twin program was developed in cooperation with the Urban Development Initiative. This initiative is a cooperation between the municipality of Eindhoven, the municipality of Helmond, the Technical University of Eindhoven, Brainport Development and Fraunhoven. This cooperation was also facilitated by the VNG, who want to improve the inter-municipal collaboration for achieving goals of digital agendas. In the correspondence it was noted that the municipality had recently been interacting with Amstelveen. The municipality of Amstelveen was in the process of developing their own open data portal by using Eindhoven as a leading example. However, it was not clarified if there were any other formal agreements with other municipalities ongoing.

9.6 The large municipalities summarized

The previous research by Welle Donker et al. (2018), showed that the large municipalities were lacking in participation aspects, specifically in involving citizens. However, almost all large municipalities have made a significant positive change through the development of their digital city programs. These programs include digital twins, urban data platforms, and applications that allow citizens to become stakeholders in open data activities. As a result, the large municipalities can now be placed in a higher maturity level for participation compared to earlier research. In terms of cooperation, the large municipalities are actively engaged with other municipalities, not only to develop digital twins but also to collaborate on other open data activities.

10 Summary of the middle-sized municipalities

Chapter 4 to 8 provided an analysis of the open data governance in a selection of middle-sized municipalities in the Dutch Randstad area. These municipalities were assessed in a three level assessment framework. This framework was presented in Chapter 3. This chapter provides a summary of all these middle-sized municipalities, and the state of their open data governance.

The framework assessed open data governance through different themes. These were strategizing, sustaining, legal framework, cooperation and participation as independent themes. The thematic scores are presented in Table 1. Each theme had a number had a number of indicators that resulted in an average score for each theme. The indicator scores are presented in Table 2 on page 92. The possible scores that municipalities could receive were initial, intermediate or advanced. It was also possible to have a score in between such as initial-intermediate. Initial refers to governance in either a starting phase, or which had not yet been given significantly developed since. The intermediate score was given to open data governance that had made some development, but had not yet become fully integrated element within the municipality. And advanced maturity was given to governance that was fully integrated within the municipality, with transparency to the public as well. The thematic scores of all middle-sized municipalities are visually presented in a spider diagram on Figure 49. The themes also have average scoring visualised in as a spider diagram on Figure 50.

	Gouda	Zoetermeer	Zaanstad	Hilversum	Haarlem	Average
Strategizing	Intermediate (2)	Intermediate-Advanced (2,5)	Intermediate-Advanced (2,5)	Advanced (3)	Advanced (3)	Intermediate-Advanced (2,5)
Sustaining	Initial (1)	Intermediate (2)	Intermediate (2)	Intermediate-Advanced (2,5)	Intermediate (2)	Intermediate (2)
Legal framework	Initial-Intermediate (1,5)	Intermediate-Advanced (2,5)	Advanced (3)	Advanced (3)	Advanced (3)	Intermediate-Advanced (2,5)
Cooperation	Intermediate (2)	Intermediate (2)	Intermediate (2)	Intermediate (2)	Advanced (3)	Intermediate (2)
Participation	Initial-Intermediate (1,5)	Initial (1)	Initial-Intermediate (1,5)	Advanced (3)	Intermediate (2)	Intermediate (2)

Table 1: Summary of middle-sized municipalities

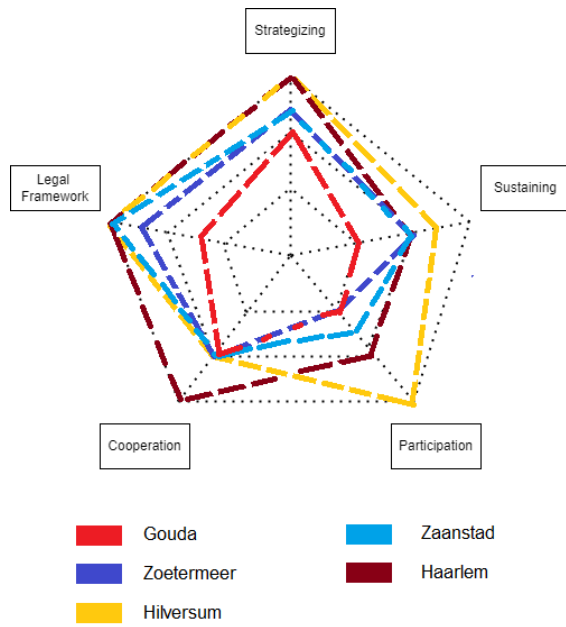


Figure 49: Scores of all middle-sized municipalities

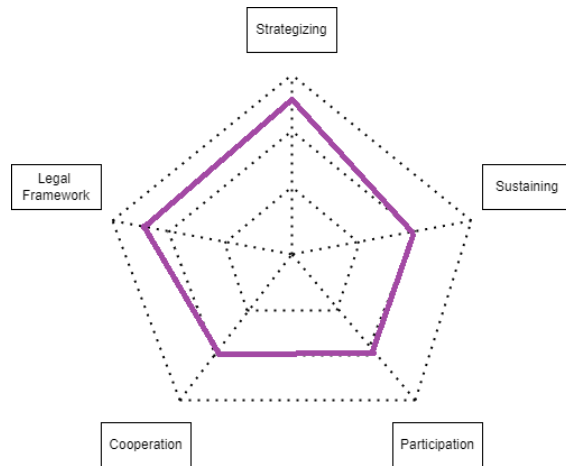


Figure 50: Average score of middle-sized municipalities

10.1 Themes and indicators

Strategizing assessed all governance activities that involved the creation of a clear and transparent vision, setting up a task division and ensuring democratic leadership with clear accountability. These three aspects were used as strategizing indicators.

Sustaining assessed how municipalities manage their financial overview of budgets specifically allocated for open data, and to which extent open data was assessed for its economic impact upon before release. These two aspects were used as sustaining indicators.

Legal framework assessed the governance of legal issues around data sensitivity and releasing data in adherence to the AVG, as well as how agreements with data owners are set up for current and future open data activities. These two aspects were used as legal framework indicators.

Cooperation assessed how the governance of knowledge exchange on open data between within the municipality and between the different departments and staff members, as well as how different municipalities come together and form agreements for knowledge exchange and mutual projects. These two aspects were used as cooperation indicators.

Participation assessed all governance aimed at identification and involvement of external users for feedback, to actively promote local open data to gain new users, to build user communities, and to have citizens as users involved in the development of open data through open governance. These four aspects were used as participation indicators.

10.2 Strategizing open data in middle-sized municipalities

Strategizing was one of the highest scored themes of the middle-sized municipalities, with an intermediate-advanced score. The majority of the municipalities have an advanced score. The municipality of Gouda has a relatively lower score, which can be attributed to their their lack of formalized open data governance. All indicators of strategizing were placed in the intermediate-advanced level. However, the majority of the municipalities lack transparency on their open data activities. Thus, they cannot be given an advanced score.

The middle-sized municipalities were able to establish a clear role division. The municipalities significantly differ in terms of staff size involved in open data activities. Gouda has the smallest staff available for open data development, while Hilversum was in the process of hiring four new employees to specifically work with open data.

The middle-sized municipalities have a flat hierarchy, which have a positive influence on the leadership. The managers reward proactive behavior and are willing to listen to employees for new input. In majority of the municipalities, the coordinating figures in open data have multiple functions. This results in open data benefiting from knowledge input from multiple departments within the municipality.

10.3 Sustaining open data in middle-sized municipalities

The middle-sized municipalities score intermediate for sustaining. None of the municipalities have a budget specifically allocated to open data. Instead, they are part of other local government programs. This is because financing specific programs within local government requires requires a large budget not that exceeds the expenses of open data. The the majority of middle-sized municipalities reported to easily gather resources from the multiple programs within their local governments. All municipalities, except for Gouda, have an explicit policy to fund open data. Nevertheless, Gouda still reported to have still sufficient budget available due to the municipal position of the staff who engage in open data release. The majority of the municipalities lack active monitoring on current and future open data expenses. Moreover, except for Hilversum, the majority of the municipalities have no public transparency on their open data expenses.

Overall, none of the middle-sized municipalities have their data-release based on the economic impact framework developed for the Open Data Directive. However, the majority of the municipalities are aware and have used the "high-value" framework developed by the VNG. Furthermore, they are aware that some data sets have a higher value than others. Only Gouda did not engage in data assessment, as it was stated that it would cost too much time and effort. Data release would instead be done on request.

10.4 Legal framework of open data in middle-sized municipalities

The middle-sized municipalities have an intermediate-advanced score for legal framework. Data sensitivity is formalized with adherence to the AVG, and with clear internal transparency. All municipalities, except for Gouda, have developed a framework to assess sensitive data before release. Nevertheless, Gouda has an sufficient in-house body of knowledge to intuitively assess data without the need for developing a standardized format.

The flat hierarchies within the middle-sized municipalities provide a clear overview on the data owners, with whom regular meetings are arranged for open data activities. The municipalities faced little to no issues when requesting input or help from internal data-owners for open data development. The majority of the municipalities have made have procedures to centralize data gathered by private third parties, so any gathered data is owned by the municipality. The municipalities consider centralized data ownership important issue. As a result, the municipality of Zaanstad has become a leading example for other municipalities in their effort centralize data to release it as open.

10.5 Cooperation of open data in middle-sized municipalities

The middle-sized municipalities score intermediate for cooperation. The interaction indicator had a higher score (intermediate-advanced) than the expertise indicator (intermediate). The majority of the middle-sized municipalities (formally) cooperate with other municipalities. This occurs primarily for projects within their own region. The majority of these interactions are based around knowledge exchange. However, some of them also develop new data portals for open data. The municipality of Haarlem works with nearby small-municipalities to host a regional open data portal for the purpose of improving healthcare and elderly care. These small-municipalities regularly send their data to the municipal staff of Haarlem, to maintain existing open data sets or to combine the multiple municipal data sets into new single open data sets.

The middle-sized municipalities had wide range of scores on expertise (Initial: Zoetermeer and Zaanstad, Intermediate: Gouda and Hilversum, advanced; Haarlem). In some of the municipalities, the majority of the open data users were the employees. As a result, the staff engaged in open data is regularly involved with sharing knowledge. However, the majority of the middle-sized municipalities do not have knowledge exchange as a core task. Hilversum has planned to expand the knowledge culture within the municipality according to their public documents, but the research did not configure to what extent this had been realized. Haarlem however, has made educating staff on open data a core task from the start of the activities, and has been ongoing since.

10.6 Participation of open data in middle-sized municipalities

The middle-sized municipalities score intermediate for participation. They all have some awareness on their users as their open data portals have communication channels for contacting the municipal open data staff. However, the majority of the middle-sized municipalities are only involved in passive engagement. Only the municipalities of Hilversum and Haarlem are involved in active engagement. Their citizens and local civic groups are regularly requested to provide feedback on the municipal open data development.

The municipalities with passive engagement claimed that the AVG makes it difficult to truly know a user until they are contacted by them. The municipalities with active engagement also adhere to the AVG, but are consciously and actively involving citizens and local civic groups through their open data strategies. Moreover, Haarlem and Hilversum are the only two middle-sized municipalities that engage in outward promotion of their open data activities. The rest of the municipalities are not doing any sort of outward promotion.

The majority of the middle-sized municipalities have occasional training sessions and interactive moments with specific groups who use their data. However, this is not a formalized process for most. Hilversum is the exception, as it has developed policies to bring the government and citizens together in an open

data community. None of the municipalities, except for Hilversum, is actively involving their citizens to develop the municipalities themselves. As a result, Hilversum is has a higher maturity level for open governance compared to all other middle-sized municipalities.

	Gouda	Zoetermeer	Zaanstad	Hilversum	Haarlem	Average
Vision	Intermediate (2)	Intermediate (2)	Intermediate (2)	Advanced (3)	Advanced (3)	Intermediate-Advanced (2,5)
Task division	Intermediate (2)	Intermediate-Advanced (2,5)	Intermediate (2)	Advanced (3)	Advanced (3)	Intermediate-Advanced (2,5)
Leadership	Intermediate (2)	Advanced (3)	Advanced (3)	Advanced (3)	Intermediate-Advanced (2,5)	Intermediate-Advanced (2,5)
Financial overview	Initial (1)	Intermediate (2)	Intermediate (2)	Advanced (3)	Intermediate-Advanced (2,5)	Intermediate (2)
Data set evaluation	Initial (1)	Intermediate (2)	Intermediate (2)	Intermediate (2)	Intermediate (2)	Intermediate (2)
Sensitive data	Initial (1)	Advanced (3)	Advanced (3)	Advanced (3)	Advanced (3)	Intermediate-Advanced (2,5)
Data ownership	Intermediate (2)	Intermediate (2)	Advanced (3)	Advanced (3)	Advanced (3)	Intermediate-Advanced (2,5)
Interaction	Intermediate (2)	Advanced (3)	Advanced (3)	Intermediate (2)	Advanced (3)	Intermediate-Advanced (2,5)
Expertise	Intermediate (2)	Initial (1)	Initial (1)	Intermediate (2)	Advanced (3)	Intermediate (2)
Engagement	Intermediate (2)	Intermediate (2)	Intermediate (2)	Advanced (3)	Intermediate-Advanced (2,5)	Intermediate (2)
Outreach	Initial (1)	Initial (1)	Initial (1)	Advanced (3)	Intermediate (2)	Intermediate (2)
Community building	Intermediate (2)	Initial (1)	Intermediate (2)	Advanced (3)	Intermediate (2)	Intermediate (2)
Open governance	Initial (1)	Initial (1)	Initial (1)	Advanced (3)	Intermediate (2)	Initial-Intermediate (1,5)

Table 2: Indicator summary of middle-sized municipalities

11 Conclusion, discussion and recommendations

This Chapter begins with a summary of the findings of this research and answers to the research questions. In Section 11.2, a discussion is provided as an in-depth exploration of the findings and their implications. Section 11.3 concludes with recommendations.

11.1 Findings of this research

Chapter 1 explained how government agencies are the largest collectors and maintainers of spatial data. Most of this processing is done by local governments. International organizations, such as the Open Government Partnership, and supranational organizations, such as the European Union, are making efforts to release government data as open (spatial) data. Governments need to ensure good data governance for a successful open data release. Previous research has shown that certain aspects of open data governance are lacking in the five largest Dutch municipalities.

Based on previous findings on the success of municipal GIS implementation and population size, it was found that medium-sized municipalities were able to find a balance between the advantages and disadvantages of scale. A link was made to the impact of open data governance. Chapter 2 presented several characteristics of medium-sized municipalities and how they influence open data governance, leading to the following main research question:

To what extent do the structural characteristics of middle-sized municipalities in the Netherlands influence their open data governance?

The structural characteristics of middle-sized municipalities affect their open data activities through advantages and disadvantages. The advantages are: (1) effective communication channels and the ability to arrange meetings on the fly, (2) a sufficient budget and staff to create open data portals, to formalize and centralize data ownership, and create evaluation frameworks for sensitive data, and (3), a clear overview of task division and leadership.

However, the characteristics of middle-sized municipalities give a disadvantage to other aspects of open data governance. The effect of the characteristics of middle-sized municipalities on cooperation was explored through the first sub-question as the following:

1) How do the structural characteristics of Dutch middle-sized municipalities influence the aspect of cooperation in their open data governance?

The majority of the middle-sized municipalities did not have resources and personnel available to actively and formally share knowledge with their staff on open data. The middle-sized municipalities have sufficient personnel and resources to engage in formal collaborations with other municipalities, and to lead the development of regional open data portals in collaboration with small municipalities who are unable to do it alone.

The impact of the municipal population size participation was researched through the second sub-question as the following:

2) How do the structural characteristics of Dutch middle-sized municipalities influence the aspect of participation in their open data governance?

The majority of middle-sized municipalities did not have sufficient funds or personnel to outwardly promote open data. As a result, there is no community building or engagement of citizens as stakeholders in the open data development process. A comparison was made with the contemporary open data governance of the large municipalities in the Netherlands. This led to the formulation of the last and final sub-question:

3) How do the Dutch middle-sized municipalities differ from the Dutch large municipalities in the open data governance aspects of participation and cooperation?

The large municipalities (G5) developed their open data earlier than the middle-sized municipalities, as they are no longer developing open data as a separate entity but rather a part in the creation of their digital city programs, which involve citizens as stakeholders. As a result, the large-municipalities have a higher maturity level for participation compared to the middle-sized municipalities. The middle-sized municipalities are on even footing with the large municipalities for cooperation. The large municipalities collaborate with other municipalities across the Netherlands to develop digital twins and exchange knowledge.

The only middle-sized municipalities with a high maturity for cooperation and participation were Haarlem and Hilversum. The middle-sized municipalities with a higher financial buffer can engage in open data activities beyond their core tasks, like involving citizens.

11.2 Discussion

The previous sub chapter showed that the available resources among the middle-sized municipalities have a significant impact on the state of open data governance. This subsection provides an in-depth exploration by comparing the literature from Chapter 2 with the findings on managing open data resources, engaging citizens, and fostering interaction between municipalities. These findings shape the recommendations in the next subsection.

11.2.1 Managing resources for a mature open data governance

In the GIS implementation study by Graafland (1993), it was found that municipal geo-information initiatives benefit from starting as a bottom-up process and then transitioning to a top-down process after reaching a certain level of maturity. In this research, the middle-sized municipalities that started as a bottom-up process and then transitioned to a top-down process outperformed the municipalities that still used a bottom-up approach. However, moving from a bottom-up to a top-down approach requires a significant financial investment. Setting up an open data initiative is costly enough, changing the governance approach would add more to the cost (Ubaldi, 2013).

In general, resource constraints are a major barrier for open data development (Benitez-Paez et al., 2018). This research showed that these constraints also apply to the development of a more mature open data governance. These constraints were evident in the governance aspects of cooperation and participation. Municipalities with fewer resources also have problems with hiring new staff to strengthen their workforce. In addition, municipalities with fewer resources could not afford to develop new strategies and to hire staff to engage citizens in open data. Nor did these municipalities have the resources available to create a knowledge culture within their organization. These were seen as activities outside their core tasks.

Having sufficient and knowledgeable staff was found to be critical to open data development. To coordinate stakeholders, an open data champion is needed to formulate common goals and agree on methods to achieve these goals (Plotkin, 2014). However, when these open data champions leave their positions, it has a significant negative impact on open data development. The middle-sized municipalities are affected when open data champions leave their organization, as was seen in the large municipalities years earlier (Welle Donker et al., 2018). Municipalities that do not have the resources to find a replacement are at risk in their open data development.

11.2.2 Involving citizens in open data

Open data development is seen as a way to create greater trust and transparency in government. However, underdeveloped governance leads to unfulfilled open data outcomes (Welle Donker and Van Loenen, 2017). Based on previous research, it was theorized that middle-sized municipalities would have their citizens more motivated to participate in open data development (Welle Donker

et al., 2018; McDonnell, 2020). However, the majority of municipalities do not actively gather input from outside users, nor do they promote their data to the outside world. As a result, citizens remain unaware of open data.

Governments can build communities to raise awareness and engage users. However, community building comes from two sides: the government and the users. If local governments do not provide opportunities for their citizens to participate, the positive effects of participation will not be fully realized. As shown in this research, the majority of middle-sized municipalities do not sufficiently build a community for open data users, especially citizens. The municipality that did actively try to involve citizens was also successful to the point of winning an award for engaging citizens with geospatial data.

The majority of mid-sized municipalities have taken their first steps to involve external stakeholders, such as the private sector and educational institutions, to contribute to their open data. However, the development of open data also requires the involvement of citizen stakeholders (Sjoukema et al., 2017). Open governance is still a largely underdeveloped element in all municipalities, which is in line with previous findings.

11.2.3 The lack of cooperation in open data

The research of Zuiderwijk et al. (2018) showed that small municipalities are reluctant to start open developments because they fear that their lack of staff and resources can not bring a successful implementation and maintenance. Therefore, these small municipalities can especially benefit from collaborating with middle sized municipalities for open data development. As shown by the regional open data portals developed by the municipality of Haarlem.

A high level of collaboration maturity could also have a positive impact on the development of a more mature governance of participation. In the Sjoukema et al. (2017) study, it was found that municipalities do not share knowledge about open data among themselves. In the same study, it was noted that open data governance becomes more complex as more stakeholders are involved. This research showed that the majority of middle-sized municipalities have not yet integrated citizens as stakeholders. By improving interaction, municipalities can learn from each other in a variety of ways, including developing strategies for engaging citizens in open data.

The research showed that the VNG (Association of Netherlands Municipalities) coordinates municipalities in the creation of common open data strategies. However, the VNG has proven to be largely ineffective in successfully coordinating municipalities in joint long-term open data projects. Dutch municipalities have a high degree of autonomy and the VNG is only an advisory body. Dutch municipalities tend to drop out of VNG projects to focus on their core tasks, and since VNG has no mandate to keep them involved, open data projects tend to wither away over time.

11.2.4 Reflection and future research

This research showed that Hilversum had a higher average score in a variety of governance issues compared to other middle-sized municipalities, especially in the aspect of participation. It is important to note that Hilversum, unlike the other middle-sized municipalities, could not be reached for a validation interview. Zoetermeer, on the other hand, offers two perspectives. The departure of the first architect led to a validation of the results by the second architect. This resulted in some of the scores from the first interview being lowered, especially for strategizing.

Although the sample size of five municipalities is relatively small, there are some differences between the municipalities other than their size that would benefit from further research. Working in a regional project seems to have an impact on the willingness to cooperate with other municipalities. Future research could focus on the different outcomes of municipalities involved in regionally shared projects compared to projects created by an overarching nationwide organization such as the VNG. This would be particularly useful as there is an increasing trend towards standardization of spatial data within the EU and its member states. Additional research on the overall wealth of communities, the demographics of their residents, and the presence of educational institutions can provide new insights into the extent to which this affects participation, particularly among citizens.

11.3 Recommendations

Both large and middle-sized municipalities are likely to develop a gap in open data activities when a data champion leaves office. To avoid this, municipalities need to focus on finding a suitable replacement within a reasonable timeframe and with a similar "can do" mentality.

The Dutch government needs to shift its focus from the use of advisory bodies for the development of municipal open data to the creation of a body with a clear mandate to take over this task. This mandate must make it easier for municipalities to comply with existing executive regulations such as the Woo and the Spatial Planning Act (Omgevingswet), as well as several upcoming EU regulations such as the Digital Market Act (DMA), the Digital Services Act (DSA) and the Data Governance Act (DGA). The DMA requires local governments to publish accurate and well-maintained government documents in machine-readable formats. The DGA, which is expected to come into force sometime in 2023. It will facilitate the reuse of government information and require data providers to be transparent and neutral. It also requires the presence of neutral intermediaries to connect data owners and users.

The DGA is expected to place a significant regulatory burden on local governments. Therefore, the new entity must facilitate and standardize open data governance across the many legal aspects. It should standardize ethical aspects, such as the regulation of sensitive data, but also the use of algorithms. It should also raise awareness of the "high value" evaluation framework of the Open Data

Directive.

Middle-sized municipalities need to increase their efforts to involve citizens, not only in open data activities, but also in future urban data platforms. While many municipalities have initiated open data projects for societal benefits, the actual outcomes may not match the proposed benefits if citizens are not adequately informed, educated or given the opportunity to contribute to the development of open data from the outset. A critical first step can be taken by increasing the transparency of open data. This can be achieved by presenting strategies to citizens, along with clear benchmarks and associated costs and benefits. Promoting open data outwardly is not currently a core task of local governments, but it should be if citizens are to become more involved.

Outward promotion can raise awareness of open data among a wider range of users, such as citizens who have no background in geospatial information. Organizing courses and tournaments aimed at solving problems such as mobility or green areas through open spatial data allows citizens to have a hands-on experience with open spatial data. In this research, Gouda serves as a leading example of how to introduce senior citizens involved in heritage foundations to open geospatial data and tools. Through these courses, the municipality gains user experience input and the citizens apply their knowledge to improve the web services of their foundations. Another example would be the development of interactive games or just a simplified viewer. The municipality can put these on tablets or computers in local community servers. In this way, both children and adults can learn about open data in a playful manner.

A Appendix

Bijlage 2 Beslisboom Open Data – PE CDO

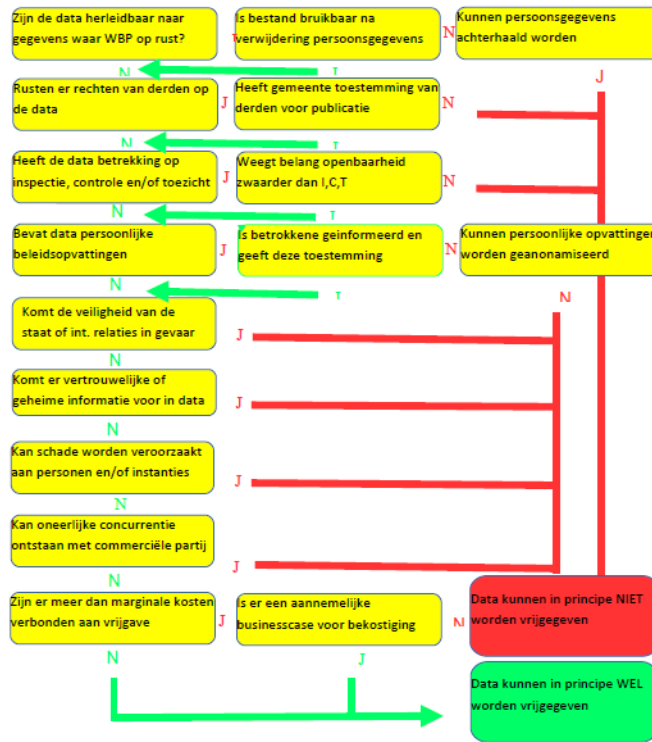


Figure 51: Open Data filter of Haarlem

Bijlage 1 Stroomschema beschikbaar stellen open data – PE CDO

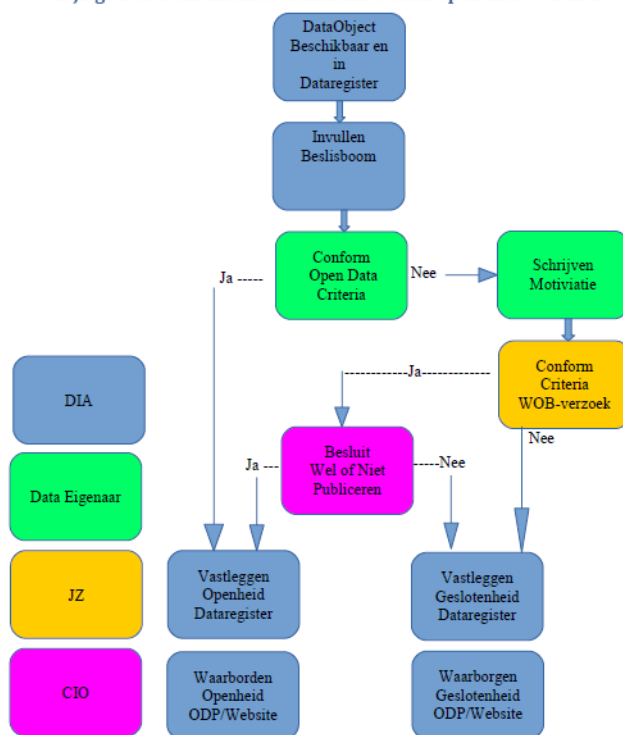


Figure 52: Task division open data Haarlem

Themes - Indicators		Level 1 - Initial	Level 2 - Intermediate	Level 3 - Advanced
Strategizing	Vision	Project is run by enthusiastic individuals with no clarity about planned standards, content, or release dates.	Clear direction for future open data activities, but lack of active monitoring and transparency	Clearly defined goals, constantly monitored for adjustments, clear internal and external transparency
	Task division	Lack of clear task division, informal potpourri of individuals and teams taking on different tasks based on current needs	General task division present but lacks specific allocation for open data project, part of a general government team (GIS, IT)	Specific functions for open data have been created within the organization
	Leadership	Lack of clear leadership, no defined groups or individuals who carry responsibility for the project	Clear leadership roles but static, little effort to democratize the process	Democratized leadership, transparent responsibilities, duties and accountability
Sustaining	Financial overview	No allocation of resources specifically for open data. Project is sustained by funding from one or more departments	Local government as a whole has a conscientious policy of funding open data, although resources may flow from other departments.	Allocated budget is actively monitored and analyzed for optimization, resources go directly to project
	Dataset evaluation	No evaluation of data sets, data release without monetary expectation, but willingness of staff to publish.	Data sets are evaluated and prioritized based on standardized formal (high value) data sets.	To maximize the economic impact of data sets, standardized formats are used along with active user consultation.
Legal Framework	Sensitive data	Informal approach to data anonymization, lack of standardized approaches, instead relying on staff intuition	Standardized assessment frameworks for sensitive data applied prior to release	Individuals and teams are given specific functions to assess data sets with potential information to comply with formalized sensitive data policies
	Data ownership	Data is scattered across multiple municipal departments with no clear ownership.	Active engagement with data owners, early attempts to establish communication channels between users and data owners	Centralize data ownership for future efforts by formalizing agreements with internal and external data producers.
Cooperation	Interaction	Little or no effort is made to cooperate with other municipalities.	The local government has made some initial efforts to collaborate with other municipalities for knowledge sharing or data standardization.	Formal agreements with other municipalities to promote shared knowledge, standards, training and projects
	Expertise	A handful of experts run an open data project without an active effort to spread knowledge or skills.	Teams and individuals within the organization have received some informal training on how to use open data, while also providing feedback to experts.	The organization actively provides courses and training for employees who want to learn about open data, in an effort to create a more skilled workforce.
Participation	Engagement	Little or no effort to identify users	Active efforts to identify users, but only for passive engagement. Channels for data requests and communications on digital platforms are accessible to users	Users are identified and classified into a variety of user types. Active engagement with users, either physically or digitally, to monitor new requirements
	Outreach	Organization has made little or no attempt to promote open data to the general public. Focus is solely on publishing.	There are some low-level external awareness campaigns, through articles or informal networks,	Active open data awareness campaign through bootcamps, demos, and promotions in the digital or physical world.
	Community building	Little or no effort made to build a user community	The organization participates in community building by offering workshops, trainings, and providing digital platforms for sharing and learning.	Community building is an active element of open data governance, with tasks and roles specifically designed to facilitate user engagement.
	Open governance	Lack of transparency in open data projects. Users have little to no say in open data decision-making.	There is some effort to make the open data project transparent through reports or surveys, but users have not been fully involved in the decision-making process.	Users have a voice in the decision-making process for adjustments to goals, direction, activities, and future improvements.

Table 3: Indicators and progress levels

Themes - Indicators		Middle sized characteristic
Strategizing	<i>Vision</i>	Enables employees who work across multiple departments to open data without having to set clear goals or deadlines
	<i>Task division</i>	Task division can be a barrier due to smaller amount of staff and resources
	<i>Leadership</i>	Fewer employees can lead to more democratic and transparent governance
Sustaining	<i>Financial overview</i>	Employees from different departments can use funds from different departments to publish open data.
	<i>Dataset evaluation</i>	Can use small and informal meetings to get input from people in different departments for faster data analysis.
Legal Framework	<i>Sensitive data</i>	Fewer resources to create job positions for handling sensitive data, which could overwhelm current staff.
	<i>Data ownership</i>	Data sets are less isolated across departments, and more knowledge about data owners is available among employees.
Cooperation	<i>Interaction</i>	Greater willingness to work with other communities due to scale advantages
	<i>Expertise</i>	Informal, on-the-fly ability to share knowledge within the organization across departments
Participation	<i>Engagement</i>	The government has a closer relationship with the organizations that make use of its open data.
	<i>Outreach</i>	Increased engagement with local citizens motivates employees to spread open data awareness
	<i>Community building</i>	Closer ties to individuals and groups allow for easier team building
	<i>Open governance</i>	Low threshold for civic engagement encourages citizens to actively participate in decision making

Table 4: Presumed open data governance characteristics of middle-sized municipalities

References

- Avellaneda, C. N. and Gomes, R. C. (2015). Is small beautiful? Testing the direct and nonlinear effects of size on municipal performance. *Public Administration Review*, 75(1):137–149. <https://doi.org/10.1111/puar.12307>.
- Benitez-Paez, F., Degbelo, A., Trilles, S., and Huerta, J. (2018). Roadblocks hindering the reuse of open geodata in Colombia and Spain: A data user’s perspective. *ISPRS International Journal of Geo-Information*, 7(1):6. <https://doi.org/10.3390/ijgi7010006>.
- Boehnke, R. F., Hoppe, T., Brezet, H., and Blok, K. (2019). Good practices in local climate mitigation action by small and medium-sized cities; exploring meaning, implementation and linkage to actual lowering of carbon emissions in thirteen municipalities in The Netherlands. *Journal of cleaner production*, 207:630–644. <https://doi.org/10.1016/j.jclepro.2018.09.264>.
- Borgesius, F. Z., Gray, J., and van Eeoud, M. (2015). Open data, privacy, and fair information principles: Towards a balancing framework. *Berkeley Technology Law Journal*, 30(3):2073–2131. Available at SSRN: <https://ssrn.com/abstract=2695005>.
- CBS (2022). Aantal gemeenten daalt tot 342 op 1 januari 2023. retrieved from <https://www.cbs.nl/nl-nl/nieuws/2022/52/aantal-gemeenten-daalt-tot-342-op-1-januari-2023>.
- CBS (2023). Gemiddelde WOZ-waarde van woningen op 1 januari; eigendom, regio. retrieved from <https://www.cbs.nl/nl-nl/cijfers/detail/85036NED>.
- Centraal Bureau voor de Statistiek (2019). Sterke groei in steden en randgemeenten verwacht. retrieved from <https://www.cbs.nl/nl-nl/nieuws/2019/37/sterke-groei-in-steden-en-randgemeenten-verwacht>.
- Centraal Bureau voor de Statistiek (n.d). Gemeentegrootte en stedelijkheid. retrieved from <https://www.cbs.nl/nl-nl/onze-diensten/methoden/classificaties/overig/gemeentegrootte-en-stedelijkheid>.
- Conradie, P. and Choenni, S. (2014). On the barriers for local government releasing open data. *Government Information Quarterly*, 31:S10–S17. <https://doi.org/10.1016/j.giq.2014.01.003>.
- Dalla Corte, L. (2020). Safeguarding Data Protection in an Open Data World: On the idea of balancing open data and data protection in the development.
- data.europa.eu (2018). The psi directive and gdpr. <https://data.europa.eu/en/publications/datastories/psi-directive-and-gdpr>.
- Dhimitri, E. (2018). Analysis related to optimal size of municipality and efficiency-a literature review. *European Journal of Interdisciplinary Studies*, 4(1):131–138.

- digtaaloverheid.nl (2023). 10 basisregistraties. retrieved from <https://www.digtaaloverheid.nl/overzicht-van-alle-onderwerpen/stelsel-van-basisregistraties/10-basisregistraties/>.
- DiMaggio, P. and Powell, W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American sociological review*, 48:147–160.
- Duch-Brown, N., Martens, B., and Mueller-Langer, F. (2017). The economics of ownership, access and trade in digital data. *SSRN Electronic Journal*. <http://dx.doi.org/10.2139/ssrn.2914144>.
- European Commission (2022a). European legislation on open data. retrieved from <https://digital-strategy.ec.europa.eu/en/policies/legislation-open-data>.
- European Commission (2022b). Open data: Commission urges belgium, bulgaria, czechia, croatia, hungary, latvia, the netherlands, austria, slovakia and sweden to enact eu rules on open data and the reuse of public sector information. retrieved from <https://digital-strategy.ec.europa.eu/en/news/open-data-commission-urges-belgium-bulgaria-czechia-croatia-hungary-latvia-netherlands-a>
- Floridi, L. (2014). Open data, data protection, and group privacy. *Philosophy & Technology*, 27(1):1–3. <https://doi.org/10.1007/s13347-014-0157-8>.
- Gemeente Amsterdam (2023). Het hoe en waarom van basis- en kernregistraties. retrieved from <https://www.amsterdam.nl/bestuur-organisatie/organisatie/dii/basisinformatie/basisinformatie/registraties/hoe-en-waarom>.
- Gonzalez-Zapatal, F. and Heeks, R. (2015). The multiple meanings of open government data: Understanding different stakeholders and their perspectives. *Government Information Quarterly*, 32(4):441–452. <https://doi.org/10.1016/j.giq.2015.09.001>.
- Graafland, A. (1993). Geo-informatievoorziening in nederlandse gemeenten. PhD Thesis, Delft University of Technology.
- Harvey, F. and Tulloch, D. (2006). Local-government data sharing: Evaluating the foundations of spatial data infrastructures. *International Journal of Geographical Information Science*, 20(7):743–768. <https://doi.org/10.1080/13658810600661607>.
- Hilversum (2022). I-Visie. retrieved from <https://api1.ibabs.eu/publicdownload.aspx?site=hilversum&id=100394537>.
- Hufty, M. (2011). Investigating policy processes: the governance analytical framework (gaf). *Research for sustainable development: Foundations, experiences, and perspectives*, pages 403–424.

- Jakob, M. and Krcmar, H. (2018). Which barriers hinder a successful digital transformation in small and medium-sized municipalities in a federal system? In *Central and Eastern European eDem and eGov Days*, pages 141–150. <https://doi.org/10.24989/ocg.v331.12>.
- Janssen, K. (2011). The influence of the PSI directive on open government data: An overview of recent developments. *Government Information Quarterly*, 28(4):446–456. <https://doi.org/10.1016/j.giq.2011.01.004>.
- Janssen, M., Charalabidis, Y., and Zuiderwijk, A. (2012). Benefits, adoption barriers and myths of open data and open government. *Information systems management*, 29(4):258–268. <https://doi.org/10.1080/10580530.2012.716740>.
- Johnson, P. A. (2017). Models of direct editing of government spatial data: Challenges and constraints to the acceptance of contributed data. *Cartography and Geographic Information Science*, 44(2):128–138. <https://doi.org/10.1080/15230406.2016.1176536>.
- Johnson, P. A., Sieber, R., Scassa, T., Stephens, M., and Robinson, P. (2017). The cost (s) of geospatial open data. *Transactions in GIS*, 21(3):434–445. <https://doi.org/10.1111/tgis.12283>.
- Kadaster (n.d). Basisregistratie Adressen en Gebouwen - BAG. retrieved from <https://www.kadaster.nl/zakelijk/registraties/basisregistraties/bag>.
- Kassen, M. (2013). A promising phenomenon of open data: A case study of the Chicago open data project. *Government information quarterly*, 30(4):508–513. retrieved from <https://doi.org/10.1016/j.giq.2013.05.012>.
- Kassen, M. (2022). Open data governance in sweden: Government data transparency in the context of social democracy. In *Open Data Governance and Its Actors*, pages 97–132. Palgrave Macmillan.
- Masser, I., Rajabifard, A., and Williamson, I. (2008). Spatially enabling governments through SDI implementation. *International Journal of Geographical Information Science*, 22(1):5–20. <https://doi.org/10.1080/13658810601177751>.
- McDonnell, J. (2020). Municipality size, political efficacy and political participation: a systematic review. *Local Government Studies*, 46(3):331–350. <https://doi.org/10.1080/03003930.2019.1600510>.
- Mergel, I., Kleibrink, A., and Sörvik, J. (2018). Open data outcomes: US cities between product and process innovation. *Government Information Quarterly*, 35(4):622–632. <https://doi.org/10.1016/j.giq.2018.09.004>.

- Midsize NL (2016). Het toekomstperspectief van de middelgrote stad. retrieved from https://www.platform31.nl/uploads/media_item/media_item/60/18/Magazine_Midsize_NL-1455112679.pdf.
- Ministerie van Binnenlandse Zaken en Koninkrijksrelaties (2013). Visie Open Overheid.
- Ministerie van Justitie en Veiligheid (2018). Handleiding algemene verordening gegevensbescherming.
- Okediji, R. L. (2020). Government as Owner of Intellectual Property? Considerations for Public Welfare in the Era of Big Data. *Vanderbilt Journal of Entertainment and Technology Law*, 18:331. retrieved from <https://scholarship.law.vanderbilt.edu/jetlaw/vol18/iss2/5/>.
- Open Data Institute (2015). Open Data Maturity Model. retrieved from <https://theodi.org/article/open-data-maturity-model-2/>.
- Open Government Partnership (2020). The Netherlands: Open Government Action Plan 2020-2022. https://www.opengovpartnership.org/wp-content/uploads/2021/01/Netherlands_Action-Plan_2020-2022.pdf.
- Open Knowledge Foundation (n.d). What is open? retrieved from <https://okfn.org/opendata/>.
- Overheid (2022). Basisregistratie adressen en gebouwen (bag). retrieved from <https://data.overheid.nl/dataset/basisregistratie-adressen-en-gebouwen--bag->.
- Overheid.nl (2017). Gemeentelijke High Value Datalijst. retrieved from <https://data.overheid.nl/gemeentelijke-high-value-datalijst>.
- Paskaleva, K., Evans, J., Martin, C., Linjordet, T., Yang, D., and Karvonen, A. (2017). Data governance in the sustainable smart city. In *Informatics*, volume 4, page 41. MDPI.
- Pinkroccade Local Government (2020). Voorkom datalekken met ikernregistraties. retrieved from <https://www.binnenlandsbestuur.nl/digitaal/kernregistraties-zijn-de-gemeentelijke-basisregistraties>.
- Plotkin, D. (2014). *Data stewardship: An actionable guide to effective data management and data governance*. Elsevier. <https://doi.org/10.1016/C2012-0-07057-3>.
- Qureshi, F. M. and Rajabifard, A. (2008). Design of sdi to facilitate urban planning at local level. In *AsiaGIS 2008 Conference*.
- Raad van State (2022). Wet implementatie open data richtlijn. <https://www.raadvanstate.nl/actueel/nieuws/oktober/samenvatting-open-data-richtlijn/@132262/w04-22-0141/>.

- Rajabifard, A., Feeney, M.-E. F., and Williamson, I. P. (2002). Future directions for SDI development. *International Journal of Applied Earth Observation and Geoinformation*, 4(1):11–22.
- Rijksoverheid (n.d.a). Gemeentelijke belastingen. retrieved from <https://www.rijksoverheid.nl/onderwerpen/financien-gemeenten-en-provincies/belastinginkomsten-en-specifieke-uitkeringen-gemeenten-en-provincies/gemeentelijke-belastingen>.
- Rijksoverheid (n.d.b). Hoe bepalen gemeenten de woz-waarde? retrieved from <https://www.rijksoverheid.nl/onderwerpen/waardering-onroerende-zaken-woz/vraag-en-antwoord/woz-waarde-bepalen>.
- Rijksoverheid (n.d.c). Inkomsten gemeenten en provincies. retrieved from <https://www.rijksoverheid.nl/onderwerpen/financien-gemeenten-en-provincies/inkomsten-gemeenten-en-provincies>.
- Safarov, I., Meijer, A., and Grimmelikhuijsen, S. (2017). Utilization of open government data: A systematic literature review of types, conditions, effects and users. *Information Polity*, 22(1):1–24. DOI: 10.3233/IP-160012.
- Schillemans, T. and Bjurstrøm, K. H. (2020). Trust and verification: Balancing agency and stewardship theory in the governance of agencies. *International Public Management Journal*, 23(5):650–676. DOI: 10.1080/10967494.2018.1553807.
- Sjoukema, J.-W., Bregt, A., and Crompvoets, J. (2017). Evolving spatial data infrastructures and the role of adaptive governance. *ISPRS International Journal of Geo-Information*, 6(8):254.
- Stedennetwerk G40 (2022). Werkprogramma G40. retrieved from <https://www.g40stedennetwerk.nl/pijler/g40>.
- Stichting Groene Hart (2021). Beleidsplan 2017-2020 Stichting Groene Hart. retrieved from <https://groenehart.info/wp-content/uploads/2018/10/Beleidsplan-SGH-2017-2021-versie-d.d.-21-3-2017.pdf>.
- The European Parliament and the Council of the European Union, (2013). Directive 2013/37/eu of the european parliament and the council of the european union of 26 june 2013 amending directive 2003/98/ec on the re-use of public sector information. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L1024&from=EN>.
- The European Parliament and the Council of the European Union (2019). Directive (eu) 2019/1024 of the european parliament and of the council of 20 june 2019 on open data and the re-use of public sector information (recast). <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L1024&from=EN>.

- Ubaldi, B. (2013). Open Government Data: Towards Empirical Analysis of Open Government Data Initiatives. <http://dx.doi.org/10.1787/5k46bj4f03s7-en>.
- Van Loenen, B. and Grothe, M. (2014). Inspire empowers re-use of public sector information. *International Journal of Spatial Data Infrastructures Research*, 9:96–106. DOI: 10.3390/ijgi6080254.
- Vancauwenberghe, G., Dessers, E., Crompvoets, J., and Vandenbroucke, D. (2014). Realizing data sharing: The role of spatial data infrastructures. In *Open Government*, pages 155–169. Springer.
- Vancauwenberghe, G., Valečkaitė, K., Van Loenen, B., and Donker, F. W. (2018). Assessing the Openness of Spatial Data Infrastructures (SDI): Towards a Map of Open SDI. *International Journal of Spatial Data Infrastructures Research*, 13:88–100. DOI: 2902/1725-0463.2018.13.art9.
- Vancauwenberghe, G. and van Loenen, B. (2018). Exploring the emergence of open spatial data infrastructures: analysis of recent developments and trends in europe. *User Centric E-Government*, pages 23–45.
- Vilminko-Heikkinen, R. and Pekkola, S. (2019). Changes in roles, responsibilities and ownership in organizing master data management. *International Journal of Information Management*, 47:76–87. <https://doi.org/10.1016/j.ijinfomgt.2018.12.017>.
- VNG (2020). Van open data naar samen data delen. https://vng.nl/sites/default/files/2020-12/vng_r_visie_open_data.pdf.
- VVV (2023). Welkom in Gouda. retrieved from <https://welkomingouda.nl/>.
- Welle Donker, F. (2018). Funding open data. In *Open Data Exposed*, pages 55–78. Springer.
- Welle Donker, F., Braggaar, R., and van Loenen, B. (2019). *Hergebruikers van open data in beeld: onderzoek iov Ministerie van Binnenlandse Zaken en Koninkrijksrelaties*. Kenniscentrum Open Data, TU Delft.
- Welle Donker, F. and Van Loenen, B. (2017). How to assess the success of the open data ecosystem? *International Journal of Digital Earth*, 10(3):284–306.
- Welle Donker, F., Vancauwenberghe, G., and van Loenen, B. (2018). *AMS E-GOS Governance modellen van open data bij gemeenten en de performantie van open data: AMS E-GOS Local Deliverable D4.2*. Kenniscentrum Open Data, TU Delft”.
- Zuiderwijk, A. and Janssen, M. (2014). Open data policies, their implementation and impact: A framework for comparison. *Government information quarterly*, 31(1):17–29.

Zuiderwijk, A., Volten, C., Kroesen, M., and Gill, M. (2018). Motivation perspectives on opening up municipality data: Does municipality size matter? *Information*, 9(11):267.