ENGAGING CITIES:

OVERCOMING THE BARRIERS TO CLIMATE ACTION

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Executive Summary

Individual cities around the world are gearing up to play a major role in the fight against climate change: adopting climate targets, ratifying sustainability plans, and actively campaigning for change. It has been shown that individual city commitments can play a major role in this effort, bridging up to 15% of the emissions gap – the 8-10GtCO_2e difference between current emissions and the maximum allowed emissions to prevent a temperature rise two degrees Celsius – as their climate programs are in many respects independent from national ones. However, while the membership of city networks continues to increase (Covenant of Mayors, Compact of Mayors, ICLEI, C40), concrete results – significant emissions reductions, lowering energy intensity, dramatic increases in renewable energy production – expected from cities committed to mitigating climate change are, currently, conspicuously absent.

While there are several good practice guides available for large/mega cities, when asking Dutch climate actors if local municipal governments could implement such plans the answer was, "no." The scale of action required was a common limitation cited, as well as governmental capacity and power available to implement large fundamental changes. This was also found in the literature that small- to medium-sized cities are typically overlooked when allotting resources and energy in favor of large urban centers. The limited literature on known good practices available to smaller urban centers (below 500,000 inhabitants) was a key element pursued in this study. As a result, I chose to examine climate action in Dutch municipalities with populations between 50,000-250,000 to codify good practices and provide a model for future climate actions and increase the overall rate of global climate mitigation. Both quantitative and qualitative indicators were gathered and analyzed to answer the main research question: What are good practices for Dutch SMCs and are there demonstrable effects linking them to climate targets?

The following sub-questions were used to guide the study:

1. What is the main role of municipal governments in local climate action?
2. What current good practices have been implemented by Dutch municipalities to achieve mitigation targets?
3. Are currently available monitoring data in the Netherlands sufficient to demonstrate good practice?
4. Are there other indicators which show progress towards achieving climate targets?

Case studies were conducted to determine what small- to medium- sized municipalities in the Netherlands can currently do to implement climate actions with meaningful environmental impacts. This approach was used because case studies allow an empirical inquiry into a current phenomenon within its real-life context. The population range, between 50,000 and 250,000, was selected based on lack of available literature discussing climate actions and good practices of small- to medium-sized cities. Specific cities were targeted to achieve a range of populations, municipal sizes, locations, and achieved 5-year emissions reductions within the Netherlands.

Following extensive interviews with climate actors and civil servants across the Netherlands, I compiled 13 case studies of Dutch municipalities leading to 26 good practices the outline of which can be seen in the table below. The overwhelming majority, 23 out of 26 good practices, exhibited the characteristics of governing by enabling in contrast with governance by authority, provision,

and self-governance. Additionally, throughout this study, all Dutch civil servants active in climate mitigation agreed that the role of the municipality was that of a facilitator, assisting other parties to implement climate actions and, collectively, achieving local climate targets. In the other modes of governance: authority, provision, and self-governance; the local authority would mandate sustainable change, provide sustainable services, or improve its own performance on climate respectively. This result shows that Dutch civil servants are focused on working with external parties, pushing their efforts, to jointly tackle the complexities of climate mitigation.

Good practices discussed in interviews with civil servants of Dutch municipalities

Public Engagement	**Energy Ambassadors** (Almere) **Energy Scans** (Almere) **Subsidy Schemes** (Almere) **Public Engagement** (Arnhem) **Wind Turbines: External Pressure** (Goeree-Overflakkee) **Energy Cafés: Public engagement** (Zaanstad)
Citizen-Led Energy Cooperatives	**Energy Cooperatives** (Eindhoven) **Energy Cooperatives** (Groningen) **Lisserbroek: Energy Cooperation** (Haarlemmermeer)
Municipal Actor Engagement	**How to engage Municipal Actors (**Almere) **Municipality: interdepartmental engagement** (Goeree-Overflakkee) **Engaging Municipal Actors: Redefining Role** (Nijmegen)
Company Consortia	**Creating a consortium of companies (**Arnhem) **Bosch Energy Covenant: Organization of Companies** (Den Bosch) **Heating without gas** (Eindhoven) **Company energy coalition** (Groningen) **Helmondse Energy Community** (Helmond) **Business involvement: Project teams** (Leeuwarden) **Platform COOL** (Maastricht) **Nijmegen Energy Covenant** (Nijmegen) **Company Energy Consortium** (Zaanstad)
Project Creation	**Sustainable Transport** (Amstelveen) **EnergyNul73 Homes: Zero Energy Homes** (Den Bosch) **MeerMaker: Municipal Company** (Haarlemmermeer) **Housing Organization** (Leeuwarden) **Large Wind Turbines: Engaging the public** (Nijmegen)

While enabling poses difficulties when monitoring the impact of such actions – it has yet to be shown if enabling as a governmental strategy leads to emissions reductions – I was encouraged to find the number of consortia which had been formed in interviewed municipalities. Several of the company consortia required members, typically large energy consumers, to commit to annual emissions reductions. This along with the consistent increase in energy cooperatives as well as the extent of their projects within the Netherlands, highlights that businesses and private citizens are willing and are currently investing directly in climate mitigation projects.

Despite the breadth of indicators gathered, little correlation was able to be found which would indicate good practice. In fact, other than the modest emissions reductions found in the Klimaatmonitor, it was difficult to find links to progress climate actions and achieving local climate targets. Given the limitations found in monitoring data, my main recommendation for further study is to research descriptive indicators which could be used to more easily monitor project implementation. Rather than monitoring emissions, if clear quantitative metrics could be compiled per project, then a base-level understanding could be built around what a municipality is accomplishing on a project level. This would also reduce the economic burden in FTE and budget of monitoring emissions reductions directly.

The goal of this study was to find and describe climate actions which could then be replicated to spur climate action within the Netherlands. It was all too common to learn that local climate actors worked in isolation from as opposed to in collaboration with other external municipalities. And, if good practices could be shown, then perhaps this redundancy in effort could be removed. Ideally, I was looking for solutions, clear actions which, if implemented, would have an immediate effect on local CO_2e emissions. However, I was unable to directly link the actions I found in this study to achieving such targets. This is not to say that the work being done in municipalities is ineffective but that I cannot show to what extent such projects impact climate mitigation.

There are several actions which I would recommend all civil servants take which could build capacity for future action and, potentially, have immediate impact on local emissions. The first of which is to enforce the environmental protection act; this is one instance where individual municipalities have the power to enact meaningful change, and, in some cases, businesses will support this measure as they want, but cannot afford to alone, enact meaningful change to their organizations. Second, identify and write detailed plans specifically for areas where the municipal decision will lock-in emissions and future practices (heating, transport, etc.). Here, plans are required because once on the path towards district heating over electric boilers or vice versa, those systems are locked in and returns can be substantial. However, since the overall investments will be high, a thorough plan will be required to link the short-term actions to the long-term goals. Finally, create and maintain a record of citizens, companies, and initiatives within the municipality interested in climate action. When a citizen, cooperative, or corporation calls the municipality asking what they can participate in, ask for their contact information so you can connect them and easily facilitate their activities and support initiatives when asked.

Acknowledgements

This study would not have been possible without the civil servants and other climate actors who generously made time in their overloaded schedules to give me an interview. Thank you for your time and your tireless work. For those I interviewed working on climate adaptation in particular, thank you so much for your time, and I apologize that this study does not include your work – it was invaluable for me to learn, but I was unable to fit every piece I wanted into my completed study.

Also, I would like to thank Ecofys, in particular Juriaan van Tilburg and Sigrid Lindner, and to the Fulbright Center and for their support throughout my work in the Netherlands.

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1 Introduction

This study was initiated to search if it be possible to provide "plug and play" climate action plans for municipalities across the world. Initially, such a scheme seemed a real possibility given the relative consistency of city climate strategies, targets, and "low hanging fruit" shared by several municipalities. However, upon diving deeper into the literature and interviewing industry experts, it became clear not only that the situation within each municipality was far more unique than originally expected (Reckien, Flacke et al. 2013) but also that there was little understanding or evidence about what cities both in The Netherlands and globally were actually accomplishing (Brooks 2017). While the membership of city networks continues to increase (Covenant of Mayors, Compact of Mayors, ICLEI, C40) (UNEP 2015), concrete results – significant emissions reductions, lowering energy intensity, dramatic increases in renewable energy production – expected from cities committed to mitigating climate change are conspicuously absent (Brooks 2017). The question then became, where are those data, what concrete effects can we show which have originated from cities, and what actions can be successfully taken by municipal-level governments that will have a meaningful impact on emissions?

1.1 Why cities?

The Paris climate agreement was an international signal that both climate mitigation and adaptation were crucial political aspirations. Nearly every national government signed the agreement pledging to work towards a sustainable future. This landmark agreement was felt across the world: news organizations, blogs, and social media exploded with an outpouring of support. However, pledging support, signing an agreement, or publishing a local climate document is a far cry from implementing meaningful climate action. Such pledges must be broken down into concrete actions, with clear plans for each step of their implementation; then, of course, those plans must be put into action. The question remains, however, who will oversee this process and how, given the complexity of the problems facing global climate action, can a sustainable future be ensured?

Despite the pomp and circumstance associated with the Paris agreement, even the full implementation of all climate commitments are not sufficient to limit the global temperature increase to 2^{o} (UNEP 2016). Regardless of the recent climate commitments, the current projected emissions gap in 2020, the difference between the theoretically allowed emissions to prevent catastrophic climate change and actual emissions, has remained relatively unchanged (UNEP 2015). The stasis of the emissions gap demonstrates the necessity of alternative approaches to climate action outside of international and national commitments. One promising approach to bridge the emissions gap are actions taken by non-state initiatives: cities, regions, companies, NGOs, etc. While there is some overlap between such actors and current actions, there is still a significant portion of untapped potential for emissions reduction. Out of such initiatives, cities were reported to have the highest total committed emissions reduction (UNEP 2015).

As of 2014, over 54% of the world's population was living in urban centers and, and, by 2050, this percentage is expected to grow to roughly 66% (DESA 2015). In Europe, this percentage is even greater with 78% of residents living in urban areas in 2012 (Mabey 2015). While reports differ, it has been estimated that cities are directly responsible for between 30% - 80% of the total global emissions (Krause 2011). Regardless of where the "true" percentage falls, cities are and will remain one of the principal sources of GHG emissions. Furthermore, as the climate continues to

change, cities in particular will become more vulnerable to the adverse effects (Hoppe, van der Vegt et al. 2016).

Since cities are major sources of anthropogenic emissions, there are key advantages for climate action to originate from local governments. First, local governments have the greatest contact with citizens, and it is on this local level where climate actions are taken (Hoppe, van der Vegt et al. 2016): building renovations, changes in heating practices and power grids, and construction of renewable power plants all occur within municipal boundaries. These actions all have local spatial implications affecting citizens, businesses, and authorities as well as local regulation of transportation, construction, spatial planning, and the economy. Each aspect of implementation is crucial and must be considered to ensure initial and continued success of climate actions (Hoppe, van den Berg et al. 2014). Given the outpouring of support for the Paris agreement, citizens must be given the opportunity to engage in climate action directly, which can be more effective if facilitated by local governments. Furthermore, as hotspots for climate action, cities can innovate and pilot processes which could then be more broadly implemented if proven effective (WWF 2015, Hoppe, van der Vegt et al. 2016).

1.2 Problem Definition

Over half the global population is currently living in an urban center (DESA 2015), encompassing a vast range of populations, densities, budgets, capacities, and barriers to climate action. C40, a global coalition of the largest cities in the world has published a number of good practice guides, detailing processes from District Energy to Bus Rapid Transit, including case studies of cities which have implemented such schemes. However, these implementation practices may require far greater capacities, political sway, and budgets than are available to smaller urban centers. Indeed, it was found in the literature review that there is a significant lack of understanding of the role of small- to medium-sized cities (SMCs) in the energy transition (Hoppe, van der Vegt et al. 2016). While the Covenant of Mayors (CoM) has published a number of "Benchmark[s] of Excellence" which state actions taken by their member cities across the world, these are not a codification of good practices to implemented within the boundaries of other signatories: they contain no guide to implementation nor budget required and are merely a statement that such an action has been taken without significant further explanation.

Current research emphasizes the role of large and megacities, capitalizing on their visibility and emphasizing their role as frontrunners in climate and sustainability while deemphasizing or ignoring the role of SMCs (Hoppe, van der Vegt et al. 2016). Though a significant percentage of the world population lives in urban centers, only around 12% of the urban population live in megacities, urban areas with greater than 10 million inhabitants and around 41% living in cities with more than 1 million. However, it has been estimated that up to 50% of the global urban population lives in cities with *fewer* than 500,000 people (DESA 2016). So, not only are cities responsible for a large percentage of global emissions, up to 80%, but also those cities which are seldom the priority are home to the majority of the Earth's urban population. As a result, examining climate action in SMCs to codify good practices could provide a model for future actions and increase the overall rate of global climate mitigation.

In order to implement climate actions, city and municipal governments must have the capacity, resources, and political will do so (Bulkeley and Betsill 2005). However, it has been shown that

only in larger or capital cities are these requirements fulfilled when broader support for climate actions are limited (Reckien, Flacke et al. 2015). The availability of resources between a large or capital city can be stark, regardless of the size difference as can be seen when comparing the total and environmental budgets of Amsterdam, the capital of the Netherlands, and the municipality of Groningen. Amsterdam, with a population of 847,176, not by any means a megacity, had a total budget of €5.5 billion and an environmental budget of €75 million in 2016. Groningen, a city of 201,860, in the same year had a total budget of €989 million and an environmental budget of €2.3 million (Openspending 2017). While it has just over four times the population, Amsterdam has an annual budget nearly six times greater and an environmental budget nearly 33 times greater than that of Groningen

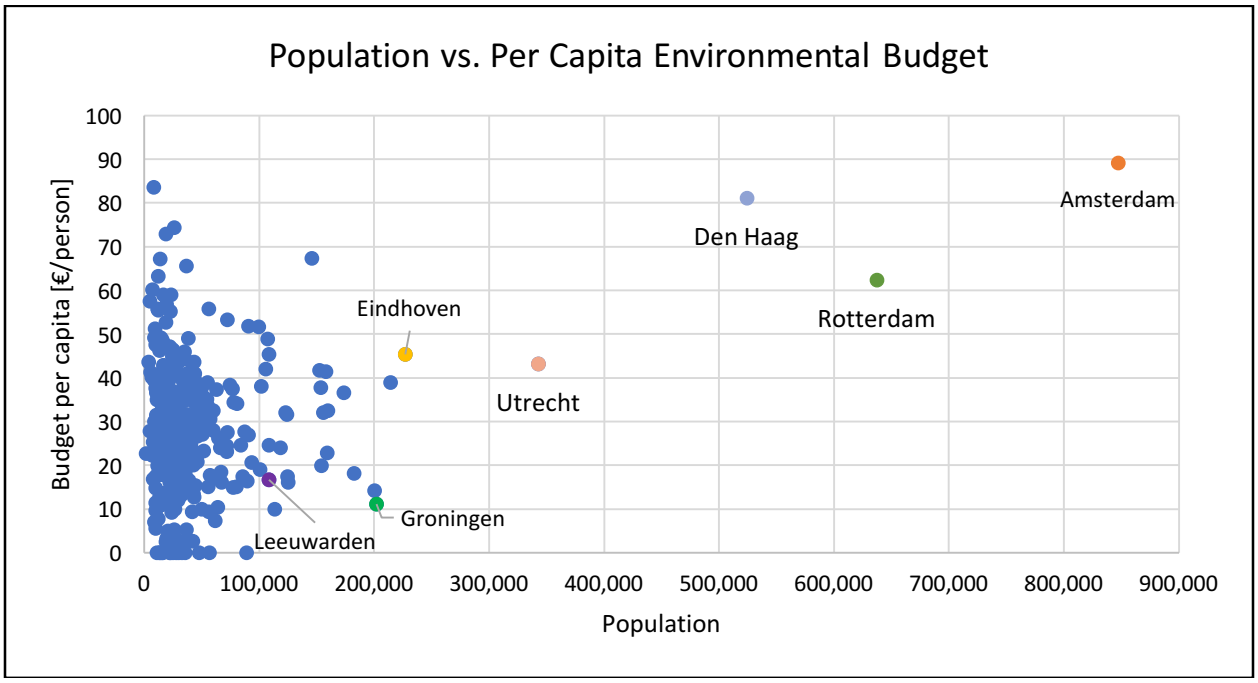


Figure 1: Population vs. Per Capita Environmental Budget for Dutch Municipalities which excludes budgeting for: public health care, youth health care, waste disposal and treatment, sewerage, and funeral services

As can be seen in Figure 1, nearly all Dutch municipalities are small- to medium-sized, with the majority with a population of well below 100,000. In addition, very few of the smaller municipalities have an environmental budget per capita which even approaches that seen from the largest three in the Netherlands: Amsterdam, Rotterdam, and Den Haag. From this figure, it is clear that economic resources per capita which can be brought to bear on the environment can be vastly disproportionate to the population. This disparity further emphasizes the need to explore and what good practices for the implementation of climate actions in SMCs exist to maximize the impact of their actions given their (more limited) budgets.

Codifying good practice requires the availability of accurate and up-to-date monitoring reports of climate actions, the lack of which was a crucial piece of why this study was conducted. Without such information, it is impossible to weigh climate actions against each other and to build a scale from which good practices could be derived. At the onset of this research, the CoM was used as a critical resource to understand city climate action. Their huge member base – over 7,500 signatories as of June, 2017 – as well as their database of action plans[1], targets, and monitoring

1: Covenant of Mayors website (http://www.covenantofmayors.eu) surveyed 4th April, 2017

data seemed to be concrete evidence that cities were taking the lead on achieving global climate targets.

According to the JRC, those cities which have submitted monitoring reports to the CoM have achieved an average of a 28% per capita decrease in emissions as of 2015 when comparing monitoring to baseline reports (Kona A 2016). This far outstrips the 20% target for 2020 set by the European Commission and the 20% reduction pledge required when becoming a CoM signatory (JRC 2017). However, the 28% per capita reduction is based on only 122 cities which had submitted a full monitoring report, representing only 3% of the total cities with submitted action plans. Additionally, a short survey of current published monitoring reports showed that while as of April 2017 the website claims to house 1239 monitoring reports, I was only able to find 521 cities for which a report had been published after their baseline year submission (Table 1 below). The Covenant of Mayors was repeatedly contacted to discuss these findings but did not respond to my emails.

Table 1: Number of monitoring reports submitted by cities which have a registered report on the Covenant of Mayors website (CoM 2017)

Number of Monitoring Reports	
Number of monitoring Reports	**Number of Cities**
0	718
1	403
2	92
3	12
4	6
5	6
6	1
10	1
Grand Total	**1239**

Independent of this brief survey, it has been found that high-profile networks may lead to symbolic programs as opposed to concrete policy change and climate mitigation actions (Giest 2013) as well as the lack of transparency found in such networks due to privacy agreements (Climategroundswell 2017). This is merely an illustrative example of the lack of available institutional monitoring. In order to address this, national monitoring efforts will be analyzed in this study including the discussion of several indicators to attempt to address and further understand the current lack of transparency in climate mitigation in the Netherlands.

1.3 Research Objectives

A significant number of studies have been written outlining the barriers to climate action in cities. While it is important to understand where and how the implementation process stalls, more is required to change the current process: solutions. The first portion of this work will be dedicated to assessing the present state climate actions in SMCs in the Netherlands and, then, to study how it could be improved – in particular, the available criteria from which good practices could possibly

be derived. Building upon this, I then recorded and catalogued implemented and planned local climate actions to construct examples of good practice from Dutch municipalities which could be spread across the country to spur climate actions using known actions to more efficiently achieve climate targets. The driving question behind this research: What are good practices for Dutch SMCs and are there demonstrable effects linking them to achieving climate targets?

The following sub-questions (RQs) were used to guide the study:

1. What is the main role of municipal governments in local climate action?
2. What current good practices have been implemented by Dutch municipalities to achieve mitigation targets?
3. Are currently available monitoring data in the Netherlands sufficient to demonstrate good practice?
4. Are there other indicators which show progress towards achieving climate targets?

1.4 Research Approach

This study focuses on the implementation of climate actions; in particular, how small- to medium-sized municipalities (SMCs) within the Netherlands can have a significant impact on CO_2 emissions – specifically, municipalities with populations between 50,000 and 250,000. The Netherlands is an ideal location to conduct such a study. Nearly all Dutch municipalities have published concrete climate targets stating their individual goals and strategies to become climate neutral, typically by 2050 (Interview: Senior adviseur RWS Lokaal Klimaatbeleid, 11-1-2017). Additionally, nearly half of all the municipalities belong to the Klimaatverbond, an organization which began in 1992 focusing on sustainability, renewable energy, and climate. Finally, this study could not have been performed if there weren't incredible sources of data detailing emissions, energy intensity, and renewable energy in the Netherlands freely available from the Klimaatmonitor (Rijkswaterstaat 2017). This database is an unparalleled source, far outstripping any other that had been found when researching this study, and merits intense investigation in the future.

In order to answer the research questions, both quantitative and qualitative sources of data were required. Chapter 2 will outline the current understanding of RQ1 in the literature, which will then be expanded upon in Chapter 5. The main body of quantitative data was found mainly through the Klimaatmonitor, a website which catalogues a vast number of indicators of climate action within the Netherlands. In addition, municipal action plans, expert interviews, and other online data sources were used. Descriptive statistical analysis was then performed on these data in order to understand their implications and the overall impact of climate actions and support those claims made from qualitative indicators answering RQ 3 & 4. Examples of good practice were gathered primarily from expert interviews as well as municipal climate documents; the resulting analysis will answer RQ 2. For more information on the research approach, see Chapter 3: Methods.

1.5 Report Structure

This thesis was structured first with the problem statement followed by the theoretical background to this research in Chapter 2. This chapter outlines the current accepted background to this research, providing a base from which this study was constructed. Following this is the operationalization of the theory in Chapter 3: Methodology. Included in this chapter are the research methods, case selection, data collection, methods for data analysis, and limitations.

Chapter 4 provides in-depth case studies of 14 municipalities surveyed municipalities, and the methods found in Chapter 3 are then applied to these results in Chapter 5: Analysis. Chapters 6&7 the Discussion and Conclusion reflect upon these findings, placing them in both an actionable context for climate actors and positioning the results in the current body of literature.

2 Theoretical Framework

The Theoretical framework is divided into five sections, each focusing on the currently accepted theories and/or practices relevant to one critical aspect of this study. Given the breadth of papers available on climate action, this chapter is not comprehensive, but is, rather, a critical representation of what information exists and will begin to show why this study was necessary.

2.1 Current State of City Progress & Focus in Literature

While regional and national actors may have the ability to enact broad-sweeping legislations with regards to climate change, the focus of climate actions must include cities. Urban development will determine a nation's ability to deliver low-carbon services to citizens: current and future planning and construction decisions will lock in emissions, governing a city's ability to pursue a sustainable future (Corfee-Morlot, Kamal-Chaoui et al. 2009). Cities have a vast potential to affect climate change and to chip away at the relatively unchanged gap between global commitments and required emissions reductions, currently between 8-10 $GtCO_2e$ for the year 2020 (UNEP 2015). While studies vary on the independent contribution of cities to emissions reductions, cities are consistently seen as a major partner in closing this gap. The UNEP 2015 report suggests that members of three large city initiatives (Covenant of Mayors, C40, and ICLEI) correcting for the overlap between them have committed to a further emissions reduction of 1.08 $GtCO_2e$ by 2020 (UNEP 2015). Additionally, a study by Erickson et al. (2014) suggests that urban mitigation actions which city governments have the power to undertake could contribute up to 15% of the total emissions reductions required to prevent a global temperature increase greater than 2°C.

Climate actions from cities typically fall under the egis of local governments existing legislative and administrative power bases: health, water, waste management, urban planning, and transport (Bulkeley 2006). Given such accessible expertise, it is possible that mitigation actions in these sectors could be more easily addressed; however, local governments do not necessarily have a mandate to address climate change or sustainability (Deng-Beck C.; van Staden 2015). In order to spur progress, local regulators will be required to deploy a variety of strategies to deliver the required emissions reductions, far more than simply setting ambitious targets (Blok 2015). Since national pledges and plans suggest strategies which can be implemented across various economic sectors, in particular electricity production and industry, they seldom overlap with city and local-level actions. As a result, city climate actions can be considered additional to national commitments (Erickson 2014).

The need for city climate action has become broadly accepted, but the role local governments will play in defining the scope and focus of such actions remains somewhat undefined (Broekhoff 2015). According to the Broekhoff study, cities are critical implementers of national policies and should focus their energy on implementing higher-level policies effectively on a local level. Such an approach could avoid piecemeal adoption, leading to jurisdiction shopping by actors seeking to avoid higher environmental standards. An added benefit of widespread adoption of new technologies is the potential for lower cost for consumers.

Alternatively, given local governments' connection to private citizens, civil servants have the distinct ability to be policy innovators, testing new practices and building capacity for national climate action while generating their own, independent emissions reductions (Chan 2015). Regardless of their defined role, given their ability to implement climate actions, national

governments and the international bodies should foster local climate action, either as a means to more successfully implement national policy or to more successfully innovate and advance future capabilities (Bulkeley 2013). Such pursuits could be better facilitated if the international community established more effective frameworks for supporting and coordinating local climate action (Chan 2015). Regardless of the main role cities will take in the future, their ability to innovate on a local level could foster an entrepreneurial environment allowing broad dissemination of successful innovations (Corfee-Morlot, Kamal-Chaoui et al. 2009).

While it appears that cities have both a high potential to impact emissions reductions and certain established areas where local actions can occur, monitoring reports and evaluations of implemented climate actions are scarce (Brooks 2017). According to Brooks, cities have done little which has directly contributed to the recent decline in emissions intensity. Additionally, upon examining 40 action plans in the US, it was found that while those documents exhibit awareness of mitigation potential, they have limited actionable approaches for implementation (Heidrich, Reckien et al. 2016). A similar result was found in The Netherlands, including low-carbon strategies targeting city districts and neighborhoods (Hoppe 2009).While this could be due to the lack of long-term perspective, as policy agendas typically plan only for a few years, the fact remains that cities typically focus on short-term solutions and co-benefits (e.g. jobs) as opposed to working towards achieving long-term climate targets (EEA 2016). With such limitations, even if cities have political will and resources available to act, it is crucial for policymakers to ask the question how they can best to achieve their city's mitigation potential (Broekhoff 2015).

2.2 Definition and Conceptualization of Climate Action

The process from which climate policy and actions are developed is characterized by four distinct pieces: input, throughput, output, and outcome. Input refers to the resources required (personnel, FTE, budget), throughput those activities necessary to implement services or schemes, output, actions taken, products, or services of the performing organization, and outcome, the direct or indirect effects of those actions taken (kplusv 2015, Hoppe, van der Vegt et al. 2016). Within this scheme, input and throughput are those pieces which lead to climate actions (output), and outcome is the effects of those actions taken. This study will primarily focus on output and outcome, or climate actions taken by municipalities and their measurable effects using those input and throughput indicators which could be gathered to further illuminate how such actions were implemented.

The variety of frameworks for output or climate actions obscures a researcher's ability to quantify what an organization has actually implemented to achieve meaningful emissions reduction. The Five Milestone framework (WWF 2015) classifies five major action types: GHG inventory, quantifying reduction targets, action plan development, plan implementation, and monitoring. While these five types combine to create an action plan, only one "action type" in this framework directly or indirectly leads to emissions reduction, "plan implementation." In addition, the framework lacks clear guidelines for just what pieces of information a planned action should include – in particular, I found that seldom did any plan clearly answer the question "how?" with reference to implementation. City actions are further defined as a broad range of programs to help meet emissions targets from energy plans to technical assistance (Broekhoff 2015).

The definition which will be used for this study, however, is that defined by the Carbon Climate Registry. "Actions include a diversity of measures that are planned, implemented and monitored, for example strategy, action plan or policy; regulation; technical or infrastructure; fiscal or financial mechanism; stakeholder engagement, etc..– addressing mitigation and/or adaptation. Each action is also defined in terms of its status of implementation and financing (Deng-Beck C.; van Staden 2015)." This study will focus explicitly on climate mitigation actions. Further expanding upon this definition is the explicit understanding that climate actions are measures or initiatives cities take to mitigate the effects of climate change (e.g. achieve emissions reductions) (C40&ARUP 2015). A climate "Action Plan" or "Climate Program" as used in this study, is a document which codifies municipal climate mitigation actions – to the extent of the definition above – which in total are projected to achieve emissions reduction targets.

2.3 Theory of Change

There are several areas where municipal governments may have an advantage in the processes surrounding the implementation of climate actions: project design, development, implementation, enforcement, and monitoring (Rodrigo 2009). According to a publication from Climategroundswell in 2017, there are three mechanisms through which local climate actions can arise:

1. "Sub/non-state climate actions contribute directly to climate mitigation and adaptation, and mobilize resources for both.
2. Sub/non-state climate action boosts the confidence, resources, and political will of governments to raise their own ambition, strengthening the Paris process.
3. Sub/non-state climate action drives change in technological and economic systems."

Coupled with a firm definition of climate actions, it is critical to have an understanding of the origin of local climate actions, and from which areas within the municipality actions can be developed. As such, this study will focus on the first mechanism listed by Climategroundswell: "Sub/non-state climate actions contribute directly to climate mitigation and adaptation, and mobilize resources for both."

The latter mechanisms, boosting confidence/resources/political will and driving technological and economic change, were considered out of the scope of this study. Since cities have been shown to have a vast yet untapped potential for achieving GHGe reductions Section 2.2, the focus of this study was on what concrete actions, if any, could be implemented at a local level to achieve local climate targets. While mechanisms 2 and 3 could lead and are related to local climate actions, they do not, directly cause GHGe emissions reductions.

Building on several studies of climate actions and policy implementation, Hoppe et al. (2016) developed an analytical framework through which municipal climate actions can be evaluated, broadly delineating their origin from within the municipality (see Figure 2 below).

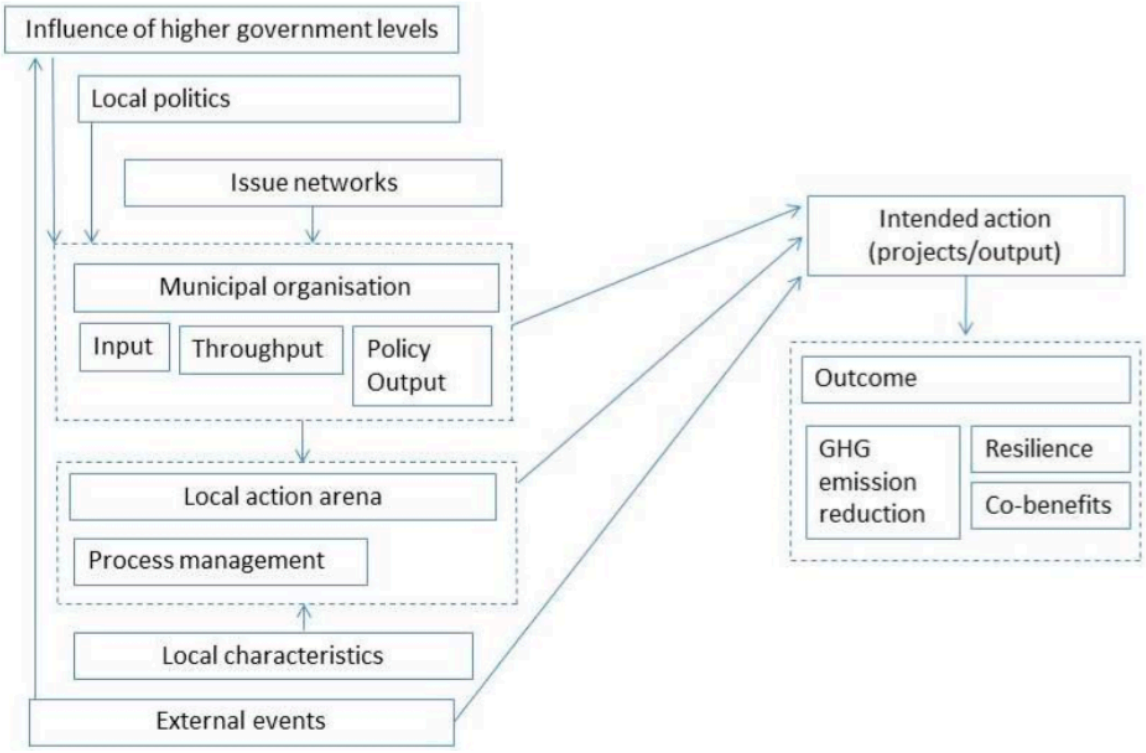


Figure 2: Analytical framework on factors influencing local climate action (Hoppe, van der Vegt et al. 2016)

This current study is focused primarily on climate actions which could lead to good practices, and, as such, will focus on those arenas out of which local climate actions can be taken: what can occur as a result of work from the municipal organization as well as those results from the local action arena. While issue networks (e.g., the Covenant of Mayors, C40, cCN) can have been found to have a positive effect on municipal climate action (Bulkeley 2006), their efforts are considered out of the scope of this study.

While the municipal organization block is relatively self-explanatory and can be found in (Hoppe, van der Vegt et al. 2016), the local government, the local action arena and local characteristics require further explanation. The local environment refers to the demographic characteristics of citizens as well as the presence and involvement of environmental groups and NGOs. It was seen that such factors can have a direct effect on political support and thus, climate change policy (Zahran, Brody et al. 2008, Lubell, Feiock et al. 2009, Krause 2011, Bedsworth and Hanak 2013). However, their effects were seen limited to influencing the local action arena as opposed to possessing the ability to directly undertake climate actions themselves (Hoppe, van der Vegt et al. 2016). The local action arena was defined as the interface between the local government and other local climate actors. It is within this area where partnerships are formed between local citizens, environmental groups, industry, and the municipal government. Through such partnerships, climate actions can be made to take steps towards achieving their climate targets/desired outcomes (Bulkeley 2013, Hoppe, van den Berg et al. 2014). It has been seen as well that civic engagement is a crucial challenge when implementing climate actions in cities (Bulkeley 2013).

2.4 Governance Styles

Given the unique position and contact municipal governments have with local citizens and businesses, they are ideally placed to tailor climate actions to their respective locations and avoid unnecessary locking in of emissions (Corfee-Morlot, Kamal-Chaoui et al. 2009, UNEP 2011). However, there are several approaches available to local governments to work towards their emissions targets. Furthermore, given that SMCs frequently claim to have few resources to implement climate action, choosing appropriate methods is critical to achieving climate targets (EEA 2016). In their 2006 publication, Bulkeley and Kern (Bulkeley 2006) outlined four governance styles employed by local governments to achieve climate targets: (1) Governing by authority (the municipality as regulator, enacting regulations to control other actors, strategic and urban planning, guidance); (2) Self-governing (the municipality implementing climate actions themselves, limiting the ecological footprint of municipal stock); (3) Governing by provision (the municipality providing sustainable services – water, electricity, public housing, transport, etc.); (4) Governing by enabling (the municipality as facilitator such as enacting subsidies, loan schemes, distributing information, coordinating climate actions among other actors, and establishing public-private partnerships). While all forms of action are likely to be employed, identifying trends and the use of specific governance styles to implement certain actions could be a key spreading effective climate actions.

Several studies have been conducted to identify the prevailing mode(s) of governance used to enact climate actions; however, a consensus has yet to be reached. In their 2006 paper which outlined the four basic governance styles, Kern and Bulkeley identified that authority and provision failed to prioritize climate protection, suggesting that enabling was developing as the core method used to enact successful climate policy, noting that this represented a key shift in local governance and could pose difficulties as a result (Bulkeley 2006). A further study by Giest found that self-governing and enabling were the most prevalent in climate actions in Europe, indicating that through these governance styles, municipalities were afforded great discretion and decision making power (Giest 2013). In a study of 627 climate experiments in 100 global cities, Castan Broto and Bulkeley found enabling to be second to provision in prevalence: number of actions taken (Castan Broto and Bulkeley 2013). However, a study of four Dutch municipalities by Hoppe et al in 2016 found that self-governing and authority were most used by local governments, stating that enabling was hardly used as a governance strategy used to enact climate actions and was seen by many city officials as merely ornamentation as opposed to a real strategy to achieve climate targets (Hoppe, van der Vegt et al. 2016).

Direct local action is required to decrease the emissions gap, and the appropriate local approach to climate action is critical to achieving the maximum city mitigation potential (Corfee-Morlot, Kamal-Chaoui et al. 2009, EEA 2016). Municipalities can, however, be supported by national governments: The BANS (Bestuursakkoord Nieuwe Stijl) scheme which encouraged local governments to develop climate policies; SLOK, a program dedicated to perpetuating the implementation of climate initiatives (Hoppe, van den Berg et al. 2014); LKA, a program through which resulted in over 10,000 actions being taken in The Netherlands (kplusv 2015). Such programs can encourage capacity building as well as increase collaboration and the dissemination of critical information to local policy makers (Hoppe, van den Berg et al. 2014).

Despite the existence of national programs focusing on local climate action, there remains a lack of knowledge on good or best practices/actions for local governments. As such, further exploration is necessary to build a consensus on the appropriate governance styles for specific climate actions, or, alternatively, the codification of good practices or strategies to implement similar climate actions using diverse governance methods. However, without coordination between local climate actors, it is unlikely that local governments will deliver on their potential to close the emissions gap (Climategroundswell 2017).

2.5 In Search of Good and Best Practices in Local Climate Action

Defining good or best practice for climate actions is difficult because, though there are many cities which claim to be climate leaders with examples of successful actions (Castan Broto and Bulkeley 2013), the local contextual differences among cities prevent the codification of action architypes (Olazabal M.; Hurtado S.D.G.; Olazabal 2014). Additionally, amongst reviewed cases, the co-benefits and non-climate benefits of climate actions were found to have between 50-350% of Net Present Value of the direct total benefits (Ürge-Vorsatz, Herrero et al. 2014), emphasizing that the local context not only is crucial for the municipality's ability to implement but also the majority of an action's effect. Furthermore, it was found that implemented climate actions may be selected based on their ease/timeframe of implementation rather than their ability to produce effective mitigation results as long-term goals and proposals are not yet fully integrated into urban development plans (Corfee-Morlot, Kamal-Chaoui et al. 2009). While action planning is seen as a key aspect of local climate action (C40&ARUP 2015), it was also found that policymakers should redirect their focus towards the implementation of specific programs as opposed to on creating city-level plans as little correlation was found between drafting a climate plan and achieving emissions reductions (Millard-Ball 2012).

Compounding these difficulties, local climate policy is a growing field, and attention is generally skewed towards large/mega cities in Western countries, despite that the majority of urban citizens live in areas with fewer than 500,000 people (Hoppe, van der Vegt et al. 2016). Criticized for their small size, uncertain power over decision making (Corfee-Morlot, Kamal-Chaoui et al. 2009), and limited capacity, SMCs are easily overlooked when considering good practices for climate actions. However, even if such policies be enacted, there is a possibility of emissions generating activities hopping from the regulated to a nearby, unregulated locale, diminishing the measurable effect of such a practice (Krause 2011).

While there may be little literature available on good practices for SMCs, C40 has published eleven guides for good practices demonstrated in their cities (http://www.c40.org/other/good_practice_guides). Each document is specific to a particular area in which cities will implement climate actions. However, despite their existence, in only two of the eleven is there any standard mentioned by which a "good practice" was assessed; both were for transport practices and independently provided scoring systems but did not list the scores achieved by the "good practices" listed. As a result, it appears that good practice was assigned to actions which were taken and achieved some emissions reduction. Without a list of good practices and a scale used to assess them, no "Best Practice" cannot be claimed.

2.5.1 Lack of available monitoring and its effect on defining good practice

In order to demonstrate good practice some form of monitoring must be regularly completed to show the effects of the implementation of projects and action plans. However, such regular project- or city-level data is seldom available, even from major cities hailed to be at the forefront of climate action (Brooks 2017). This lack of quantitative data is a major barrier to analyze strategies and could explain the prevalence of case-study research used to analyze urban climate action (Millard-Ball 2012). Indeed, in an analysis of over 10,000 energy and climate actions undertaken by the Lokale Klimaatagenda (LKA), it could only be stated "qualitatively" that they had a positive effect (kplusv 2015). Without accurate, up-to-date data, quantitative analysis of climate actions is severely inhibited, limiting a researcher's ability to definitively codify a good practice. While it does appear that the capacity for climate actions has increased in recent years, there is little evidence that this has also been coupled with an increase in goal attainment (Hoppe, van der Vegt et al. 2016).

Despite the prevalence of global city networks focus on climate action (C40, Covenant of Mayors, ICLEI), each has implemented a unique system for monitoring limiting one's ability to compare progress between cities (Climategroundswell 2017). According to the Intergovernmental Panel on Climate Change (IPCC), no comprehensive, consistent data set exists for urban emissions (Seto 2014), and I was able to find no database or collection of consistent monitoring reports on action impacts throughout this study. Since such data sets are not able to be directly compared, analyzing the overall impact of city climate action becomes increasingly difficult. Furthermore, while some data is available to the public, analysts seeking to use it in aggregate must "scrape" it from the websites due to limited sharing and privacy agreements (Climategroundswell 2017). Such a lack of transparency from global climate networks not only limits one's ability to show the effects of climate actions but also reduces the level of trust in their published results (see Section 1.2). As a result, published good practices or project successes must also fall under greater scrutiny as their quantitative effects on emissions reductions cannot be confirmed.

Given the lack of available quantitative data, other indicators are increasingly used, such as the existence of action plans, network memberships, and the total extent/number of actions taken to show progress (Reckien, Flacke et al. 2015). However, while action planning has been used as such an indicator there is little robust evidence that such plans lead to its implementation or the success of those climate actions described (Millard-Ball 2012, Reckien, Flacke et al. 2015). Furthermore, in an analysis of city action plans, it was found that the climate plans weakest points are, universally, actionable components and the documents on the whole are inadequate to achieve their emissions targets (Krause 2011).

Such deficiencies in both data collection and action planning have led to an inadequate pursuit of good practices. Given the near-universal quality of this phenomenon, it is possible that there be a political reason or otherwise maintaining the relative inaccessibility of available project monitoring. As a result, city climate actions stated to be a good practice will be accepted as such. Quantitative and qualitative indicators will be collected to analyze the effect of such actions in this study, and any limitations in my findings will be described in detail.

3 Research Methodology:

This chapter is divided into sections to highlight the critical features of how the study was approached, which techniques were used, and how data were collected and processed. The study began by interviewing a number of climate actors within Ecofys, an energy consultancy in the Netherlands, to build a knowledge base on current climate action as well as a network from which civil servants could be contacted. Following these discussions, 20 interviews of civil servants at municipalities were conducted, 18 of which in the Netherlands, leading to 14 case studies. Two surveys were conducted internationally to test, albeit briefly, if any observations found in The Netherlands were similar to those found elsewhere. This was done to test if further study were necessary to probe to what depth such similarities, if found, existed (e.g. if local climate mitigation action in The Netherlands was distinctly different from other European countries or if obvious similarities exist). Each municipality was studied in-depth to the extent time allowed to give context to and clearly describe relevant phenomena to local climate actions taken within those municipalities both quantitatively and qualitatively based not only on concrete emissions indicators but also on anecdotal evidence from climate actors working within each location.

3.1 Definition of Good Practice

As discussed in Section 2.5, there is a lack of available criteria designating good practices found in city climate action. As a result, a good practice will be defined as an action, implemented by a city or municipal government that has been stated in my interview to be a success and potentially replicable in another location. Success will be considered when an action is expected to directly or indirectly lead to a reduction in emissions / energy intensity or to an increase in renewable energy production as described by municipal climate actors. In this study, I will attempt to also use a series of both quantitative and qualitative indicators to evaluate those climate actions asserted by civil servants to have been successful. Further explanation can be found in Sections 3.3.1 and 3.3.2.

3.2 Case Studies

Case studies were conducted to determine what small- to medium- sized municipalities in the Netherlands can currently do to implement climate actions with meaningful environmental impacts. This approach was used because case studies allow an empirical inquiry into a current phenomenon within its real-life context (Yin 2003). Furthermore, the investigation of local climate actions falls directly into the technical definition of a case study:

- "Copes with the technically distinctive situation in which there will be many more variables of interest than data points, as one result
- Relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result
- Benefits from the prior development of theoretical propositions to guide data collection and analysis (Yin 2003)."

Such an approach suits the challenge of addressing the 'wicked problem' of taking climate actions and implementing sustainability policy (Rittel and Webber 1973). A wicked problem is defined as one which is "difficult or impossible to solve due to incomplete, contradictory, or changing requirements (Commission 2012)" (Wikipedia 2017). Case study research is ideal to address such problems as multiple sources of evidence are critical to gain any reasonable understanding of the situation, and, given the nature of climate actions and policy, there are a dearth of variables available to be analyzed, far more than the number of actions taken by municipalities.

At the outset of this study, it was assumed that future actions would be taken in a relatively similar socioeconomic and political climate. This assumption was made to focus this study on determining first if there are good and/or best practices available to municipalities, and if such claims could be verified using both quantitative and qualitative indicators. The combination of sources led to an in-depth understanding of the current state of climate action as each of these sources could be weighed against one another to ensure accuracy and understanding of key indicators.

3.2.1 Case Selection

Cities within the Netherlands were selected based on population, between 50,000-250,000 inhabitants, to study what meaningful climate actions could be taken by the local governments in small- to medium-sized municipalities. This population range selected based on lack of available literature discussing climate actions and good practices of small- to medium-sized cities. Specific cities were targeted to achieve a range of populations, municipal sizes, locations, and achieved 5-year emissions reductions. While the number of cases studied in depth is too small for statistical generalization of the findings, this study lays the groundwork for understanding how and where municipalities can successfully implement climate actions and aims to illuminate and analyze patterns. While it was decided to focus on this population range within the Netherlands, additional municipalities were surveyed outside of these criteria for exploratory reasons to search for additional insights that would potentially contrast with those found from those municipalities within the study. Culemborg and Wijk bij Duurstede, two small towns within the Netherlands were explored, as well as the city of Bremen in Germany. The aim of this addition was to understand if such trends as those seen in the Netherlands may be seen elsewhere as well.

3.2.2 Research Boundaries

The scope of this study was determined to ensure the research questions could be answered within the time frame. Additional time, funding, and resources could greatly expand upon this study and delve further into the rich sources of data which are explored in this thesis. Indeed, it must be noted that whatever findings are presented are not be generalizable to other regions within the Netherlands nor are strong correlations drawn between climate actions within Dutch municipalities to those in Bremen, Germany – for example due to the large population difference between surveyed municipal populations in the Netherlands and that in Bremen. However, knowledge transfer is possible and can lead to a greater understanding of what climate actions are both possible and successful in some SMCs. While one case study outside of the Netherlands does not allow broad-scale comparisons, such those interviews were conducted to expand upon the scope of the research to gauge if further exploration, in a future study, be warranted.

3.3 Data Collection and Data Treatment

Each case study was written based on quantitative and qualitative data gathered from a variety of sources, including but not limited to the Klimaatmonitor, municipal climate documents, CBS data, and interviews with civil servants from each municipality studied. A consistent procedure was followed for data collection to ensure key indicators were collected from municipal climate documents and emissions data prior to interviewing each civil servant to direct the conversation towards crucial points and to delve deeper into the root causes of each integral datum.

1. Contact civil servants within the municipality. Prior to the interview, a set preparation email was sent to reiterate the theme of the interview: the focus on how to overcome the barriers to implement meaningful climate actions within the municipality. The interviewees were also made aware that questions would aim to understand the steps connecting municipal climate action documents and implementation as well as delving into the quantitative data available to see if the effects of such actions could be seen.
2. Construct and analyze graphs of emissions, energy intensity, and renewable energy for the municipality over the 5-year period from 2010-2015.
3. Read annotate climate action plans to learn municipal goals, stated plans, budget, and other key indicators.
4. Combine notes from climate documents with quantitative indicators to highlight potential connections or dissonance between the two data sources.
5. Interview the civil servant, always noting that all findings would be public and freely available upon the culmination of this project.
6. Rewrite, organize, and send interview notes back to the civil servant with comments and further questions to ensure collection accuracy.

3.3.1 Quantitative Data

Quantitative data were mainly gathered to from a variety of sources, each which adhere to a standardized collection methodology and record data from most Dutch municipalities. The main sources of information were the Klimaatmonitor, Openspending.nl, StatLine.cbs.nl, municipal climate documents, and interviews with municipal civil servants. While some indicators are missing for given years within the records, and, in interviews, some civil servants doubted the accuracy of those data recorded by the Klimaatmonitor and CBS, their standardized collection methodology allows direct comparisons to be conducted between municipalities and, further, for general trends to be analyzed form that entire body of data. These data were collected to answer research questions 2-4, in particular RQ 3: Are currently available monitoring data sufficient to demonstrate good practices?

In some cases, municipalities collected and recorded their own quantitative indicators with regards to emissions equivalents, energy intensity, and renewable energy production. However, those data were collected using a unique methodology or were calculated based on certain underlying assumptions, potentially resulting in vastly different data not replicable in other locations. Such individual monitoring methods cannot be accurately compared to one another without a thorough examination of the methods and assumptions which led to such information, which was out of the scope of this study. As a result, the few misgivings of climate actors were noted with regards to data from the Klimaatmonitor and CBS, however, those data were used for the main bulk of this study for the aforementioned reasons.

Prior to conducting this study, certain underlying assumptions were made:

1. Accuracy and uniformity of data and data collection from listed sources
2. Most recent climate documents are accurate representations of municipal climate work
3. Single interviews with (generally) one civil servant per municipality are credible sources of data
4. Translations of climate documents and information from civil servants and colleagues were accurate

Such assumptions are required prior to drawing any comparisons or correlations using those data found for each municipality studied.

3.3.1.1 Data Analysis

In order to assess if current monitoring efforts were sufficient to judge first if they were sufficient to prove draw conclusions about the effects of good practices within the Dutch municipalities. Those quantitative data collected were organized into a table of key metrics from municipalities (See Table 2). In addition, multiple databases were created containing emissions, energy intensity, and renewable energy data from all Dutch municipalities to further explore the possibility that the results of this study could potentially be generalized to other Dutch municipalities.

In order to support the claim that a climate action is a good practice, ideally any quantitative data would be able to show this at both the project and municipal levels, and such indicators would then be able to be generalized across municipalities. While project-level data was unavailable for this study, the Klimaatmonitor holds sectoral data from nearly all Dutch municipalities which were used extensively in this study. Given this limitation, good practice will be assessed as general trends as opposed to on a per-project basis. To do so, three municipalities will be assessed in detail with respect to their emissions, energy intensity, and renewable energy. This analysis will then be built upon, including all municipalities surveyed for this study based on the compiled indicators, and, finally, discussing overall trends found in climate data for the Netherlands.

Table 2: Key quantitative indicators from municipal data

Population
Change in Population
Area [km2]
Population Density
Per Capita Emissions 2015
5 year Absolute Change [Tons]
5 year %per Capita Change
Per Capita Energy Intensity 2015
5 year Absolute Change [TJ]
5 year %per Capita Change
Per Capita Renewable Energy 2015
Total Renewable Energy [TJ]
% Renewable Energy
Registered PV [kWp]
Registered Wind [MW]
% LED Public Lighting
FTE
Climate Budget [€]
Climate Budget per Capita [€/person]
Total Environmental Budget [€]

Total Municipal Budget [€]

Based on this table of indicators, descriptive statistical analysis were conducted first on the municipalities which participated in this study, then those within the population range of the study (50,000-250,000), and, finally, across all Dutch municipalities. The emissions, energy intensity, and renewable energy per capita were calculated to level municipal data on a common scale: population. In addition, the per capita climate budget was calculated from municipal documents or from the in person interviews.

The resultant data could then be directly compared to one another, plotting two variables individually to illuminate whatever trends could be identified either within a single municipality, or across the entire range of municipal-level data available. In addition, the first derivative of the per capita emissions and energy intensity were taken and the standard deviation of those annual rates of change calculated. Given that many climate documents layout gradual changes in practice as opposed to singular, fundamental shifts on a single-year basis, calculating the deviation from the mean could indicate whether the five year changes see were due to individual yearly jumps or, rather, a slower but more consistent shift in emissions and energy consumption.

For each municipality, plots of the annual emissions, energy intensity, and renewable energy production were made for the period of 2010-2015. The annual percent per capita change was calculated as follows: (Year 2 – Year 1)/(Year 1) and plotted alongside the total per capita emissions. From these charts, overall trends were analyzed over the time period and coupled with the absolute observed. In this way, comparing the percent per capita change as well as the absolute change, a greater depth of analysis can be achieved. Furthermore, anomalous data in these municipal charts were noted for further discussion. Additional analysis was required to understand the overall municipal trends given the incredible breadth of those data available. Beginning with the in-depth case studies, then expanding the sample size first to municipalities of similar populations and finally to all Dutch municipalities, overall correlations were drawn between a variety of key indicators to further explore what conclusions could be drawn from these data.

Charts constructed include:

1. Climate budget per capita vs Emissions/Energy Consumption/Renewable Energy/Population
2. FTE vs Emissions/Energy Consumption/Renewable Energy/Climate Budget per Capita
3. Population vs Emissions/Energy Consumption/Renewable Energy (per capita)
4. Standard Deviation of emissions, energy intensity, RE within Study vs all Dutch Municipalities

3.3.1.2 Limitations

While those data available are in many respects comprehensive, there are several limitations to what was able to be used for the purposes of this study. Climate data from the Klimaatmonitor was, in general, available on a municipal level from 2010-2015. In certain cases, single or even multiple points were unavailable for a given municipality over this five year period. While such a database recording the emissions from nearly all Dutch municipalities is an incredible source of information, municipal-level data can be difficult to tie to individual project results. Additional

project-level information was unable to be found for this study and would have provided far greater clarity on the direct effects of municipal implemented climate actions. Furthermore, the data presentation cycle of the Klimaatmonitor is around 1.5 years behind the present day, so more recent data than 2015 were not available for this study. Given that many municipalities act on 3-4 year cycles of climate planning, many of which began in earnest between 2010-2014, this deficiency may limit the ability to illuminate the true direct or secondary effects of climate actions.

With regards to budgeting data from Openspending.nl, the annual environmental budgets were recorded per municipality, however, these are not specific to the climate budget; as stated earlier the environmental budget excludes: public health care, youth health care, waste disposal and treatment, sewerage, and funeral services. So, while broad comparisons between the environmental budget and its effects in the municipality can be made, there the broad definition of this budget prevents further understanding how just how much of that municipal money is directly used for climate projects – such data was only available in some cases from action plans and interviews. In addition, while the climate and environmental budgets recorded were assumed to be the entirety of the budget allotted towards local climate actions, this may not be the case. Since climate mitigation actions affect several departments (urban planning, buildings, waste, transport, etc.…) it is possible that the budgets used to implement climate actions from these other departments are not recorded as the budget for the municipal climate office.

3.3.2 Qualitative Data

Those data analyzed in this piece of the study were collected from municipal climate documents, typically the most recent action plans written at each municipality and through in person interviews of civil servant(s) focused on climate mitigation and sustainability.

Prior to the outset of this study, the following assumptions were made governing the interpretation of information:

1. Most recent climate documents are accurate representations of municipal climate work.
2. Single interviews with (generally) one civil servant per municipality are credible sources of data.
3. The combination of climate documents and in-person interviews are sufficient to write accurate descriptions of how to implement good practices.
4. Translations of climate documents and information from civil servants and colleagues were accurate.

Those qualitative data used for this study were collected in a series of key indicators used to assess the state of climate action in each surveyed municipality (see Table 3). The method for the collection of each data point will be discussed in the following sections.

Table 3: Qualitative indicators collected for case study analysis

Municipal Climate Goals
Outreach/Initiatives: Cooperatives, Consortia, Interdepartmental work
Municipal Role: Self Governing, Authority, Provision, Enabling
Climate organization membership
Good Municipal Practice for Implementation

3.3.2.1 Climate Documents / Municipal Action Plans

In this study, the term "Action Plan" has been and will be reserved for the explicit definition of plans which codify actions to the standard of the definition given in Section 2.2; however, since many municipalities title their documents a "Climate Action Plan" it is important to reiterate that while this given to such documents, they do not, in general, achieve the standard of an "Action Plan" as described in this thesis. Additionally, while there is a great deal of information available in each individual municipal climate document, there is no standard format or method used when writing them. As a result, there are few consistent indicators which can be found amongst all the documents and other sources of data were required, mainly the expert interviews, to add, confirm, and flesh out those pieces of information found.

From the climate documents, the municipal short-and long-term climate targets were recorded, focusing on the major climate targets: emissions reduction, energy intensity, and renewable energy. These could then, in the future, be measured against the quantitative data gathered to assess the municipal progress towards their goals. Further, each identifiable action in the climate strategies was counted and categorized using Bulkley et al 2006 to classify actions by their style of governance: Governing by Authority, Provision, Enabling, Self-Governing. Such analysis was conducted to further illuminate the predominant governing style used to implement climate actions within Dutch municipalities. More broadly, each most recent climate document was itself classified as a Plan, Strategy, Roadmap, or Not Available. The classification system is outlined in Table 4 below:

Table 4: Definitions of action plan, sustainability strategy, and climate roadmap

Action Plan	Codified actions with GHG emissions reduction baseline and target, required budget, stakeholders, implementation plan, and monitoring scheme
Sustainability Strategy	Clear definition of municipal strategy which falls short of the five requirements of an action plan.
Roadmap:	Climate/sustainability document with themes and genera breakdown of targets to achieve climate goals. May include milestones, sectoral GHG emissions or energy consumption, and outline of overall strategy to achieve targets.
None	No documents found or nothing recorded

In some cases, information regarding local energy cooperatives, company consortia, and interdepartmental work were also recorded in the climate action plans. However, a publication was found from the Lokale Energie Monitor which lists all the energy cooperatives active in their network; this list was assumed to be comprehensive for the purposes of this study (Schwencke 2016). An additional point collected was the total score from the duurzaamheidsmeter. This survey was completed in 2014 and ranked municipalities based on People, Planet, and Profit with

reference towards taking actions to combat climate change (Duurzaamheidsmeter 2017). This was collected to give another dimension to those surveyed municipalities.

3.3.2.2 Expert Interviews

For each municipality, an expert interview was conducted with a civil servant selected to be interviewed. Selection involved the criterion that each person could provide accurate information and in-depth information with regards to the municipal organization, inner works, and good practices. The professional network of Ecofys was first used to establish connections with climate actors, and then this network was expanded upon through their connections or through interviewing climate actors at the VNG or Klimaatverbond.

Upon connecting with and scheduling a meeting with a suitable climate actor in a municipality, the process leading to an interview was consistent as outlined in 3.3 Data Collection: a preparation email, reading and annotating municipal climate documents, combine climate documents with quantitative data, interview, and follow up. The preparation email was consistent and outlined the goals of the process, namely, illuminating how the municipality was able to overcome the barriers to implementing meaningful climate actions. Interviews were conducted between November 2016 and May 2017 and were typically scheduled for one hour, but generally lasted for between 1.5 and 2.5 hours. All interviews were conducted in person (excluding those for Groningen and Bremen) to ensure that the greatest accuracy possible, and all interviewees were told explicitly that these data would be made public upon the publication of this study. The structure of the interview was fluid to allow each civil servant the time to focus on whichever topics and climate actions which were of critical interest to their work, but followed general themes:

1. Introduction and explanation of the study
2. Examination of quantitative data and discussion of climate documents
3. Discussion of the municipal role in climate action
4. Discussion of municipal good practices to implement climate action; further questions were asked to try and correlate actions and quantitative data
5. Barriers to climate action

No interviews were recorded, rather, notes were taken as a record of what was said. After the interview, these notes were then rewritten incorporating elements from municipal climate documents and quantitative data where relevant, and sent to the interviewee to be edited for content and detail. This was done to ensure their faithful recording and accuracy, giving each interviewee the chance to change emphasize or explain elements of the discussion which may not have been fully understood.

Table 5: Interviewed municipal experts for case studies

Municipality	Title	Date of Interview
Almere	Process Manager	14-3-2017
Amstelveen	Beleidsadviseur Duurzaamheid at Gemeente Amstelveen	18-4-2017 11-5-2017
Arnhem	Programmaleider Energy made in Arnhem	24-2-2017

Den Bosch	Energietransitie – Verbinder - Duurzaam	20-2-2017
Eindhoven	Consultant Sustainable Energy	26-4-2017
Goeree-Overflakkee	Beleidsadviseur Duurzaamheid	27-3-2017
Groningen	Senior beleidsmedewerker duurzaamheid	2-5-2017
Haarlemmermeer	Procesleider Energieakkoord	30-3-2017
Helmond	Programmamanager Duurzame en Gezonde Stad	20-4-2017
Leeuwarden	Energiecoordinator Beleidsadviseur Duurzaamheid	10-4-2017
Maastricht	Senior Beleidsmedewerker	19-4-2017
Nijmegen	Senior Adviseur Duurzame Ontwikkeling	23-3-2017
Zaanstad	Program Manager climate and Energy	24-3-2017 3-5-2017
Bremen	Klimaschutzmanager	12-5-2017

Table 6: Additional municipal & climate experts interviewed for this study

Organization	Title	Date Interviewed
Amsterdam Zuidas	Projectmanager Duurzaamheid	20-Dec-16
Carbonn Climate Registry	Project officer, Low carbon	24-Jan-17
Ecofys	Consultant Climate and Energy Policy Design	22-11-2016
Ecofys	Managing Consultant	20-10-2016
Ecofys	Principal Consultant	23-11-2016
Ecofys	Associate Director	21-11-2016
Ecofys	Director, Utilities Europe and Middle East	25-11-2016
Energy Cities	Communication and Policy Officer	09-Feb-17
Eurocities	Project coordinator for climate change and energy	13-Dec-16
Fairbusiness	Mede-eigenaar, MVO-adviseur	08-Feb-17
Gemeente Arnhem	Hoofdaviseur openbare ruimte, water en ecologie	16-Jan-17
Gemeente Arnhem	Cluster Beleid en Regie Afdeling Omgevingskwaliteit	16-Jan-17
Gemeente Breda	Senior Adviseur Wonen en Milieu	02-Mar-17
Gemeente Culemborg	Beleidsadviseur Duurzaamheid	07-Dec-16
Gemeente Culemborg	Climate Adaptation	07-Dec-16
Gemeente Eindhoven	Program manager Energie Werkt	26-Apr-17

Gemeente Haarlem	Beleidsmedewerker Haarlem klimaat neutral 2030	18-Apr-17
Gemeente Leiden	Senior Project Manager	09-Jan-17
Gemeente Wijk bij Duurstede	Coördinator Duurzaamheid	09-Jan-17
Klimaatverbond	Manager projecten en campagnes	13-Jan-17
Klimaatverbond	Projectleider adaptatie	15-Dec-16
Klimaatverbond	Freelance Environmental Advisor	20-Dec-16
Klimaatverbond	Programme Advisor	22-Feb-17
Klimaatverbond	Projectleider Green Deal Scholen	27-Jan-17
Leiden University	Beleidsadviseur Stadsontwikkeling	28-Mar-17
Municipality of Bremen	Policy Advisor	16-Jan-17
City of Bratislava	Mgr. Útvar hlavnej architektky	16-Jan-17
Rijkswaterstaat	Senior adviseur RWS Lokaal Klimaatbeleid	11-Jan-17
The World Bank	Solid Waste and Urban Specialist	02-Mar-17
Toledo	Finance and Partnerships for Green Infrastructure & Cities	08-May-17

3.3.2.3 Data Analysis

These qualitative data were organized into a table of indicators as listed above in section 3.3.2 Qualitative Data. These data were reflected upon critically through repeated cycles of interpretation based upon the theoretical background highlighted in Section 2.4 as well as through the lens of those quantitative data collected. A ranking system was considered for each indicator to allow further comparison between municipalities; however, this idea was shelved as given the sort of indicators collected it was decided that other methods of analysis would be more illuminating. Once organized, general trends were established and each good practice mentioned in the interviews were organized by type of governance and sector. These specific actions were then generalized to show where and how municipalities can have a meaningful climate impact

3.3.2.4 Limitations

While this study aimed to be a comprehensive look into municipal climate action, certain limitations were considered at its outset. First, all climate documents available for this study were written in Dutch and were translated into English using Google Translate. While the functionality of this service is quite high, information can always be lost in translation. To address this, oddly translated or confusing passages were discussed during the interviews and further clarification was also available from native Dutch colleagues. In addition, all interviews were conducted in English as well. While the level of English spoken in the Netherlands is incredibly high, again, there is always the possibility that information is misconstrued or lost; follow-up communication and vetting of the notes played a crucial role in ensuring clean and accurate information. Finally, typically only one interview was conducted per municipality. This has the possibility of introducing an individual's bias to those data already collected. However, this study is based on independently collected quantitative data, municipal climate documents, as well as the interviews, limiting the influence of such a bias.

In some cases, those actors contacted did not respond to emails or declined an interview. For non-response, a follow-up emails were sent approximately one week and three weeks after the initial contact. However, if no response was made, or a message was sent declining an interview, alternative members of the organization (typically a municipal government) focused on climate mitigation were contacted as well. These additional email addresses were found mainly through asking those actors already surveyed for connections to contact, and the same process was repeated. If, however, after two rounds of connections were contacted without success, then the municipality was no longer pursued unless in the case of a later, positive response, which occurred several times months after the initial email was sent. This places a further bias on the study made, as all those surveyed were able to donate their time to an external report.

4 Case Studies

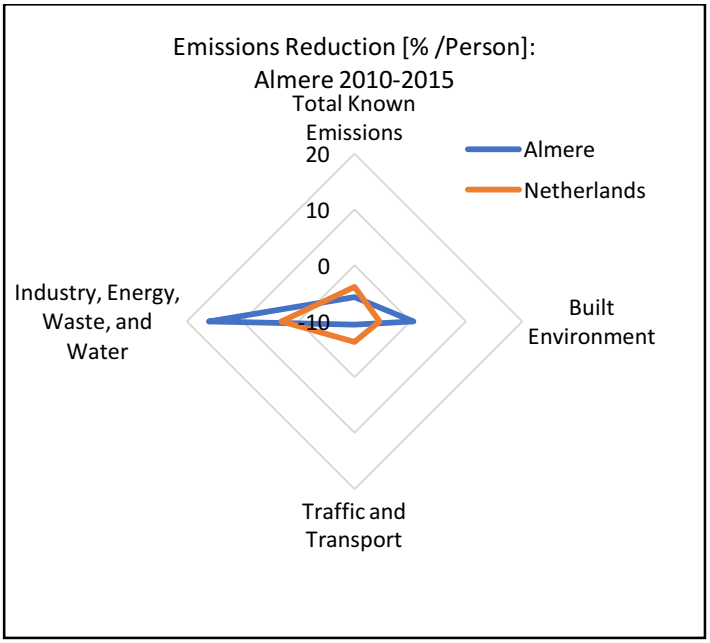
The case studies in this chapter are provided to give a more in-depth understanding of current climate actions and processes in each surveyed municipality. The analysis of these results will follow in Chapter 5; as such, these case studies will not contain my own analysis but, rather, will strictly adhere to that information found in local climate documents and given in interviews with civil servants. Each case study is divided into two sections: the municipal status and local good practices. The municipal status is further divided into a set of figures of quantitative indicators, and a qualitative description based on climate documents and an interview with a local civil servant in municipal climate action. FTE, climate budget, and municipal climate goals were products of the interview and, in many cases for FTE and budget, were estimates of what the municipality had at its disposal. The municipal population was derived from CBS data compiled by Statline (Statline 2017), the total environmental and municipal budgets were recorded on Openspending.nl (Openspending 2017), and the emissions, energy intensity, and renewable energy statistics were recorded by the Klimaatmonitor (Rijkswaterstaat 2017).

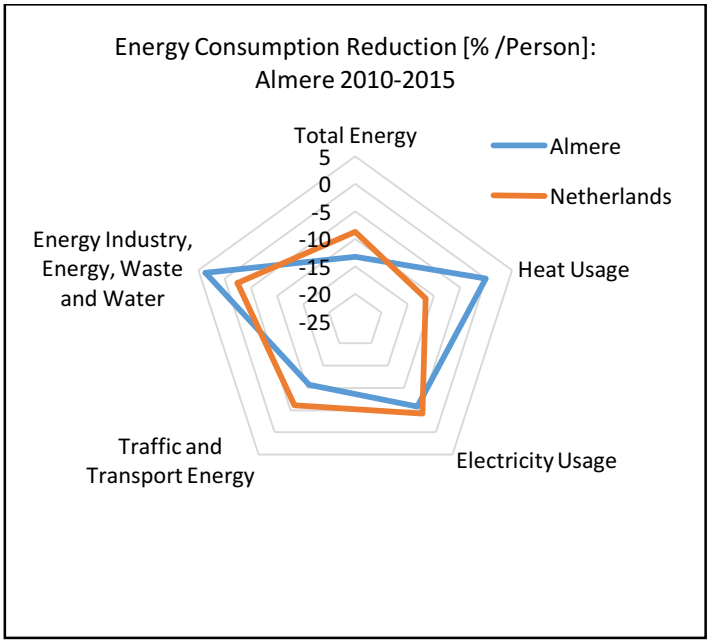
All information recorded in the qualitative municipal status and good practices was compiled during the interview with a climate expert in each of the cities surveyed unless explicitly cited otherwise. Data from municipal sustainability documents, budgets, and emissions data were compiled prior to the interview and information was then confirmed in the interview to ensure accuracy. In addition, all notes taken during the interview were sent back to the interviewee to allow them to edit and confirm that all information was recorded faithfully.

In each interview, several good practices were discussed. However, the good practices recoded below were those which the civil servant could provide sufficient detail and explanation. As a result, an additional bias was included in this portion of the study as different climate actors within the municipality have different areas of expertise/focus, and, therefore, those good practices listed below are only those which were well known to the interviewee.

4.1 Almere

Area [km^2]	249	FTE	4.7
Population [2016]	206,603	Climate Budget [2015-2018]	€ 3.7 M
Population Density [People/km^2]	830	Climate Budget per Capita	€ 5.97
Population Growth [2010-2016]	9,948	Total Environmental Budget [2016]	€ 2,865,000
Duurzaamheidsmeter	74%	Total Municipal Budget [2016]	€ 715,103,000





Status of the municipality 2010-2015: Percent per capita

Emissions:	Energy Consumption:	Renewable Energy:
-6%	-13%	5%

Status of the municipality 2010-2015: Difference in Annual Statistics

Emissions [Tons]	Energy Consumption [TJ]	Renewable Energy [TJ]
-17683	-1179	535

Registered PV [MWp]	Wind Energy [MW]	%LED Public Lighting
12.5	36.5	n/a

Goals:
2023: Reduce CO_2 emissions by 80-95% [No Reference Year Given] (Programmalijn_3_Almere_2.0)
2050: Fossil Free municipality (Programmalijn_3_Almere_2.0)

Klimaatverbond membership: No
Covenant of Mayors membership: Yes, as per 28 April, 2015
Point of Contact: Process Manager & Program manager of Energie Werkt

4.1.1 Municipal Status

The analysis of trends in emissions and energy consumption in Almere is difficult. Multiple data points for Almere are missing between 2010-2015, allowing an overall analysis of the total recorded reductions in emissions and energy consumption, but not the 5-year trends which could indicate the success of specific processes or indicate anomalous behavior with wide fluctuations.

The municipality's ambition, on paper, is to be nearly emission free by 2023 a result which would dwarf the modest emission reduction seen from 2010-2015. However, it was made clear by the Process Manager in Almere that the aim of these goals was not, necessarily, to accomplish them. Rather, without such tremendous ambitions, people (municipal actors, companies, and the public) won't move, listen, or act. To further push people, a study was commissioned to understand the cost to the municipal government in 2050 if the municipality failed to act until that time. This is used for shock value; to be able to explicitly quantify how significant the burden would be. With such information, current projects can be easily justified against that baseline. It is vitally important to be able to answer two questions when discussing climate actions with other actors: What is in it for me? What are you asking from me?

The program Energie Werkt is divided into 5 working areas: Solar, heat, wind, schools & associations, and residents & companies. Each area has several actions to implement by 2018 when this round of the program ends the most ambitious of which are: 20-40 MWp Solar, 500-1000 Homes w/solar collectors or heat pumps, 5-6 repowered windmills, 10 schools/associations 10-30% more efficient, and 5000-10000 homes to cut energy consumption by 5-10% (2015_Almere_Energie Werkt). Within each working area, current collaborators are listed which show the extent of the roadmap. However, Almere does not yet have an itemized actionable plan which will take the municipality from its current state to its goal of 80-95% CO_2 reduction by 2023.

The role of the climate actors in Almere is primarily as a motivator, facilitator, and expert. In Almere, it has been found that many actors (among companies, the public, or even those in the municipality) are not sure what to do to take climate actions. As a result, municipal actors focused on climate are required to take steps to increase the prevalence and knowledge of climate action. To do so, they must make it as simple as possible for residents and companies to act. The local government intends to support a company to create set renovation plans, with set costs, tradeoffs, and benefits all from a single provider within the municipality. This would work to bridge the knowledge gap found by civil servants and push private citizens to act. However, such plans need to be implemented quickly to minimize difficulties to investors.

In addition, the municipality believes it can set an example for its residents by investing in building renovations which lower the energy demand and increase the RE energy production of its buildings. Almere has been quite successful on this front and, within a year of hiring an employee 1 day/week, nearly 100 municipal buildings have PV panels installed. The success of this project was in large part due to these buildings were being renovated on their natural cycle.

4.1.2 Good Practice

1. Energy Ambassadors:
Cost: ~€100/Ambassador
The municipality has found that when information comes from a neighbor or friend, it is far more well received than if delivered by the government. To capitalize on this, in Almere, there are currently around 33 active energy ambassadors. These enthusiastic volunteers are recruited from the existing network of citizens interested in climate which has been built through projects, those who have renovated their homes, installed PV panels, or who call the municipality and are interested in taking a more active role. The municipality provides free trainings (presentation, information, and skill development) as well as space within the municipal building to meet. They are connected to upcoming projects and company/housing meetings and are given awards for actions as well as a "Thank you drinks" at the end of the year.

2. Energy Scans:
Cost: ~200€/Scan
FTE: 2 days per week (1 day for homes, 1 for companies)
2016 Scans: 10 schools, 18 sports clubs, 100 homes, 100 companies
A neighborhood of 2700 households with 100 different house types approached the municipality asking for energy scans to understand how to make their homes more efficient. Rather than do this internally, the municipality put out a tender and hired the Climate Neutral Group and provides the scans free of charge to companies and residents. This company conducts the scans, and follows up with the owners to learn what actions were taken and to encourage homeowners to make (further) changes. The goal of this effort is not only for residents to know what measures they can take individually, but to provide them with both the tools and the motivation to make a change. By continuing the relationship beyond the energy scan, the company hopes to provoke more actions and more significant investment per action taken.

Not only does the municipality offer free energy scans to companies, they also announced that the government would begin to enforce the regulation stating that for buildings consuming over certain levels must take actions with a payoff of under 5 years. The municipality can focus on known high emitters and, using their free-energy-scan data, knows exactly what actions each company must take. While this was not a planned scheme, it did work out to benefit municipal enforcement of the Environmental Protection Act.

3. Subsidy Schemes:
1. Solar Panels: €100,000 from municipality
Per applicant: €250-€500 rebate for panel installation
Result: €1.5M private investment
The program reached its budget ceiling within 2 months of being active. There are two companies which sell PV panels within Almere. Their representatives go door to door advertising their products as well as the subsidy scheme. Both the personal engagement as well as the knowledge of current cost reduction made it incredibly popular. Since the companies visited private citizens, the local population learned about the available subsidy and, more importantly, how it could directly impact their lives. Furthermore, since the companies were advertising the subsidy

themselves as it was good for their own business, their representatives were aware of how best to present and apply for the money when projects were scheduled. Residents are still calling the municipality asking about the subsidy to install their panels.

2. Low interest renovation loans: €300,000 invested
Provides €3.5M fund for home renovations
Maximum €20,000/homeowner at 1.6% interest
Between January and March of 2017, there were applications totaling over €100,000,000. The success of this program was likely due to the energy ambassadors spreading the information throughout the community as well as municipal advertising through the website and social media. In addition, it was a key point that whenever a homeowner called the municipality with questions regarding sustainability, this scheme was mentioned and explained.

Given the success of this program a fund of €2.5M has been opened to companies of €50,000-€100,000 at 3.4% interest, and there is one in planning for rental properties/low income renters providing for €4.5M in loans.

4. How to engage municipal actors:
Since climate policy and actions cannot be implemented without the support of other departments within the municipality or the support of the city council, methods for working with resistant colleagues are required. When an elected official began his term within the municipal government, he insisted on disrupting and blocking climate action for, mainly, monetary reasons. Surprisingly, now he is one of the greatest allies for new climate actions within Almere. Extraordinarily, he even has PV panels on his own home. In order to work on such interpersonal skills workshops on Value Framing can be extremely helpful. This is a process to understand and tap into values and inspire change within others, and can be particularly useful when working with people with strongly held convictions. Without the ability to work with colleagues and treat them with respect, regardless of their political views, implementing climate action can be extraordinarily difficult.
Important aspects:

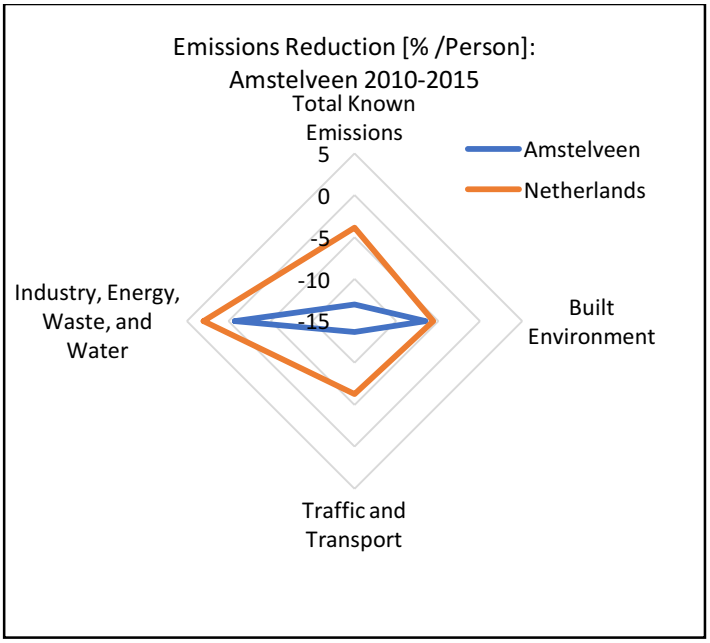
1. Treat people with respect. In this case, the official was very isolated due to his seat, causing him to be further outspoken as opposed to becoming more willing to compromise.
2. Don't fight their truth, work to understand what he believed and why. Conversations were focused on what was important to him and how he saw these ideas.
3. Using this base of understanding and mutual respect, solutions could be agreed upon and actions taken.

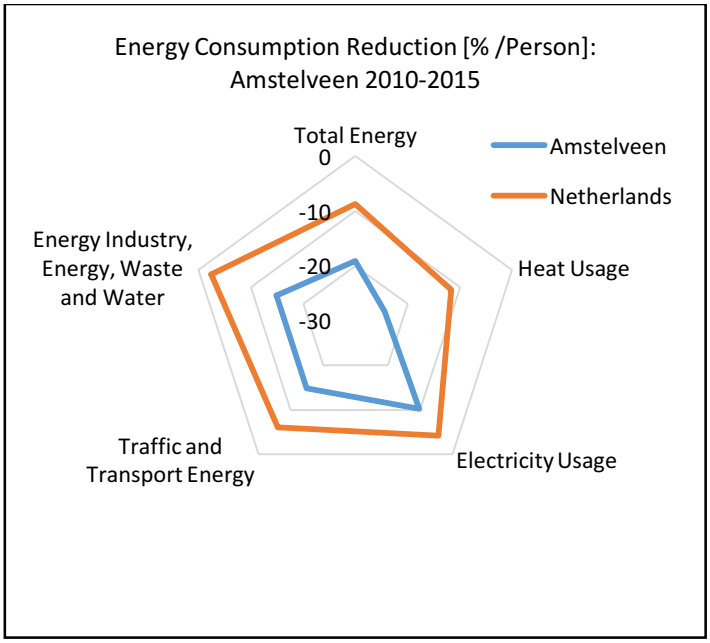
Documents:

1: 2015_Almere_Energie Werkt
2: Programmalijn_3_Almere_2.0
3: Meerjarenprogramma_vastgesteld_door_OA2.0_7_september_2016

4.2 Amstelveen

Area [km^2]	44	FTE	6-7
Population [2016]	892284	Climate Budget	€ 50,000: Processes € 50,000: Research € 20,000: From old budget
Population Density [People/km^2]	2025	Climate Budget per Capita	€ 1.34
Population Growth [2010-2016]	6806	Total Environmental Budget [2016]	€ 1,461,000
Duurzaamheidsmeter	n/a	Total Budget [2016]	€ 210,140,000





Status of the municipality 2010-2015: Percent per capita

Emissions:	Energy Consumption:	Renewable Energy:
-13%	-19%	2%

Status of the municipality 2010-2015: Difference in Annual Statistics

Emissions [Tons]	Energy Consumption [TJ]	Renewable Energy [TJ]
-29096	-835	134

Registered PV [MWp]	Wind Energy [MW]	%LED Public Lighting
3.2	n/a	n/a

Goals:
2015: Sustainable Municipal Procurement (Plan_Energiebeleidsplan_2013-2016.pdf)
2030: Fossil Free Municipal Organization
2040: Emissions Free / Energy Neutral (Plan_Energiebeleidsplan_2013-2016.pdf)

Klimaatverbond membership: Yes
Covenant of Mayors membership: No

Point of Contact: Beleidsadviseur Duurzaamheid at Gemeente Amstelveen

4.2.1 Municipal Status

Emissions in Amstelveen decreased by around 13% per capita between 2010-2015 as well as the absolute emissions between the same period. In contrast, the absolute emissions from 2011-2015 increased by nearly 9000 tons. However, this could be due to the population increase over the same period, as the emissions per capita continued to decrease, albeit less abruptly. So, while there was a significant emissions reduction over the entire period per capita, it was mainly caused by a jump between 2010 and 2011 and the rest perhaps due to an increase in population. This decrease, according to the municipality, was due to several office buildings losing their tenants. If that be the cause, it would explain why the most significant reductions in energy intensity are seen in the heating demand, where nearly ¼ of the demand was lost, and traffic and transport. These reductions in energy intensity are mirrored in emissions, where the reduction from 2010-2011 is mainly due to a decrease in emissions from the Built Environment.

The most recent climate document found from Amstelveen was the Energiebeleid Gemeente Amstelveen 2013-2016. The 2017 strategy document had yet to be published at the time of this study. The 2013-2016 strategy was broken into pillars: municipal actions / setting a good example, savings in the built environment, market facilitation, and sustainable mobility. A total of 28 projects were discussed, each under the egis of one of the pillars of the plan. However, while specific ideas were mentioned, the specific effects, implementation method, and budget were not included in the document (Plan Energiebeleidsplan 2013-2016). One major difficulty experienced with such a model was new elected officials have different agendas and don't want to be stuck implementing the previous administration's plans. In addition, some department heads were unwilling to implement even when the project was assigned to their department. This led to incomplete projects and discord between departments. In response, the 2017 strategy is said to be target oriented as opposed to project oriented. The aim is to then review projects annually, making the climate program more flexible and able to incorporate new ideas and projects without disrupting the overall progress towards emissions free municipality in 2040.

To achieve their targets, the municipal government aims, mainly, to facilitate other actors and, through their engagement, achieve the desired emissions reduction. This is due, according to the 2013-2016 plan, to the capacity and influence of municipalities is currently very limited in the Netherlands. In Amstelveen, the strategy for facilitation is to put projects to the market and let companies use their expertise to accomplish what the municipal government cannot do alone. This was implemented because it not only directly involves local businesses in the energy transition and builds relationships between companies and the government but it also can speed progress; companies can have fewer barriers to action and do not have to wait for legislation to pass to implement a given plan.

In addition to market facilitation, the municipality can take measures within its own building stock and municipally controlled land. New tenders for housing developments can include requirements

for energy standards and monitoring. Furthermore, the procurement within the municipal organization can all be done sustainably. While the target for 100% sustainable procurement was set for 2015 in Amstelveen, it was found that those involved in procurement did not understand the scope or extent of the change required to realize this target. So, the program setup is still ongoing. In addition, planning is one crucial portion of both the municipal responsibility and power structure. This has been thrown into relief by the sudden interest in removing gas from the energy mix in the Netherlands. With a concrete plan or even strategy, companies, housing organizations, and homeowners can be involved and prepare for and adapt to the coming changes. A process which is hoped will increase demand for both efficiency measures and engagement in the transition.

While facilitation can lead to climate action, it can also complicate relationships within and external to the municipal government. The city can facilitate companies and other organizations, however, civil servants are not always prepared for this new role. Given the speed of change, as well as shifting responsibilities, connecting those interested in taking action to the departments in change within the municipality is not always done. Furthermore, given that climate targets are still a relatively new municipal focus, some civil servants do not want to act or are unwilling take on new responsibilities. Finally, as projects grow, civil servants can be reticent when challenged to relinquish control, even at the expense of progress, reducing engagement and further successes.

A further problem can occur with mixed messaging from different municipal departments to external partners. One notable example in Amstelveen is the conflict between encouraging the housing organizations to renovate their stock and the city council also stating that the housing organization must sell that same building stock. This discrepancy has stalled their renovations, in particular those to high energy standards, because of this newly uncertain position. Without a concerted effort to standardize the municipal message and codify their future plans across all departments, such problems could easily continue to arise.

4.2.2 Good Practice

1. Sustainable Transport:
Budget: € 0
FTE: Permitting and creation of a parking space

As part of the Metropol Region of Amsterdam, charging stations in Amstelveen were to be tendered through the larger organization. However, while the municipality ordered 42 charging ports, of which only 4 were delivered, and the waiting list for access continued to grow, peaking above 70. The process was too slow to meet citizens' demand, and the process was relatively expensive for the municipality. Civil servants began searching for alternative options and, when Allego, a spinoff company from Alliander, approached the municipality with an offer to implement charging stations in Amstelveen, their offer was accepted. The government agreed, and, rather than increase their responsibility, there is now no budget and minimal FTE required for this project. Further, there is no longer a waiting list for charging stations and the only advertisement the municipality has created is now the number for Allego is available on the municipal website as well as another company which has begun providing the same solution. As of June 2017, there are

110 public charging stations and 4 fast-charging stations along with a number of private charging stations.

4.2.3 Future Goals

1. Sustainability fund
Amstelveen is currently working with Aalsmeer to create a fund for private homeowners' associations. Applications will be taken for groups of homeowners to create a business case for their energy transition development process: Idea, development, screening, decision, and monitoring. The aim is to spur energy renovations and planning with larger developments.

2. Heat transition plan
Since there is now the national aim to turn off the gas, Amstelveen is investigating processes to achieve the heat transition. Specifically, the study produced must answer:

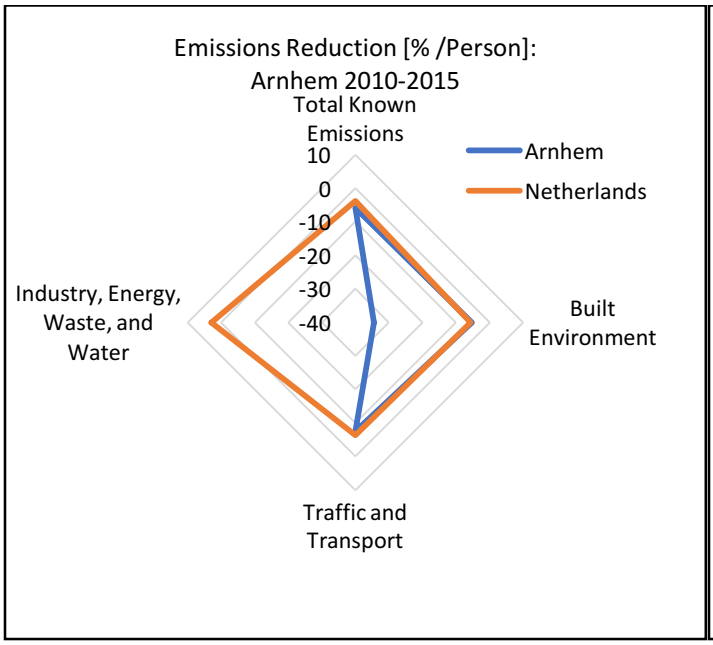
1. What is the current state of the municipality?
2. What must be done to achieve the heat transition?
3. Which solutions are most efficient (collective, individual, combined)?
4. What are the consequences of shutting off the gas?

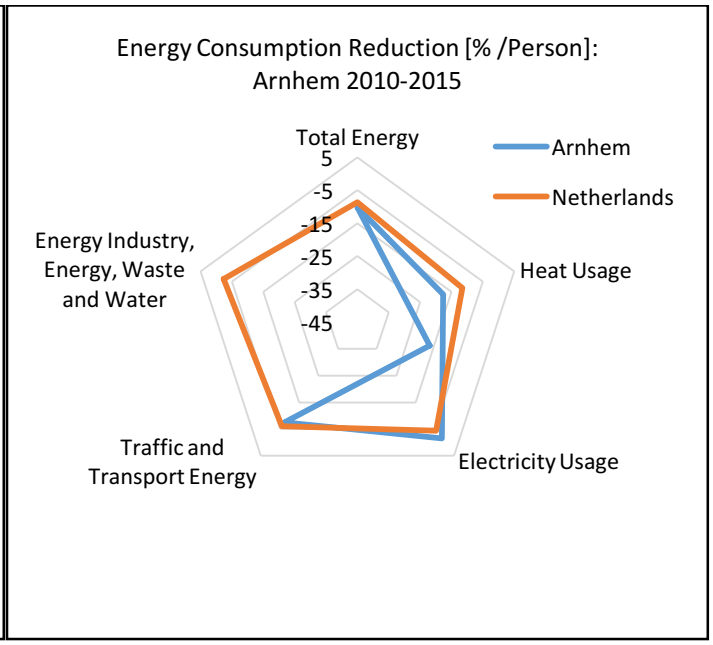
3. Monitoring municipal projects
While the Klimaatmonitor provides municipal-level data from which municipalities can be benchmarked against one another, the current state of municipal buildings is not understood. In Amstelveen, climate actors will study the current state of each municipal building to learn what funds and resources will be required to make the entire municipal organization fossil free by 2030.

References:
Plan_Energiebeleidsplan_2013-2016.pdf
Uitvoeringsprogramma_Energie_2013-2016

4.3 Arnhem

Size [km^2]	101.5	FTE	10
Population [2016]	155,586	Climate Budget	€ 506,000
Population Density [People/km^2]	1532	Climate Budget per Capita	€ 3.25
Population Growth [2010-2016]	7,516	Total Environmental Budget [2016]	€4,995,000.00
Duurzaamheidsmeter	89%	Total Municipal Budget [2016]	€732,347,000





Status of the municipality 2010-2015: Percent per capita

Emissions:	Energy Consumption:	Renewable Energy:
-6%	-10%	4%

Status of the municipality 2010-2015: Difference in Annual Statistics

Emissions [Tons]	Energy Consumption [TJ]	Renewable Energy [TJ]
-22946	-914	499

Registered PV [MWp]	Wind Energy [MW]	%LED Public Lighting
5.0	0.1	n/a

Goals:
1.5% energy savings per year
2020: 14% renewable energy
2023: 16% renewable energy
2050: Energy Neutral 2050

Klimaatverbond membership: Yes
Covenant of Mayors membership: No

Point of Contact: Programmaleider Energy made in Arnhem

4.3.1 Municipal Status

The majority of the reduction in energy consumption seen in Arnhem is due to a large decrease in heating demand. This change is responsible for nearly half of the CO_2 emissions reduction seen in Arnhem. However, nearly the entire drop per capita occurred between 2010 and 2011 and then demand rose dramatically, fluctuated, and fell once again. While the energy consumption and emissions resulting from industry dramatically decreased over the period from 2010-2015, Industry, Energy, Waste, and Water only account for around 2% of the total consumptions and emissions within the municipality. So, while the percent reduction was significant, the absolute reduction did not play a major role in the municipality's overall performance.

There are several plans which have been written by the municipality of Arnhem; however, no action plan to achieving energy neutral in 2050 exists, nor is one intended. A plan to take the municipality to energy neutral projects too far into the future and, given unforeseen changes, climate actors in Arnhem are focused elsewhere. A regional roadmap towards 2050 is currently being formulated, but while all 20 municipalities are committed to the 2050 climate-neutral ambition, there is little to no agreement on how this goal should be accomplished.

Capacity building within the municipality of Arnhem was seen as a critical first step to achieving climate targets. From 2011-2014, the focus of the action plan was building networks, generating ideas, and getting people within the municipality to act without paring down the focus to certain areas. This was done to get people interested, excited, and invested in making changes towards a more sustainable future. The current plan, which runs from 2015-2020, has pared down the broad spectrum of ideas to focus on three key areas: Energy reduction and renewable energy; the municipal government becoming a model for actions in climate change and sustainability; Economic development and innovations within the municipality and province. A crucial aspect of the current action plan is that extends beyond the current coalition. It is embedded in the municipal government in Arnhem, removing climate action from the political spectrum and, thus, cementing its existence. The intended result is to ensure the survival, budget, and capacity growth of sustainability programs within the municipality.

The focus on capacity building within Arnhem was strong because climate actors realized that they could not achieve their targets without public engagement. The municipality can make its organization sustainable, but for the rest it requires co-creation and cooperation to achieve its goals[1]. There are a few areas where the municipal government does have power to take significant action within the municipality outside of its own buildings, public spaces, and lighting: negotiating contracts and agreements with housing organizations; district heating; creating a knowledge hub for citizen projects. However, it was made clear that municipal actors cannot take the lead on legislative changes despite the local knowledge required to make effective changes within the municipality.

4.3.2 Good Practice

1. Public Engagement:
FTE: 1
In Arnhem, there are 8 municipal teams of around 5 people, one for each neighborhood, active in the community; the broad goal of each is to engage each community in government. The budget of these teams for all neighborhood projects is up to €100 million annually for actions to be implemented on a community level, a tiny portion of which is used for climate separate from the climate budget. To increase climate awareness of the public as well as to gather information about climate action within its borders, 1-2 members of each team were trained in climate and energy related matters. These community ambassadors relay information both ways, from the government to the people and vice versa, keeping both parties informed on each other's actions and plans. Including climate in the ambassadors training also dramatically increased the government's ability to connect with and encourage individual projects by providing relevant information directly to individuals.

The community ambassadors have helped the climate office to build up a database of people whom have completed projects in climate action. The municipality can then connect these people with others interested in similar projects within the community. Also, when developing new ideas, plans, and policy, the municipal government can easily contact such individuals for their input and opinion.

However public engagement must be handled with care. Like many municipalities, Arnhem is investigating how to become fossil free in the future. In partnership with Alliander, a grid operator in the Netherlands (DSO), a study is being produced to understand how the natural gas lines could be removed or turned off in neighborhoods. Two were selected without their knowledge as nothing is nor will be scheduled to change in the near future. However, when the press learned of the plan they extracted one piece out of context and stated that the municipality of Arnhem was working to cut gas lines to the two neighborhoods.

The outcome of this was the communities felt betrayed because they believed their gas lines would be cut and the government, which they had formed close ties of communication with, had not informed or consulted them prior to the selection of the two communities. While the damage was controlled, there is a lingering mistrust now and the study was delayed because of the lack of public support. This experience has caused a lasting change within the climate department:

1. To favor co-creation with the public;
2. To cultivate a better understanding with inhabitants of both present and future goals;
3. And, to demonstrate the need to develop and learn how to communicate effectively with this established network of citizens.

2. Creating a consortium of companies
Budget: tea, coffee, meeting space
FTE: half-time for 5 months + support of team as needed
Civil servants at the municipality of Arnhem planned a series of three workshops over the course of three months to bring companies interested in sustainability and climate together and focused on taking actions. The themes of these workshops were: energy neutral and leading the energy

cluster, clean mobility, sustainable buildings, sustainable procurement, and fair trade. The breadth was used to attract a wide variety of companies and NGOs to attend.

Step 1: Invitations
To begin, the municipality called all companies which it had direct and indirect connections to ask if they would be interested in joining. In addition, NGOs which had a direct interest in any of the themes were invited and encouraged to use their own networks to increase participation. The local University of Applied Sciences also contributed in organizing and allowed the use of its rooms for the meetings.

Step 2: Workshops
It is important that these workshops cultivate connections and energy within the participants to take action. Colleagues within the municipality were asked to organize and participate in portions of the workshops which pertained to their fields (a government employee working on mobility organized that portion). This interdepartmental investment helped convince companies to invest in this experience and allowed the collaboration between departmental and climate goals. Activities in each workshop were framed to translate ideas into action and each project idea from the participants was collected. At the end of each day, participants were encouraged to invite and bring others to the next meeting. The first workshop had around 20 interested companies – at the end of the three months, 80 had signed commitments.

Step 3: Commitments
At the final workshop, attendees were asked to propose a concrete action which they would commit to completing. While the size was not important, the project had to be occur within Arnhem and be conducted using their own resources. Initially, the municipality was planning to monitor the projects after 1 year; however, the time and cost investments for such a scheme proved too great, so each party monitored and presented their own progress. Each group which committed signed a covenant with their project description and became an official member of the Arnhem Energy Covenant.

Project outcomes:

1. 80 signatories in 2011, which has grown to 120 in 2017
    - Board consists of 1 municipal actor and 4 from companies
2. Monthly energy cafés: less than €1000 per meeting
    - Monthly meetings organized by one of the members around a specific theme
    - Any participant can give a presentation about their idea, project, or problems and, if they want, can host the café to advertise their project
3. Projects: Connecting Partners
    - Often citizens and companies know what they want to accomplish in climate and sustainability but do not know whom to contact
    - The municipality acts as a network manager to connect the interested party with the proper resources and people within the network
4. Municipal Tendering:
    - The municipality prefers to hire companies who have committed to this covenant which also keeps companies interested and investing the sustainability

Current Ambitions:

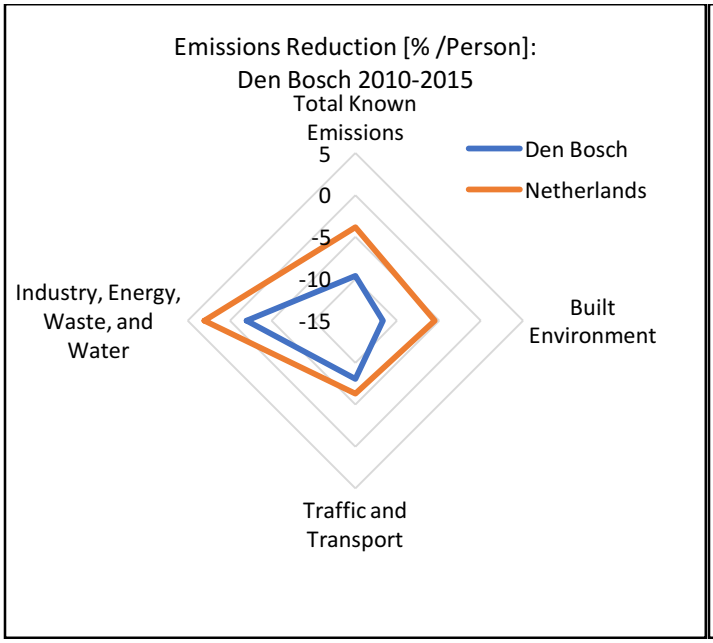
1. Low-cost renovations: "Nul on the Meter"
    - Working with one housing association, 95 buildings in Arnhem were renovated as part of a national program to develop building techniques to reduce the cost of significant renovations
    - Current cost: €60,000/home
    - Payoff after 30 years: €40,000/home

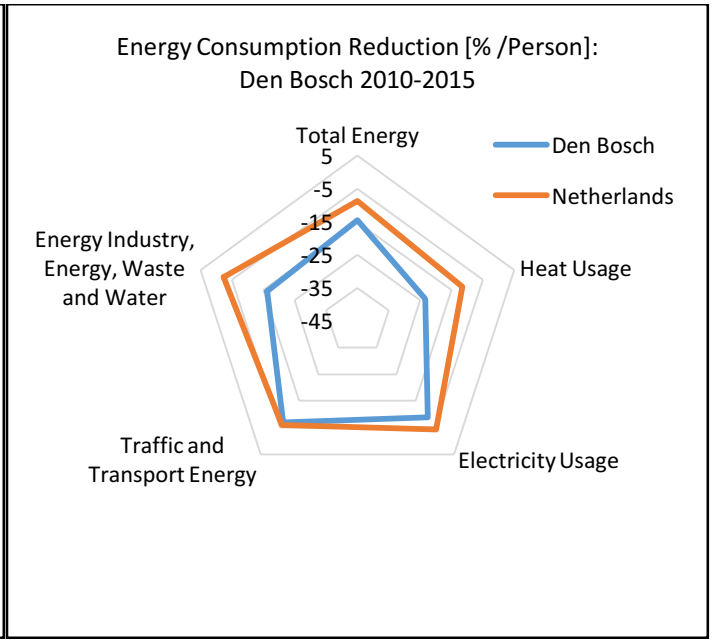
2. Renewable energy projects:
    - 4 large wind turbines;
    - 5 solar fields with an average of 8,000 panels/field

Documents:
New energy Made in [Arnhem] *Program 2015-2020*

4.4 Den Bosch

Area [km^2]	91.8	FTE	4
Population [2016]	152,479	Climate Budget	€ 230,000
Population Density [People/km^2]	1661	Climate Budget per Capita	€ 1.51
Population Growth [2010-2016]	11,693	Total Environmental Budget [2016]	€ 6,352,000
Duurzaamheidsmeter	88%	Total Budget [2016]	€ 727,165,000





Status of the municipality 2010-2015: Percent per capita

Emissions:	Energy Consumption:	Renewable Energy:
-10%	-15%	4%

Status of the municipality 2010-2015: Difference in Annual Statistics

Emissions [Tons]	Energy Consumption [TJ]	Renewable Energy [TJ]
-26950	-1035	507

Registered PV [MWp]	Wind Energy [MW]	LED Public Lighting
9.1	2.3	13.2%

Goals:
2020: Climate Neutral Municipal Organization.
2050: Climate Neutral.

Klimaatverbond membership: Yes.
Covenant of Mayors membership: Yes, as per September 8th, 2008.

Point of Contact: Energietransitie – Verbinder - Duurzaam

4.4.1 Municipal Status

As can be seen in the figures above, both heat usage and emissions in the built environment decreased significantly between 2010-2015 in Den Bosch. The fall in heat consumption accounts for around 70% of the total per-capita energy reduction observed per capita over the five-year period. However, rather than a gradual decline, this was observed in two distinct jumps, between 2010-2011 and 2013-2014.

The public climate plans from the municipality of Den Bosch are more extensive than most read for this study. In the city plan, it includes an estimate of the required investment to achieve energy neutral in 2050 (between €60-€90 million annually with a total of €2-€3 billion required). While it doesn't provide further detail into these numbers, they do provide perspective on the annual process budget of €230,000, which is 300-400 times less than the projected annual requirement. While I was unable to find actionable plans (sustainability strategies), I was told there are internal municipal documents which are said to be more substantial regarding the near future than those currently available to the public. However, while there is a roadmap to 2050, there is no action plan which has been set to achieve this goal.

With the perspective that the municipal budget alone is insufficient to achieve climate neutrality, the municipality has designated itself five roles which it will play in the energy transition: Facilitator, launching customer, funding and subsidy provider, permitting, and enforcement and monitoring[1]. The municipality must take a role which encourages and provides support for others to act in order to bridge the gap between the municipal budget and that which is necessary. From its peak in 2010 the climate budget of the municipality has dropped from €362,000 to €25,000 in 2016. This loss in funding is also an indicator of the change in the municipal role, focusing more strongly on facilitation of projects.

While in most situations the municipality acts as a facilitator, in Den Bosch there are cases where civil servants believe the government has power to directly impact climate targets. The first is in the enforcement of the Environmental Management Act which obliged energy savings measures to be taken if they have a payback time of up to five years. While enforcement was unsuccessful when the monitoring was done by the municipal Climate office, as of 2016, the Office of Enforcement now has the responsibility. The second instance is in negotiating contracts with the housing associations within Den Bosch. In addition, housing corporations can now include energy costs in rent, freeing up budget for and profits from increased efficiency measures taken during the natural renovation cycle. Finally, as with all municipalities, the government has direct control over their own building stock.

In the interview, there were a few driving questions which the municipality hopes to answer: What are the best ways to have a substantial climate impact? What are the best/most efficient ways to act? How to scale a pilot household project of 25 units to over 1800 households and companies? In addition, successful communication and advertising for climate and sustainability has proven difficult. While there is a poster, climate map, local newspaper articles, and an annual energy congress, these have yet to spur climate action in general.

4.4.2 Good Practice

1. EnergyNul73 Homes: Zero Energy Homes
In 2012, the municipality began a pilot for zero on the meter home renovations. Given the significant financial and technical issues presented, a small project was scheduled. In order to recruit participants, an advertisement was placed in the local paper notifying residents that the government was looking for participants in such a project. Though no benefits were offered, 25 homeowners responded and were connected to building and design companies which the municipality had previously contacted about conducting such renovations.

Upon monitoring the projects, only 4 out of 25 of the households were found to be energy neutral resulting from the renovation process: insulation, solar panels, and heat bumps were installed. 20/25 homes, while significantly more efficient did not achieve the goal of becoming energy neutral. While the majority of homes did not achieve energy neutrality, they were successful in dramatically reducing energy consumption and increasing efficiency. As a result, the municipality is now exploring options on how to scale this project to include up to 1800 homes by 2020. The first attempt to scale has been through the homeowners who have already renovated their homes, encouraging them to discuss their stories with their communities and convince others to participate.

2. Bossche Energy Covenant: Organization of Companies
FTE: 1 day/week.
Initial cost: €5,000-€10,000.
Annual Budget: €60,000.

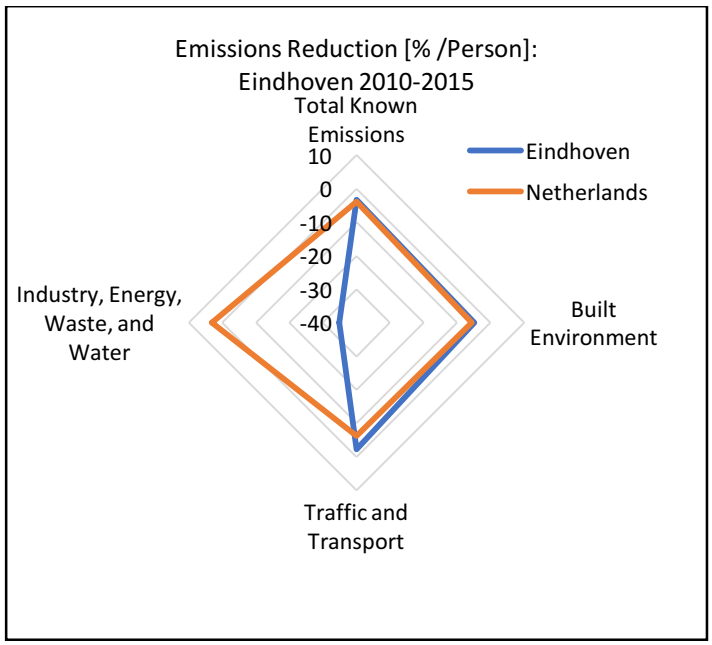
In 2010, the Bossche Energy Covenant began with two meetings set up by the municipality. The directors of the 20 largest companies/energy consumers within the municipality were invited to participate; the alderman played an influential role in convincing companies to join as well as the chairman of the BZW (Bossche Zeeuwse Werkgeversvereniging). The costs were used for outreach, scheduling, and, upon signing of the covenant, the website. After two meetings, 24 companies and institutions signed the covenant to participate in a 10% energy savings program over the next three years. The municipality played a facilitating role: organizing meetings, administration of the covenant, communication, and monitoring. While this initial program led mainly to small steps and projects, it achieved the desired awareness within the business community. In 2015, the covenant was renewed, with over 50 businesses and institutions pledging a 25% energy savings over the next 5 years, from 2016-2020.

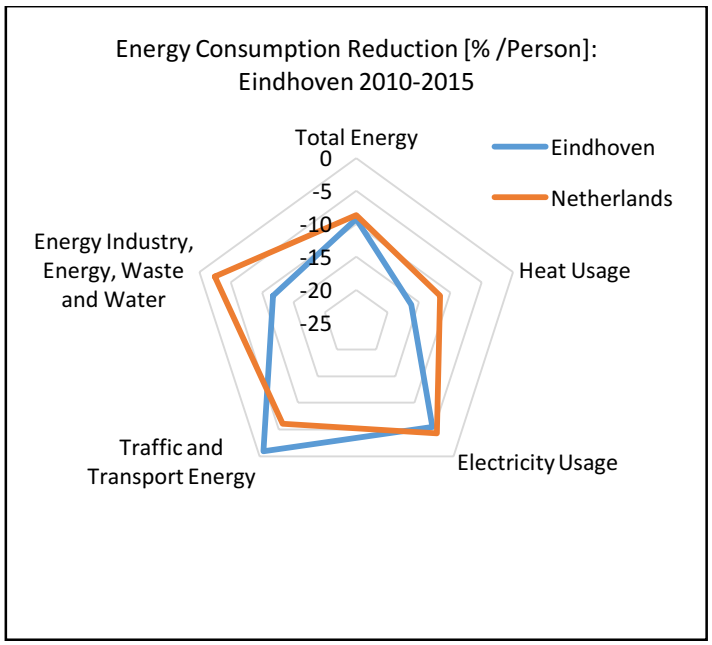
In addition to the energy savings required by individual signatories, the BEC has led to other spinoff projects within the municipality. Most notably, a project which combined the capabilities of the water treatment plant to produce biogas and project at the Heineken brewery. The partnership is scheduled to produce and then locally consume 4.7 million m^3 of biogas annually offsetting a large portion of the brewery's natural gas consumption, and allowing the wastewater plant to become energy neutral. This partnership was arranged through this municipal network, where the municipality merely connected the two interested parties and then stepped back for them to conduct their project.

1: Discussion Paper Climate 2016-2020

4.5 Eindhoven

Area [km^2]	88.9	FTE	5
Population [2016]	226818	Climate Budget	€ 750,000
Population Density [People/km^2]	2552	Climate Budget per Capita	€ 3.31
Population Growth [2010-2016]	10782	Total Environmental Budget [2016]	€ 10,290,000
Duurzaamheidsmeter	88%	Total Budget [2016]	€ 879,585,000





Status of the municipality 2010-2015: Percent per capita

Emissions:	Energy Consumption:	Renewable Energy:
-3%	-9%	3%

Status of the municipality 2010-2015: Difference in Annual Statistics

Emissions [Tons]	Energy Consumption [TJ]	Renewable Energy [TJ]
+8310	-1082	530

Registered PV [MWp]	Wind Energy [MW]	%LED Public Lighting
10.8	n/a	n/a

Goals:
2025: Fossil Free Municipal Organization
2030: 55% CO2 Reduction
2050: 95% CO2 Reduction

Klimaatverbond membership: Yes

Covenant of Mayors membership: Yes, as per 10th June, 2008

Point of Contact: Consultant Sustainable Energy

4.5.1 Municipal Status

The Municipality of Eindhoven aims to become a fossil free organization by 2025 with the entire municipality reducing emissions by 95% by 2050. Their intermediate goal, to achieve an overall 55% emissions reduction by 2035 requires an annual reduction of around 2.2% over the period of 2010-2035. As can be seen in the figures above, the municipality has only reduced its per capita emissions by around 3% over a five-year period and per capita energy consumption by 9%; however, the absolute CO_2 emissions have increased by over 8000 tons over the same period. I was told civil servants are aware of this, using the Klimaatmonitor to monitor their annual emissions. This is used not only because it is free but also because it allows the municipality to benchmark its actions against others within the Netherlands.

Eindhoven has written several strategies aimed towards achieving its climate targets. While neither the short- nor long-term documents are action plans, the strategies in the short-term strategy are thorough and written to show the monumental scope of the task at hand. The 5-year plan, currently from 2016-2020 was written to give more concrete direction. Projects implemented are evaluated annually, and the review is used to build up the portfolio of projects for the coming year. In this way, the overall scope remains the same, but the planning remains flexible enough to incorporate new ideas and drop those which were unsuccessful.

In addition, the Eindhoven documents include the expected cost of their strategy's implementation. Including this aspect places the municipal role and allotted budget in perspective, demonstrating to anyone reading the strategy that the municipal government cannot alone be responsible for climate mitigation. While the municipality has allotted a process budget of € 750,000, the total investment required is projected to be between € 80,000,000 and € 140,000,000 annually to implement the 2015-2020 climate-related projects[1]. Such projections are useful because they galvanize others and show the impact on and responsibility of the municipality as a whole (government, companies, and citizens) as opposed to just the climate office.

This dramatic difference in budget is an indicator of the role the municipal government must take in order to achieve its targets. Given the annual budget requirement is 100-200 times current the process budget, up to nearly 1/6 of the total municipal budget, entities outside of the government are expected to play a leading role in the transition. While legislation is a tool which could be used to push the climate agenda, it is seen as a less effective way to achieve climate/sustainability targets because, "[legislation] is always behind the facts." Companies and the market can react faster to changes and can take actions with fewer barriers. As a result, the goal in Eindhoven is to facilitate other actors, encouraging them to take increasingly ambitious climate actions and supporting their efforts wherever possible.

There are few areas where the municipal government has direct control over climate implementation. Clearly, the local government has control of its own building stock and public places and, in this area, can take a leading role to reduce emissions directly. Aside from municipally controlled land, however, the government in Eindhoven has power in two critical

areas. First, the enforcement of the Environmental Protection Act which mandates efficiency measures from large consumers with a payoff time of up to 5 years. In Eindhoven, this national legislation has just begun to be enforced as of January 1st, 2017. While the municipality had been aware of this legislation, it was not enforced until large companies within Eindhoven approached the municipal government requesting its enforcement. The companies wanted to implement efficiency measures but were not going to act unless others were also required to do so, leveling the playing field. As a result, 2.5 FTE have been hired solely to monitor and enforce the national legislation.

The second area where the government has explicit power is when negotiating with housing organizations. While there is the possibility to negotiate higher efficiency standards for renovations, this has yet to be done in Eindhoven in part due to the uncertainty as to which measures are the most cost effective overall for the municipality: district heating, zero on the meter renovations, heat pumps, etc. However, since the Paris agreement, the housing organizations have begun to see climate and sustainability as important issues. Climate actions are good for advertising and have reached a point where many are economically attractive to implement regardless of their social value or prospective emissions offset.

4.5.2 Good Practice

1. Energy Cooperatives
Budget: Max € 10000/year

There are currently two energy cooperatives within Eindhoven. The first began when a man called the municipality who wanted assistance starting an organization focused on climate. The aim was to increase citizens' awareness without direct funding from the municipality. As a result, the climate office offered to provide flyers and catering for meetings. The cooperative has developed independently, and provides a meaningful base of support for city climate projects.

The second cooperative wanted to work on the installation of solar panels, focusing on buying solar panels and placing them on another building. When asked for assistance, the municipality offered to provide such a roof in return for a manual on how the organization was able to circumvent the legal system which made it difficult to place solar panels on a roof which was not directly owned by the owner of the panels. The cooperative then independently organized a number of sessions to promote the purchase of solar panels within the municipality. These sessions resulted in the purchase and installation of nearly 4000 solar panels.

2. Heating without gas
Meetings: 6 over coming year
FTE: 20 hours/meeting
Budget: Meeting room and coffee

Low-temperature heating has become a buzzword over the past year in the Netherlands. As a result, in Eindhoven, the city council asked the climate office to write a plan to turn off the gas within the municipality. However, while the plan was mandated, the manner in which it will be written remains flexible. In order to generate a viable plan, 6 workshops will be held to include a wide

range of stakeholders from the municipality to participate in the planning process: housing organizations, local heating network provider, energy cooperatives, architects, contractors, and interested citizens, and other municipal departments (urban planning, permits, etc.).

The schedule of the meetings was made to make them attractive in series to the participants and to generate different discussions at each.

1. Presentation of the 2016-2020 action plan
2. What is missing from the plan? What conflicts/dilemmas are there? What is most important? What is the impact on you?
3. Address tension between interests of different parties
4. Other ideas: all electric discussion, alternatives to natural gas

5&6: Under discussion

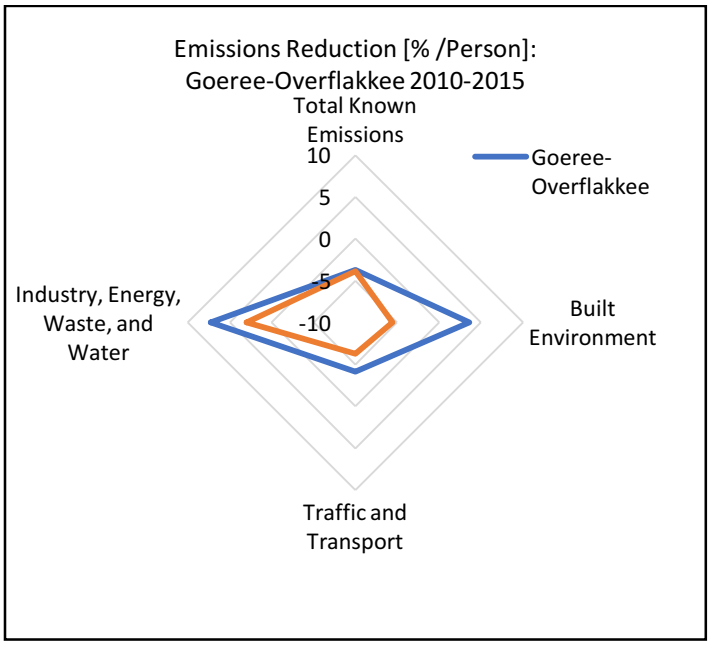
As the municipality, it is crucial to have clear ideas and a short list of options and the pros and cons of multiple proposed solutions. Meetings can then be run with the government actors as sources of information as opposed to those mandating the *only* solution possible within the community. If the government acts in this way, people feel like they can work together with to achieve not in opposition to the future climate plans. The start of this process was made far simpler because the city council asked for a plan to turn off the gas. Rather than having to convince the ministers or other city officials of its necessity, resources were already available to begin this process.

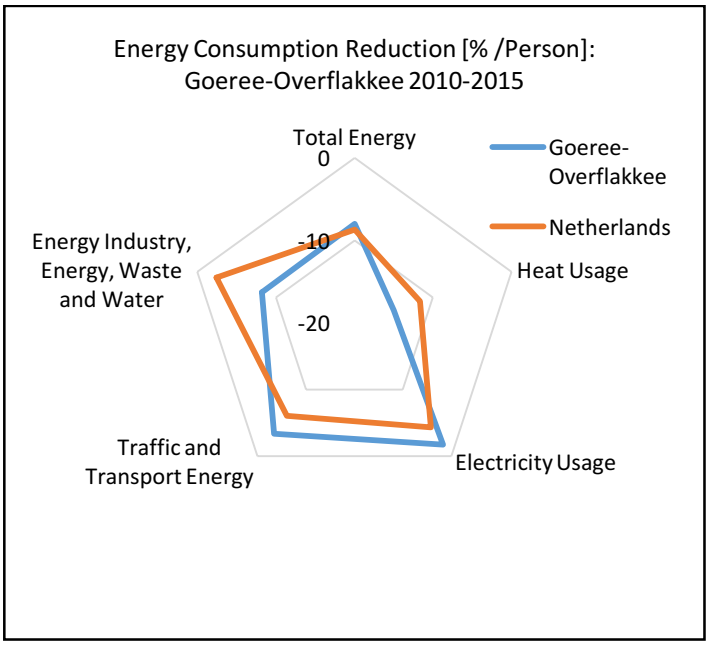
In addition to this process, any plans which are written must have clear and codified goals which are easily understood by the public. For example, “Energy Neutral” sounds great but is easily misunderstood, while “No Gas” is simple and clear with a definite message. When inviting stakeholders, focus on those which have a vested interest in such goals is crucial in the beginning of the planning process. Where connections already exist, reach out to those people. If not, attempt to find them using the existing network of the municipality. An invitation to the start of a major planning process gives these stakeholders the advantage of planning their own future business, as well as give them the opportunity to critique pieces of the process which may not be currently feasible or desirable.

1: Climate Plan 2016 - 2020 Reducing CO_2 emissions and adapt to Climate change

4.6 Goeree-Overflakkee

Area [km^2]	423.3	FTE	2
Population [2016]	48,594	Climate Budget	€ 75,000
Population Density [People/km^2]	115	Climate Budget per Capita	€ 1.54
Population Growth [2010-2016]	419	Total Environmental Budget [2016]	€ 1,858,000
Duurzaamheidsmeter	n/a	Total Budget [2016]	€ 128,818,000





Status of the municipality 2010-2015: Percent per capita

Emissions:	Energy Consumption:	Renewable Energy:
-3.68%	-8.05%	11

Status of the municipality 2010-2015: Difference in Annual Statistics

Emissions [Tons]	Energy Consumption [TJ]	Renewable Energy [TJ]
-12,124	-382	499

Registered PV [MWp]	Wind Energy [MW]	LED Public Lighting
7.3	75	12.1%

Goals:
2020: Climate Neutral

Klimaatverbond membership: No
Covenant of Mayors membership: No

Point of Contact: Beleidsadviseur Duurzaamheid

4.6.1 Municipal Status

Goeree-Overflakkee aims to be climate neutral in 2020. This target was set in 2010 and, while there has been substantial movement since then including the construction of 11 additional large wind turbines, the municipality still lacks the significant progress required to be on track for this goal. There are several documents which discuss goals for the municipality, but a public actionable plan which will take the municipality to its goal of energy neutral was not found. However, I was told there exist more detailed internal documents regarding the road to climate neutral which are not available to the public. The program overview "PROGRAMMA DUURZAAMHEID: Factsheet stand van zaken gemeente Goeree-Overflakkee 2016" provides roadmap towards their goal; however, the reported total renewable energy production, 1733 TJ/year, is almost precisely 3.6 times greater than what is recorded by the Klimaatmonitor (see above). This could be due to a mistake in calculations when converting kWh to TJ.

The ambitious goal assists the municipal role in climate action: facilitator, ambassador, and consultant. With such grand ambitions and looming date for completion, urgency and excitement can be fostered within other municipal departments as well as the public. I was told that climate targets must be ambitious and, if possible, connect to an economic agenda, showing how people and companies can make money by implementing such plans. It was also clear that if climate vulnerability can be connected to mitigation plans and targets, this will facilitate the implementation process. However, since emissions reductions and increases in efficiency are occurring on a small scale and it can be hard to imagine how one household can affect the occurrence of a large storm or other weather event.

The barriers currently faced in Goeree-Overflakkee are centered around planning and process: How to share the urgency of climate action? At which stage should different parties be involved in planning? How to approve a portfolio of projects within the time constraints? Generating a portfolio of projects which will achieve climate neutrality in three years is quite a task. In order to achieve their goal, this singular vision must be spread to and shared by all significant parties within the municipality: municipal actors, companies and businesses, and the public. Acting as facilitators, climate actors can advertise and spread successes, using those cases to spread the knowledge of what people can achieve and how. And, with an established vision, answering "why should I act?", knowing "how to?" becomes the key priority.

While the current climate budget and 2020 target appear to be entirely out of proportion to each other, I was told definitively that "[the municipality] always has some money for projects." This can be crucial for action as the municipality can provide seed capital for new ideas or help create a business case by becoming an early adopter. However, process money, used to bring parties together to meet, brainstorm, and plan can be difficult to obtain. Such meetings enhance the potential for crossover and cooperation between different actors, but, without a budget for these processes being prioritized, it can be difficult to begin such collaborations.

4.6.2 Good Practice

1. Wind Turbines: External Pressure

The energy neutral ambition began in 2010 when the Dutch government stated that there would be a significant number of wind turbines built within Goeree-Overflakkee. The municipal government decided to take the responsibility over the placement of the windmills, which produced two crucial benefits: the citizens of the municipality were able to have input in the process over the placement and number of turbines; public opinion put the municipal government and public on the same side "fighting" the national government. The conversation with regards to turbines was not an argument over should they be built, but rather a discussion of where they should be constructed.

Location Meetings:
15 meetings: 5 locations, 3 meetings per location
Budget: 1000-1500 euros/meeting
FTE: 25-30 hours total required to set up a meeting

Over the course of two years, 15 workshops were held regarding the future locations of the wind turbines. These were set up as an information market as opposed to a presentation format because a stage is a gift for the opposition, giving the loudest "NO!" an audience. Communities were informed using local newspapers, letters, and postings on the municipal social media. Early in the talks, the maximum number of wind turbines was used, and then the people "bargained" the number down. This again gave the public a "win" and helped to cement the municipal government's position on the side of the people.

Barriers:
The specific locations were finalized between 2016-2017. However, despite the significant investment in public meetings, the "Not in MY backyard" arguments are being made, in particular by those who did not participate in the planning process forcing the question, how and when is it best to involve the public?

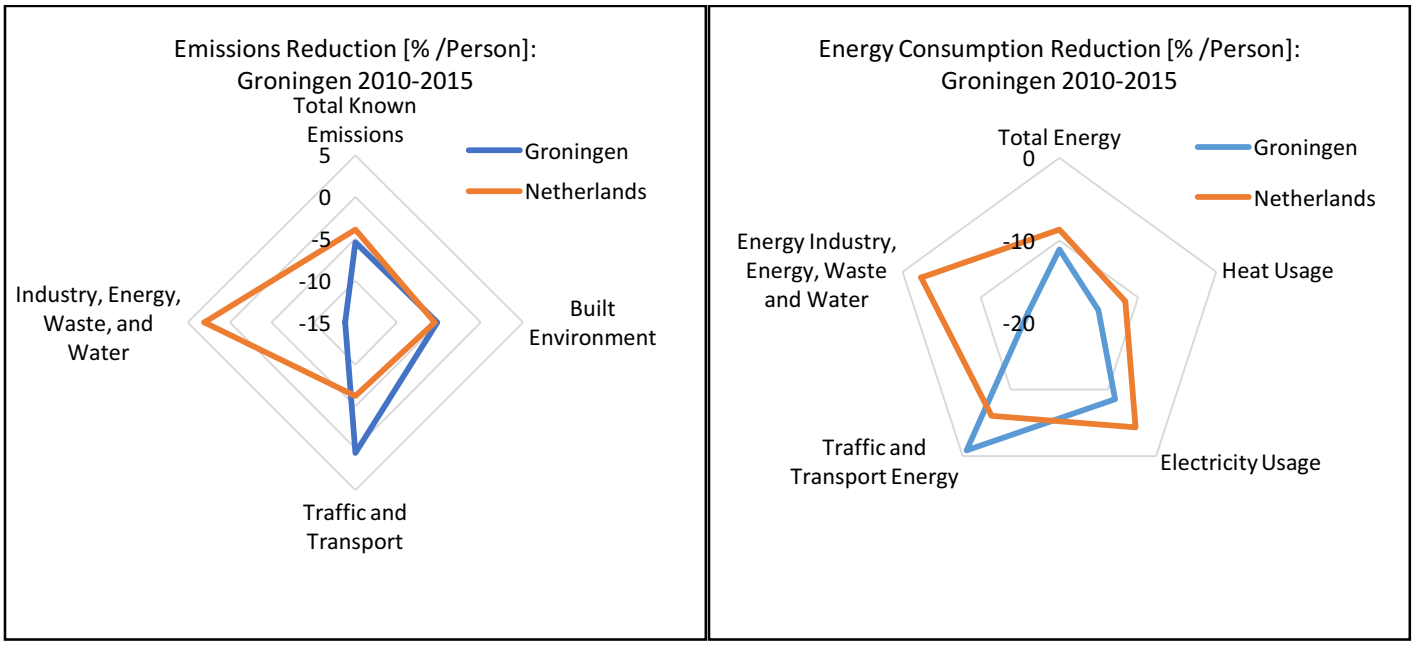
2. Municipality: interdepartmental engagement
Colleagues within the municipality can change the way they approach their own projects, but this change will not happen without effort. In Goeree-Overflakkee, there was no inherent interdepartmental support for climate action. However, in such a case, this capacity must be developed. Central to the discussion is, who is responsible for achieving climate targets within the municipality? Rather than attempting to guilt others into action, focus on empowering them with knowledge and support. This requires significant time and effort to make it easy for others to act and use sustainable methods in their work. Crucial questions:

1. What projects are you currently working on and/or struggling with?
2. What requirements are there?
3. What can I do to help you achieve your targets?

Documents:
Municipal Website: https://www.goeree-overflakkee.nl/duurzaamheid/
PROGRAMMA DUURZAAMHEID: Factsheet stand van zaken gemeente Goeree-Overflakkee 2016

4.7 Groningen

Area [km^2]	83.8	FTE	16
Population [2016]	201,806	Climate Budget	€ 1,800,000
Population Density [People/km^2]	2,474	Climate Budget per Capita	€ 8.92
Population Growth [2010-2016]	10,961	Total Environmental Budget [2016]	€ 2,256,000
Duurzaamheidsmeter	n/a	Total Budget [2016]	€ 989,443,992



Status of the municipality 2010-2015: Percent per capita

Emissions:	Energy Consumption:	Renewable Energy:
-5%	-11%	1%

Status of the municipality 2010-2015: Difference in Annual Statistics

Emissions [Tons]	Energy Consumption [TJ]	Renewable Energy [TJ]
+323	-969	281

Registered PV [MWp]	Wind Energy [MW]	LED Public Lighting
9.7	0.1	n/a

Goals:
2025: 50% CO_2 Reduction
2035: Energy Neutral / Emission free

Klimaatverbond membership: Yes
Covenant of Mayors membership: No

Point of Contact: Senior beleidsmedewerker duurzaamheid

4.7.1 Municipal Status

The annual emissions in Groningen have increased by 323 between 2010-2015; however, the per capita emissions declined by around 5% over the same period. The population grew by over 10,000, around 5%, but the municipality was able to achieve an 11% per capita reduction in energy consumption. These gains in efficiency were for the most part due to a consistent reduction in heat consumption per capita within the municipality. Over 80% of the annual intensity reduction per capita was due to reduced heating demand within the municipal boundaries, a net reduction in heating of around 1000 TJ annually. However, to be on track to achieve their 2025 goal of a 50% emissions reduction, the municipality would have had to decrease its annual emissions by over 16% over the 5-year period. Further, to be on track for the 2035 emission free goal of 2035, a 20% reduction would be required between 2010-2015.

Several climate strategies have been written in Groningen, the most recent of which the Program 2015-2018 highlight the five policy lines on which the municipality intends to act: sun, wind, heat, energy efficiency, and biomass. While none of these plans constitutes an action plan, the documentation is thorough with regards to the municipal role and how the government intends to achieve emissions reductions. The city of Groningen is one of the many actors in the energy and sustainability debate. Energy neutral in 2035 can only be achieved if all other actors participate, including residents, knowledge institutions, and companies[1]. In addition, the municipal government is investigating whether it is possible to achieve its climate targets within the municipal boundaries alone. Not only that, it also aims to answer the questions, are optimal solutions available on such a small scale? And, on what scale should climate solutions be organized?

As mentioned in our interview, over 80,000 houses within the province of Groningen must be renovated to repair damage from earthquakes. This represents a large opportunity for both the province and all the municipal governments to take action to convince homeowners to renovate towards zero on the meter. Unlike other municipalities, where renovation cycles are unknown or not monitored, in Groningen houses which have suffered damage must be renovated. In order to facilitate this, the local government has begun to communicate more closely with those who are seeking information on home energy improvements. Through these connections, the government wants to learn how to better encourage homeowners to choose to make energy renovations and why people either choose to or not to renovate to higher energy standards.

The Environmental Protection Act has yet to be enforced in Groningen. To better understand the potential gains of doing so, the municipality commissioned a study to document the total energy consumption within the municipal boundaries. It was found that over 50% of municipal energy is consumed by businesses; moreover, of that total, nearly 80% of the energy is consumed by only 15 % of the companies. However, the municipal government has yet to implement reforms or create a budget to enforce the nationally legislated renovations. It was suggested that the municipal government was waiting for the province to mandate companies' compliance or another measure which would level the playing field for industry to not encourage business to move to other municipalities. Further, the goal of the local government is to facilitate, and aims to find mutually attractive joint solutions with companies.

Nearly 40% of the houses within the municipality are owned by housing organizations. While the municipality could negotiate to mandate higher standards for renovations, in Groningen they have stuck to the nationally expected average of level B by 2020. In our interview, I was told that the municipality had little legal means to enforce or mandate a higher standard and aimed to use other means to achieve their targets. To do so, the municipality supports a sustainability Loket, which began in 2014. In this way, homeowners are supported when investigating efficiency measures in planning, payback, and choosing building contractors. The municipality also commissioned a study to assess the total solar potential of all rooftops. As a result, all actors have easy access to the potential energy generated from their roofs, and expands the potential for collaborative efforts between interest parties.

One significant barrier experienced in Groningen is the provincial governments obstruction of the development of wind turbines within the municipality. According to the province, there is no suitable landscape in the municipality for wind turbines, regardless of the municipal ambition to construct up to 10 large turbines within its borders. While the municipality is responding through legal channels, it is also developing a plan involving private citizens to reduce the provincial opposition. Plans include excursions with the provincial council to existing wind turbines, inviting the press to cover the story, and conducting a feasibility study to back their claims. The hope is that through networking and data, the "no" can be overturned, increasing the potential for renewable energy production within the municipal boundaries.

4.7.2 Good Practice

1. Energy Cooperatives:
Budget: none
Role: mutual cooperation, no official role

There are 3 energy cooperatives active with the municipality of Groningen. The largest, Grunneger power began over six years ago, but struggled after national legislation made it difficult to act. The cooperative approached the municipality for a € 200,000 loan, stipulating that they wanted to remain an independent entity as opposed to creating a contractual partnership. The loan has since been repaid, but the municipal support strengthened the relationship between the two entities. Currently, the energy cooperative has nearly 1000 members and is currently developing a solar farm project which is slated to contain 7777 PV panels.

The municipality's decision to support the cooperative was to foster groups of people interested in participating in the energy transition – a practice firmly rooted in their climate strategies. Not only do cooperatives have the capability to implement large projects, as mentioned above, but also builds support for future climate actions within the municipality. Rather than requiring legislation or other municipal "sticks" to provoke action, energy cooperatives can be the first adopters towards achieving climate goals. With large groups of people already interested in the energy transition, targets, such as turning off the gas in a neighborhood, become more possible. A cooperative in Groningen has made this their single aim, lending support to the municipality as it organizes support from the network companies, the municipality, and mobilizes other citizens to engage.

2. Company energy coalition
Budget: ~€ 1000/meeting
Meetings: 3/year
FTE: 2

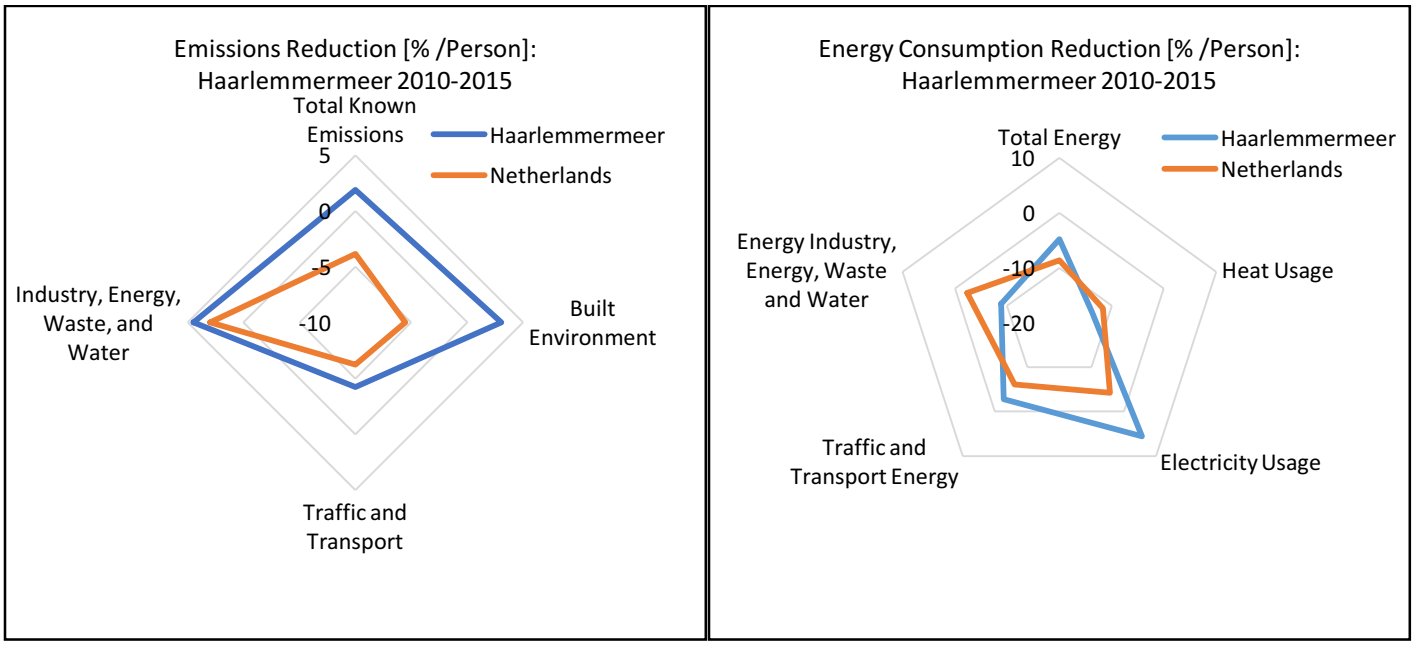
In 2015, 20 of the largest companies in the municipality of Groningen signed a letter of intent to speed the energy transition. Policy actors wrote letters to 25-30 companies asking them if they wanted to participate in the signing at the Trans-Future Festival, a large event in Groningen. The signing was a side event at the festival, and the municipality invited the local papers and advertised the initiative on social media, ensuring that the event was well known within the municipality. Companies were attracted to sign not necessarily by their intent/urgency to implement climate action but because of the positive publicity they could gain through virtually no commitment.

Since its inception, the energy coalition has evolved into the energy monitor within Groningen. Signatories pledge to transparently publish their energy consumption and their plans to curb emissions or increase efficiency. The municipality intends to double the number of signatories from the initial 20 to 40 by the end of 2017. In addition to the local monitor, around 3 workshops are planned annually around specific climate topics of interest to coalition members. Experts are brought in to run each workshop, and policy workers from the municipality, companies, new parties, and cooperatives are all invited to take part. The network continues to grow; currently, between 40 and 50 people attend each meeting. With 2 FTE focused on events and communication, the municipality has the resources to continue to innovate with this coalition's growing membership. The most recent addition was designing roundtable discussions for members to discuss barriers to climate action.

Documents:
1: Program 2015-2018

4.8 Haarlemmermeer

Area [km^2]	185.3	FTE	5
Population [2016]	145,762	Climate Budget	€ 500,000
Population Density [People/km^2]	787	Climate Budget per Capita	€ 3.43
Population Growth [2010-2016]	1144	Total Environmental Budget [2016]	€ 9,818,000
Duurzaamheidsmeter	n/a	Total Budget [2016]	€ 402,084,000



Status of the municipality 2010-2015: Percent per capita

Emissions:	Energy Consumption:	Renewable Energy:
+2%	-5%	3%

Status of the municipality 2010-2015: Difference in Annual Statistics

Emissions [Tons]	Energy Consumption [TJ]	Renewable Energy [TJ]
+43940	-852	528

Registered PV [MWp]	Wind Energy [MW]	LED Public Lighting
9.5	13.4	21.3%

Goals:
Energy Reduction: -1.5% per year
2018: -5% Energy Reduction [-1200 TJ]
2020: 14% RE
2023: -12% Energy Reduction [-3000 TJ], 16% RE
2050: 60% Emissions reduction Mobility and Transport

Klimaatverbond membership: Yes
Covenant of Mayors membership: No

Point of Contact: Procesleider Energieakkoord

4.8.1 Municipal Status

Emissions increased by 2% in Harlemmermeer from 2010-2015. While there was a decrease in energy consumption, mainly due to a reduction in heating demand (-13%), the increase in electricity consumption coupled with the high emission factor for electricity led to the increase in overall emissions. However, given the relatively modest short-term goals of the municipality which focus on energy as opposed to emissions reduction, it is still plausible they will be met. This will depend on if the municipality can determine and implement measures which will increase the rate of energy reduction to achieve its 2023 target of -3000 TJ.

The most recent plan found for Haarlemmermeer, Haarlemmermeer Duurzaam 2015-2018 Def, is a sustainability strategy, focusing on the reduction of energy intensity within the municipality. For this reason, the CO_2 emissions are not listed per sector; however, the sectoral energy consumption is. The previous sustainability document, programma Ruimte voor Duurzaamheid 2011-2014, listed the target of a 30% CO_2 reduction by 2020, but this target was not repeated in the 2015-2018 strategy. While the short-term goals are relatively straightforward, the long-term goals of the municipality are tied directly to those of the greater Amsterdam metropolitan region. Since the municipalities in the region have similar ties to industry, production, and consumption, Haarlemmermeer joined the collective aim as opposed to setting its own energy neutral target.

According to the Haarlemmermeer Duurzaam 2015-2018, the municipality plans to put energy savings as the first step to achieving climate targets, seeing this as the most cost-effective strategy. The municipal government's role in this process is that of a facilitator, providing information showing the financial benefit of energy savings, creating alliances with stakeholders to establish a common agenda for action, and working with such partners to exploit opportunities[1]. This role represents a fundamental change from that of previous years. New competences and capacity must be developed, especially those related to stakeholder management. The focus must now be on working with actors outside the local government to develop policies and initiatives as opposed to making policy for the municipality. The municipality can act as a promotor, financer, and a market developer to kick start projects and build a consumer base for new ideas and business models.

This role as facilitator is supplemented with other by actions over which the municipality has direct control. Planning and future strategies play a crucial role, and the municipal government should take a leading role, giving direction to other actors. However, in Haarlemmermeer, there is currently little money available for processes, planning and development. Most of the climate budget is allotted for projects, but it is very difficult to find process money. The local government also has control over its building stock and renovations, as well as public spaces and lighting. Through their renovation, the municipality can provide examples for other developers as well as demonstrating the feasibility of a process as a first adopter.

4.8.2 Good Practice

1. Lisserbroek: Energy Cooperation
Goal: 18000 solar cells
50% community investment
50% private company
Lisserbroek began the initiative because the town was very motivated to achieve their own sustainability targets. As a result, by the time they approached the municipality to ask if the local government would be involved, they had already developed a network of interested parties and participants within the town ready to support the initiative. This was a critical step as such projects require a local connection in order to be implemented and Lisserbroek had already self-organized allowing the project to progress quickly. The municipality was enthusiastic because it aims to develop local energy markets and worked with the initiative to find a company which would be interested in developing a model for the implementation of the project which is expected to be completed in May, 2017. This project, and other similar ones where citizens or other interested parties are passionate are a boon to civil servants, boosting their energy and enthusiasm because projects can really happen.

2. MeerMaker: Municipal company for sustainable projects
Budget: €3.3M
Offer: Sustainable projects can get up to 40% financing
Outcome: 10 projects co-financed so far between 240k and 400k per project

The project began with the municipality searching for how it could initiate a company which contributes to sustainability. A statement was published by the city council regarding energy savings in residential housing, current funds available, and the possibility of working together in with external parties to achieve the goal of creating a company. Civil servants then took several steps to pursue this goal: researching possible business constructions and their successes within the Netherlands; speaking with external parties which could potentially partner with the municipality and asking for advice on how best to create this company. Several options were considered, but those two which were most prevalent were the municipality running the company itself and finding entrepreneurs to partner with and seek funding.

It took 1.5 years for the city council to finally vote on the project. In the end, it was decided that partnering with entrepreneurs was the best decision for the municipality. The strength of this form (a private limited company) is that it is independent of the municipality and is trustworthy for other entrepreneurs and customers alike. Significant time and effort was required to research restrictions, financing, tender obligations, partnership and control, and project criteria required for investment/support from this new company. Since the company was established, the current municipal role is one of supervisor, ensuring that the municipal assets are being invested properly in projects which fit the criteria and that the money is still revolving.

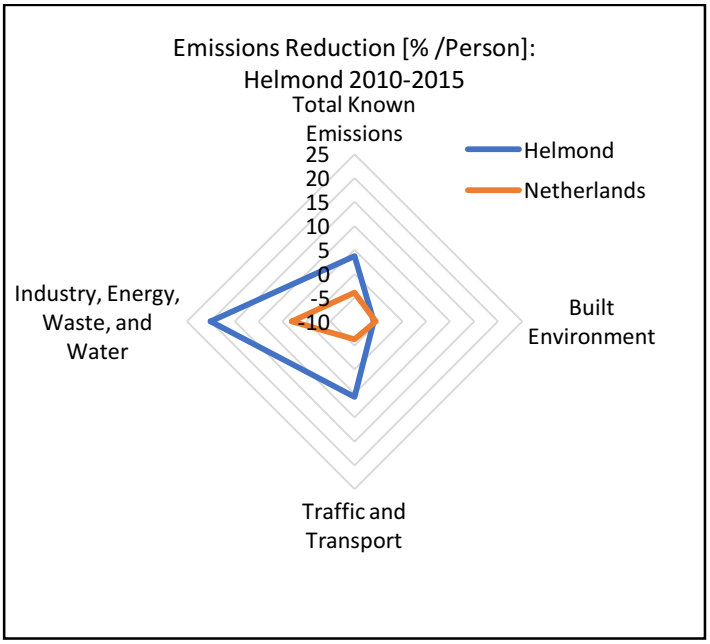
Initially, enough outside investors were found to give a 10x multiplier for municipal funds, but this wound up reducing to around 4x – still a significant boost to the initial funds available. Sustainable projects which fit the criteria are able to get up to 40% financing, and, since its inception 10 projects have been co-financed with between €240k-€400k per project from the fund, and a total of nearly €8 million invested in projects within Haarlemmermeer. One project of note

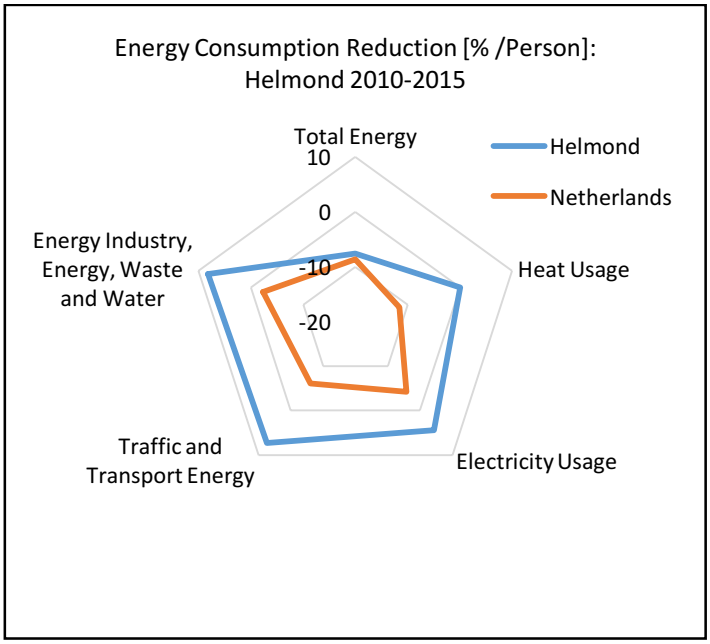
was the Tegenstroom Ymere, a solar implementation project for 1000 households within the municipality.

Documents:
1. Haarlemmermeer Duurzaam 2015-2018 Def.pdf

4.9 Helmond

Area [km^2]	54.8	FTE	7-8
Population [2016]	90527	Climate Budget	€ 400,000
Population Density [People/km^2]	1653	Climate Budget per Capita	€ 4.42
Population Growth [2010-2016]	1567	Total Environmental Budget [2016]	€ 4,690,000
Duurzaamheidsmeter	82%	Total Budget [2016]	€ 369,463,000





Status of the municipality 2010-2015: Percent per capita

Emissions:	Energy Consumption:	Renewable Energy:
+4%	-7.63%	2%

Status of the municipality 2010-2015: Difference in Annual Statistics

Emissions [Tons]	Energy Consumption [TJ]	Renewable Energy [TJ]
+31058*	-454	140

*Excluding emissions due to Agriculture

Registered PV [MWp]	Wind Energy [MW]	LED Public Lighting
4.0	n/a	n/a

Goals: 2035 Climate neutral

Klimaatverbond membership: Yes
Covenant of Mayors membership: Yes, as per 3rd November, 2009

Point of Contact: Programmamanager Duurzame en Gezonde Stad

4.9.1 Municipal Status

Emissions increase in Helmond by around 4% between 2010-2015 caused by an increase in emissions from Industry, Energy, Waste, and Water according to the Klimaatmonitor. While there was, however, a modest decrease observed in the Built Environment, these data show distinct jumps and drops per year as opposed to a gradual trend. The energy intensity in the municipality, however, dropped by nearly 8%. While those data in the Klimaatmonitor are incomplete for Heat Usage, it can be inferred from those other statistics collected that the only reduction in intensity occurred in this sector. Based on how Total Energy Consumption is calculated, it is reasonable to estimate a 16% reduction in Heat Usage per captia over the 5-year period.

Climate action in Helmond began in earnest in 2015 with a sustainability conference run by the municipality. The most recent climate strategy within the municipality, Programmaplan Duurzame en Gezonde Stad, is a broad strategy which includes health and other topics related to making Helmond livable. The strength of the strategy is in the actions which are planned in some detail including project hours required. However, despite having submitted a plan to the Covenant of Mayors, a roadmap to achieve the 2035 target of climate neutral was unable to be found. And, while the climate strategy has been written, its implementation will not directly lead to significant emissions reduction. One main goal for the coming year is to plan how to achieve the climate targets of the municipality. This, in addition to capacity building are now priorities.

The Programmaplan states that the only way targets will be achieved is if all external parties within the municipality are engaged in the process: this includes business, universities, the government, and private citizens. One significant challenge presented itself as a result of a study commissioned by the municipality to investigate heating options within Helmond. Since 2009, the municipal government has championed “null on the meter” renovations for housing. However, the study form CE Delft suggests that the lowest overall costs with greatest returns are generated by district heating powered by renewable sources, with home renovations to a far lower standard. Given the need to engage citizens in the energy transition, messaging is paramount, and, since the municipality has been championing null on the meter, this alternate conclusion could cause some damage to existing municipal networking efforts.

The municipality has the power to make actions possible, and to generate interest amongst all sectors of society. In 2015, a 3-day conference was held in Helmond focused on sustainability within the municipality. Ambassadors invited participants as opposed to municipal employees because in this way people would actually attend. This conference which gathered 120 people generated movement, excitement, and as critical in the development of the current action plan. It was this conference which has galvanized the sustainability topic, spreading through the government, industry, and private citizens. It should be mentioned that in addition to conversation, there are 3 energy cooperatives active within the municipality. While all of them are consistently invited and participate in city meetings on climate and sustainability, they maintain their own autonomy and work towards their own, individual goals. However, though empowerment of others is possible, the municipality has little ability to mandate climate action within its limits.

Successful collaboration with other municipalities, while a priority, is currently challenging for climate actors in Helmond. While there are meetings with the large 5 municipalities in North Brabant, active collaboration is minimal. Rather, the meetings can feel quite competitive, with counterparts looking at each other for ideas which they need to remain in front as opposed to sharing how projects were done. The mentality being, if they have project "X" then I must have it by the next meeting. Given the large financial and time investments required in designing, planning, and implementing projects, this mentality can slow progress as civil servants duplicate work as opposed to upscaling successful initiatives.

4.9.2 Good Practice

1. Helmondse Energy Community
Members: >40
Meetings: 4/year
FTE: ~0.2

The Helmondse Energy Community began as the result of the manager of an industrial park in the municipality wanted to reduce emissions in Helmond. The park manager spoke with and convinced the companies within the park to join the coalition. The municipality was supportive of the effort but believed that the project would be more successful if the message for sustainability was the story of the industrial park as opposed to that of the municipal government. The community began with 10-12 interested companies and has now grown to over 40 companies within Helmond. The community has been run by the park manager with around 0.2 FTE of municipal time required to support the community.

The initial agreement stated that any signatory would reduce emissions by 10% over the coming three years. The municipality originally was to monitor their progress, but, after the effort required to do so was realized, this ambition was shelved. Given the difference in products, supply lines, and energy flows of each business, it was decided that they could better self-monitor their own progress. While the original covenant mandated a certain emissions drop, other companies which had already taken efficiency measures wanted to join. As a result, the covenant was rebranded as a community, and the stringent signing measure was reduced depending on the individual business interested. Community meetings are hosted and run by companies within the community. Again, the municipality merely plays a supporting role, ensuring that the community will remain active.

Lessons learned:
1. Always work with interested parties to spur climate action
2. Monitoring and reporting require significant investment of time and resources
3. Messaging from a source external from the municipality can be incredibly powerful

<u>Unsuccessful projects:</u>

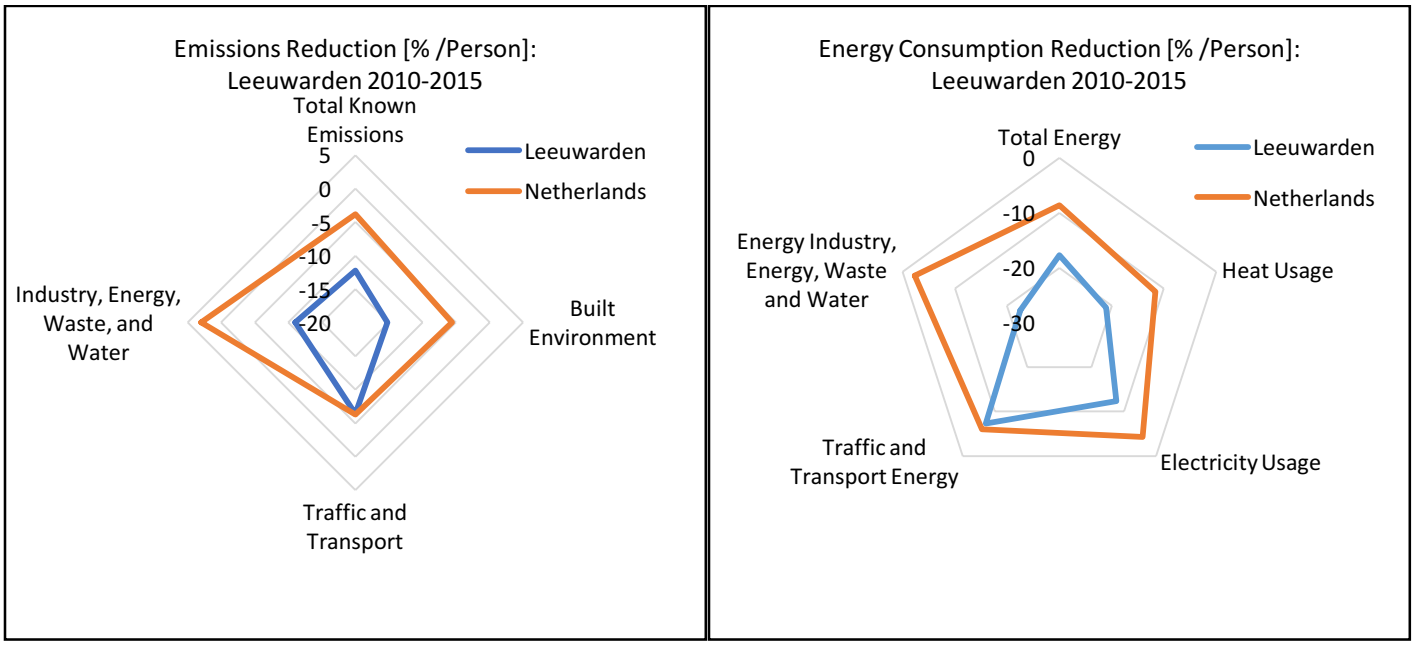
1. Community Meetings:
Meetings were held in each neighborhood in the municipality to encourage homeowners to renovate to a higher energy standard. Neighborhoods were ideal because they offer small communities the opportunity to collectively invest, potentially reducing the startup costs if all

projects are aligned. Participants were invited through an article in the newspaper and a letter to their house. Each meeting was structured as a lecture; presentations were given about potential and merits of housing improvements; however, these were not workshops or structured with working groups. In addition, at every meeting the municipality offered to give residents free energy scans to show them where and how to reinsulate, but there was little interest amongst participants.

Documents:
Programmaplan Duurzame en Gezonde Stad

4.10 Leeuwarden

Area [km^2]	167	FTE	n/a
Population [2016]	108719	Climate Budget	n/a
Population Density [People/km^2]	651	Climate Budget per Capita	n/a
Population Growth [2010-2016]	13059	Total Environmental Budget [2016]	€ 10,290,000
Duurzaamheidsmeter	93%	Total Budget [2016]	€ 879,585,000



Status of the municipality 2010-2015: Percent per capita

Emissions:	Energy Consumption:	Renewable Energy:
-12%	-18%	3%

Status of the municipality 2010-2015: Difference in Annual Statistics

Emissions [Tons]	Energy Consumption [TJ]	Renewable Energy [TJ]
-728	-614	239

Registered PV [MWp]	Wind Energy [MW]	%LED Public Lighting
10.8	5.2	12%

Goals:
2020: 20% Energy Saving with respect to 2010 & 16% Renewable Energy
2050: 80-95% CO_2 Reduction

Klimaatverbond membership: Yes
Covenant of Mayors membership: No

Point of Contact: Energiecoordinator, Beleidsadviseur Duurzaamheid

4.10.1 Municipal Status

Carbon emissions and energy intensity in Leeuwarden decreased significantly between 2010-2015. The energy intensity to such an extent that the municipality, according to the Klimaatmonitor, is ahead of its target of 20% energy savings by 2020. However, while modest reductions per capita were seen between 2010-2013, the majority of the savings, over 75% per capita, occurred between 2013 and 2014, primarily in heat usage. This reduction in energy intensity is mirrored by the CO_2 emissions which have a large drop per capita in the built environment over the same period. This drop in energy intensity and emissions suggests a sudden change within the municipality as opposed to what could be expected from the gradual implementation of a policy.

The most recent climate strategy found for Leeuwarden, the Energy Agenda 2016-2020, outlines the strategy which the municipal government plans to take to achieve its climate targets. Given the short-term goal of achieving 20% energy savings in 2020, the strategy includes sectoral energy consumption data and the goals, per sector, which the municipality aims to accomplish as opposed to the emissions. However, while there is a breakdown of some activities for the year 2016-2017 and the overall milestones which will be required to achieve their goal, this does not include budgeting or process of how those actions will be implemented.

The municipal role is broken down into 5 areas, focusing on how the municipality can both facilitate others to speed climate action: client, investor, supervisor, facilitator, and stimulator. While each area of action is important, the underlying theme is that the municipal government cannot accomplish its targets in isolation and is relying on support from the community, businesses, and other levels of government to implement actions and achieve those climate targets settled upon in the plan. It was suggested in my interview that the critical piece necessary to achieve climate successes was projects must directly benefit the local economy. Rather than championing climate and sustainability for their own rewards, use such ideas to encourage growth, jobs, and investments.

In addition, while the municipality has the capability to be involved in the breadth of topics which impact climate targets, the local government should not be the project leader everywhere, rather, stay involved and let outside parties late the lead. While the municipality can be loath to commit funding to a project, if around 5 local businesses are interested and willing to support some of the project economically, approval will come through the government. Funding is never a problem if a favorable comparison can be made between the outside investment and municipal bill when a project will work towards climate issues.

A lesson learned early in the life of the climate department of Leeuwarden was that news and publicity can ensure continued municipal action. When the program was in danger of being cut in 1997, it was decided to get climate projects and programs in the news at least 100 times within 6 months; this could be an article or a spot on a local TV or radio program. Calling reporters, publicizing their work, and reaching out to the community, this goal was met and demonstrated continual public interest in what the municipal government was accomplishing with regards to climate. This interest gave energy to those working within the municipal government to continue their work on climate and increased intradepartmental collaboration as other civil servants

recognized the shift. As a result, rather than being cut in 1999 as was potentially scheduled, the department doubled in size.

4.10.2 Good Practice

1. Business involvement: Project teams

Organizing at least 5 companies to buy into a given project prior to presenting it to the municipality presents an opportunity to create permanent partnerships between those businesses and the municipal government. Given the longevity of climate action in Leeuwarden, a substantial number of projects have started with a group of companies investing and taking their idea to the municipal government. Since, each business has a stake in the process, and, likely, benefits from any success, they have a vested interested in cooperating with each to ensure a positive outcome. However, in Leeuwarden, this was taken a step further. Rather than ending collaboration upon a project's completion, civil servants kept in contact with them as a unit: green gas, electric boats, etc.… So, each sector had an established group of companies which had worked together with the municipality to achieve a climate target. These ties were held by continued work, continued relationship with the municipality, and prestige of being the 1st group of their particular type within the municipality, ensuring future work in that sector.

Currently, these more isolated groups are being reorganized into a larger, codified consortium. Willing parties were invited to join under the following conditions: take a climate action within Leeuwarden, pay an entry fee, invite a friend to join as well, and participate in the 2 weeks of sustainability in 2018. Becoming a friend of the program provides publicity for the companies, generating business and interest in their activities. In addition, when surrounded by other members focused on a similar goal, future collaborations and business areas can be developed because they have access to the network.

2. Housing Organization:

An alternate approach was taken to encourage climate actions within housing organizations in Leeuwarden. Rather than negotiate contracts, forcing action and straining relationships and resources, civil servants worked to find a way to make the housing organization want to take climate action. This process began with 2 houses within Leeuwarden and a small subsidy for renovation from the national government. Prior to proposing the idea to the housing organization, the building contractors working with the company were contacted to see if they would be interested in higher renovation standards, what they do best, and what they would be interested in offering for sustainable homes. Prices were negotiated to ensure that such work would be attractive for not only the contractors but also the housing organization and to see what could be accomplished as such projects might be scaled.

When the houses were renovated, the press was called and the story was publicized within the region. The director of the housing organization enjoyed the notoriety and approached the municipality to see if such a project could be repeated. However, this time, it was suggested that 2 houses would no longer be newsworthy, but, perhaps, 50-100 would be of interest, increasing the impact, number of people involved, and scope of the project. With the pre-negotiated pricing

with the building contractors, the potential costs were known when the housing organization asked. To further push the director, trips were organized to with people involved with solar, insulation, politics, and buildings where he was invited to participate and learn what was happening across other parts of Europe. In addition, calls and other compliments were directed towards the housing organization further increasing their visibility within the world of sustainable buildings.

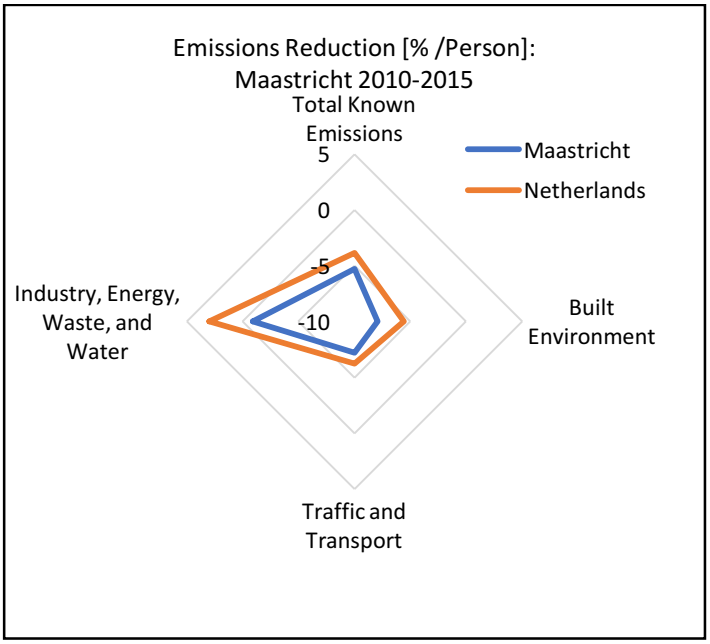
Lessons learned:

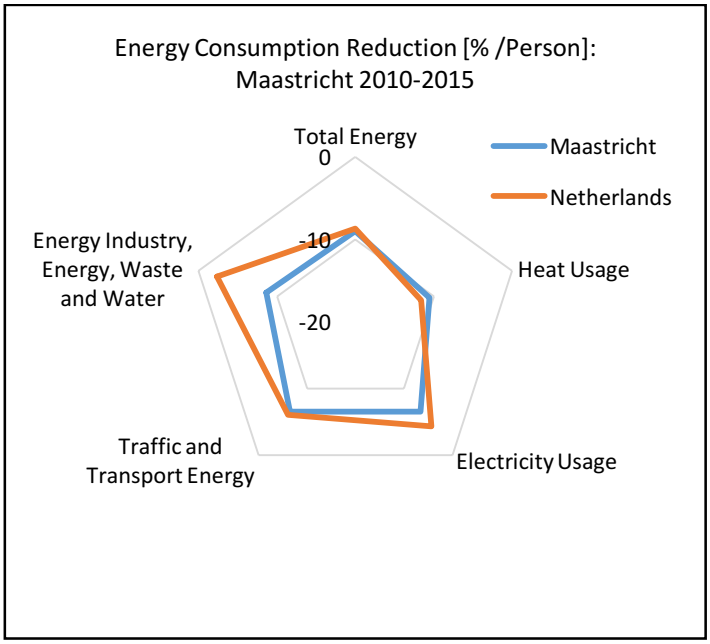
1. Encourage from multiple fronts
2. Use news and positive press to give others energy to take more ambitious climate actions
3. Make the company, organization, or cooperative the hero

Documents:
Energy Agenda 2016-2020

4.11 Maastricht

Area [km^2]	60	FTE	2
Population [2016]	123,164	Climate Budget	€ 800,000
Population Density [People/km^2]	2052	Climate Budget per Capita	€ 6.50
Population Growth [2010-2016]	2869	Total Environmental Budget [2016]	€ 3,942,000
Duurzaamheidsmeter	n/a	Total Budget [2016]	€ 600,827,000





Status of the municipality 2010-2015: Percent per capita

Emissions:	Energy Consumption:	Renewable Energy:
-5%	-9%	465%

Status of the municipality 2010-2015: Difference in Annual Statistics

Emissions [Tons]	Energy Consumption [TJ]	Renewable Energy [TJ]
-28628	-849	465

Registered PV [MWp]	Wind Energy [MW]	LED Public Lighting
6.8	n/a	8.6%

Goals:
2020: 20% CO2 reduction
2030: CO2 neutral (0 emissions)

Klimaatverbond membership: Yes
Covenant of Mayors membership: No

Point of Contact: Senior Beleidsmedewerker

4.11.1 Municipal Status

The emissions reduction observed in Maastricht was not a gradual decline, but, rather, a sudden occurrence recorded between 2010 and 2011, accounting for around 75% of the total, per-capita difference. The emissions were reduced in the built environment, which is reflected in the heat savings recorded in the same year nearly 6 GJ/person. Both the emissions and energy consumption per capita then increased, peaking in 2012/2013 at a lower consumption level than seen in 2010. As can be seen from the graphs above, the municipality achieved a slightly greater emissions reduction than the Dutch average, however, the decrease in energy intensity was slightly less than found in the Netherlands as a whole.

Currently within Maastricht, climate planning has taken a secondary role to searching for and building partnerships with partners external to the municipal government. In addition, once partners are found, the municipality hopes to structure agreements with each new partner individually. The current climate strategies reflect this, focusing on answering questions with regards to how people can better work together towards sustainable living? How can they speed actions, and which individuals and organizations should be involved in meetings and exchanges of ideas[1]. In this way, the municipality is hoping to increase its own capacity for meaningful climate action by generating interest outside of the municipal government. This focus is in response to the feeling within climate actors that community engagement is lacking, and this is a central problem to climate action within the municipality.

To build its capacity as a facilitator, the municipality has taken two main steps to increase involvement. Using models from other municipalities, energy coaches were trained for the municipality. Now, with a budget of €50,000, they are expected to engage private citizens, providing individual advice on measures and renovations to homeowners. In addition, while an online energy Loket has existed for Maastricht since 2016, a physical building is being erected which is slated to open in June 2017. Similar to others around the Netherlands, the Loket will provide a level playing field for companies and renovation strategies, with the municipality working to ensure accurate information on current practices is presented. The hope is that with a physical place where information can be accessed by homeowners will be more effective in precipitating change than the online platform.

4.11.2 Good Practice

1. Platform COOL:
Members: 20 companies/institutions
Budget: € 0
FTE: Time invested as possible

Platform COOL is a consortium of companies and institutions in Maastricht. It began because civil servants in 2007 saw a growing need for climate action and the involvement of the community of Maastricht as a whole. Without any budget to fund any activities, it was decided to invite local businesses, the University, and housing organizations to watch An Inconvenient Truth to pique their interest in climate action. After six spate trips to view the movie, a loose consortium of

companies was formed in 2009. No commitments were required to join and no targets were set as a result. Rather, this group was assembled to provide knowledge and expertise for the municipal planning process; lending their understanding so as progress, they will encounter fewer barriers because the necessary parties were involved from the start of the process. The group met to discuss plans every two months, still without any budget to fund their activities. However, the alderman at the time did not approve of this activity and Project COOL was sidelined.

In 2014, a new alderman was elected and has begun to focus on a new role for this consortium: collaborators for sustainability within Maastricht. Having access to this group of experts gives municipal actors energy, and increases their ability to successfully do their work. However, since its inception, Project COOL has remained merely an advisory group, requiring no projects or targets from its members. In addition, despite the growing interest from the current alderman in using this group as a collaborative group for climate projects, no budget has been allotted for their activities. Finally, the municipality aims to remove itself from the leading role of the project and to become one of the members as opposed to the party in charge.

Project Failure: Wind Turbines
A large project was proposed by a company for wind turbines to be constructed within the municipality. Public interest surveys were conducted prior to the locations being named to learn whether or not the public would be willing to have turbines constructed within municipal boundaries. While the public supported the idea of wind turbines in the abstract, once the locations were announced, opposition to the project was overwhelming. In addition, due to the time constraints of the approval process for the municipal land and subsidies available for the project, the public was not involved in planning the project nor in choosing the locations for the future turbines. While stock was offered in the wind turbines to the general public, this was not enticing enough to get public opinion behind the project.

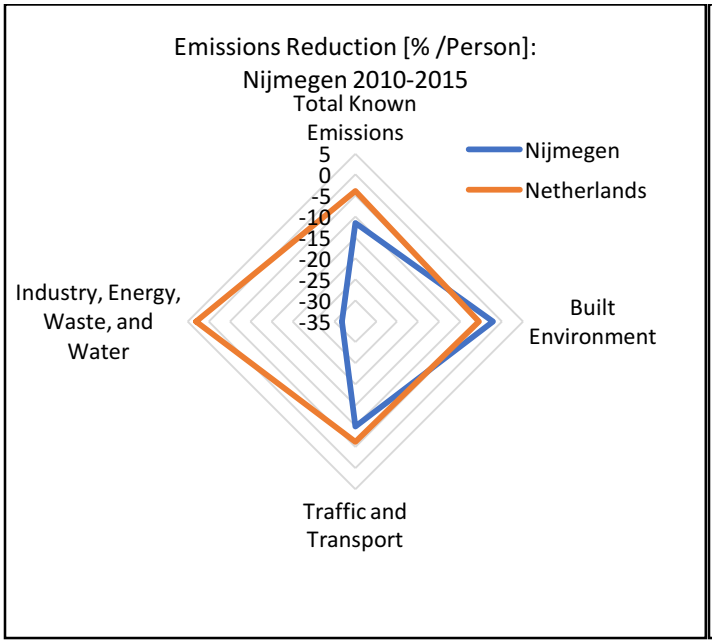
Lessons learned:
1. Require municipal vision for sustainable projects. If the public believes in sustainability in general, then any projects will be far easier to implement.
2. Involve the public in the choosing the location and project planning, otherwise the opposition will have too much fuel to overcome any incentives.
3. A project must have a face, someone leading the initiative that private citizens and companies can support.

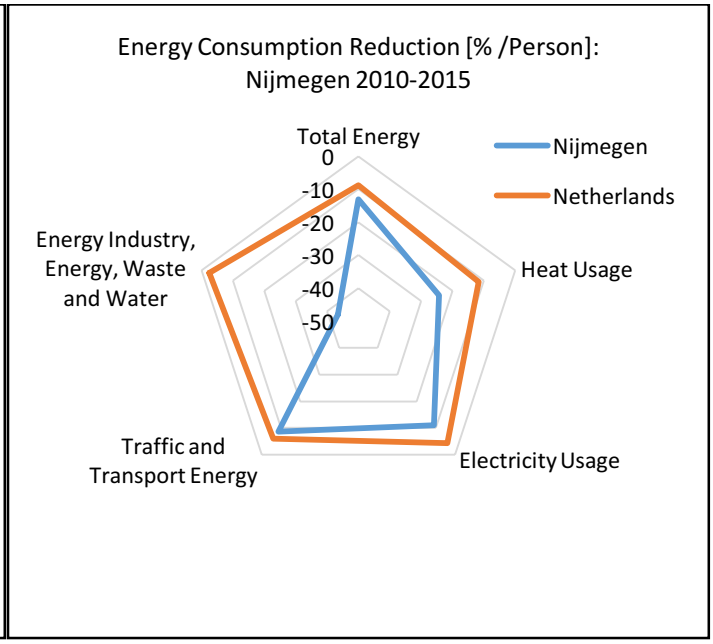
Question: How can we build a community where those people who want change to happen are brought together and supported?

Documents:
1. Stadsdialoog Lokaal Energie Akkoord: July 2015

4.12 Nijmegen

Area [km^2]	57.6	FTE	5.5
Population [2016]	173,513	Climate Budget [2015-2018]	€600,000[1]
Population Density [People/km^2]	3012	Climate Budget per Capita	€ 3.46
Population Growth [2010-2016]	9,290	Total Environmental Budget [2016]	€6353000
Duurzaamheidsmeter	97%	Total Budget [2016]	€736828000





Status of the municipality 2010-2015: Percent per capita

Emissions:	Energy Consumption:	Renewable Energy:
-12%	-18%	2%

Status of the municipality 2010-2015: Difference in Annual Statistics

Emissions [Tons]	Energy Consumption [TJ]	Renewable Energy [TJ]
-82763	-1328	271

Registered PV [MWp]	Wind Energy [MW]	LED Public Lighting
8.7	n/a	4.7%

Goals:
2014-2018: 10% energy savings
2032: Carbon Neutral
2045: Fossil Free municipality

Klimaatverbond membership: Yes
Covenant of Mayors membership: Yes, as per 23rd January, 2008

Point of Contact: Senior Adviseur Duurzame Ontwikkeling

4.12.1 Municipal Status

Emissions and energy consumption in Nijmegen decreased substantially when compared to the national average in The Netherlands. The most significant reduction in energy intensity occurred in heat usage which most likely accounts for the significant decrease in CO_2 emissions in the sector Industry, Energy, Waste, and Water. However, these impressive drops occurred over two one-year periods, 2010-2011 and 2013-2014.

The municipality of Nijmegen has written a roadmap Power2Nijmegen which predicts several scenarios to achieve its goal of a fossil free municipality by 2045. In addition, the municipality is completing a climate strategy which spans the years 2013-2017 after which a new document will be written. However, neither of these current plans are action plans. They contain emissions data and focus on the process of implementing a plan but do not contain concrete actions with budget, effects, and monitoring which constitute an actionable plan. The Nijmegen city council supported the writing of such plans but decided that continuing to write "plans" was not a key priority; they desire concrete actions, so that is where climate actors focus.

There has been significant focus from climate actors within the municipal government to encourage other departments to evaluate and take a stake in climate action. Beginning with "drinking a lot of coffee" and "never saying 'No' to a meeting with a colleague" according to the Senior Advisor on Sustainable Development in the City of Nijmegen. The frame of such discussions is crucial, excluding climate targets for their own sake, but, rather, casting energy efficiency as community monitory savings. Furthermore, if the energy transition is not invested in within Nijmegen, then the money, investments, and businesses required to do so will be spent outside of the municipality. In essence, the energy transition and sustainability are economic-, health-, and business-oriented issues, as opposed to for the sake of the climate.

Communication with other municipalities was also a clear barrier to action here. While Nijmegen and Arnhem have close working ties, it is not common to call other municipalities to ask how they accomplished a project or what items they are currently working on. While programs and processes are relatively similar between municipalities, each one works in relative isolation, reinventing the wheel for each new project as opposed to building off others' work. This may be due to the desire to become a "frontrunner" municipality or to the lack of good infrastructure for collaboration.

Compounding this problem is the lack of reliable results from pilot and other monitored projects completed in other municipalities. While the government is mandates results be recorded, those data can be difficult and, sometimes, impossible to find. Currently, there is no central database for all projects and the required follow-up reports, nor a repository where "honest fact sheets" can be found. This lack of communication and monitoring makes it yet more difficult for municipal governments to convince any party that action "X" is a good idea because there can be little to no data to support such a claim without engaging an outside party to conduct a study.

4.12.2 Good Practice

1. 4 Large Wind Turbines: Engaging the public

This project began with the municipality attempting to erect 4 large wind turbines within the municipality limits. However, the project was not to be constructed on municipal land which caused problems when the municipality attempted to engage the land owners. In addition, companies were required to investigate the feasibility and negotiate the land price as opposed to the municipality putting out a tender for construction. The mistrust of the municipality as well as external companies caused the project to stall.

At this point, the Mileau Federatse approached the municipality, asking if they could attempt to continue the project. Their approach was to go door-to-door and convince residents of Nijmegen to invest in the capital to construct the turbines. The turbines would then be entirely publicly owned, and all returns would be distributed among the investors. With this campaign, the stocks were purchased almost "too quickly". Construction of the turbines began in 2015 and they have since been completed.

Lessons learned:

1. People telling people: The municipality telling people what to do can be very divisive so having projects spread amongst the people from an external party is incredibly valuable
2. Climate awareness: The Mileau Federatse found that people knew and understood Nijmegen's climate targets and gave them an easy and profitable way to contribute
3. Financial benefit is crucial: Dependable returns on an investment with minimal input required makes negotiating easy

2. Nijmegen Energy Covenant: 2008

Budget: enough for meeting space and drinks
FTE: 1 FTE for 1 week from the municipality, 1 FTE 1 week from Royal Haskoning (consultancy)
Meetings: 3-4 times/year
2008: 13 members
2013: 19 members
2017: Expect to renew the covenant

The Nijmegen Energy Covenant was a product of trying to answer the question: How can we build capacity for self-learning within the municipality? For this initiative, the Alderman played a crucial role in both attracting companies to the initial meetings as well as ensuring municipal actors had time and support for this project. This was critical for the project to succeed. Interested companies were encouraged to bring others curious about sustainability to sign the agreement; signatories committed to reduce CO_2 emissions by 3% annually for three years. The meetings throughout the year were organized around a particular theme, struggle, or barrier which had been encountered by a covenant member.

For the first session, 2008-2011, the municipality was the main organizer for the covenant; however, it was the *only* signatory which did not accomplish its reduction target. This failure galvanized municipal actors across all departments because the municipality had failed publicly. This was a great incentive for them to act and changed the mentality within the municipality to *what can I do to help accomplish this goal?* The covenant was resigned in 2013 and is expected to be renewed again this coming year, 2017.

3. Engaging Municipal Actors: Redefining Role

Over the past few years, other departments at the municipality have realized that sustainability is not a "fad" and the work to prevent climate change will continue. A few techniques have been used by climate actors within Nijmegen to foster this change.

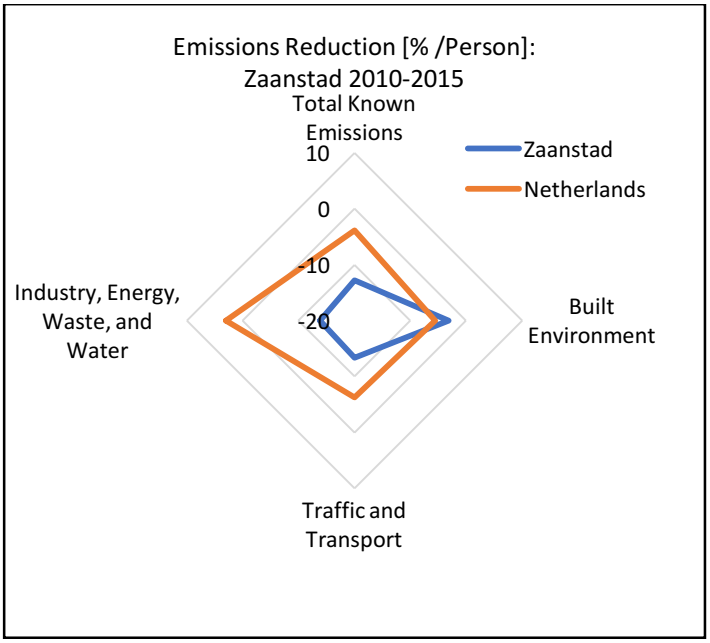
1. Advertise and spread other departments' achievements
    - This can be started with local newspapers and the municipality social media pages or when a boss or alderman from a different department congratulates them on their work. In addition, real energy can come from external recognition: e.g. a project gets noticed by another municipality and the worker gets called to consult. This is not only increases their ambitions but also the scale and potential scope of projects.
2. Engage other departments in conversation
    - When in discussions, do not focus on sustainability, but, rather, on what projects another department is working on or what problems they have. Use their interests and offer ideas and solutions if applicable.
    - If approached with a question about a sustainable solution, try to put it in the context of your municipality (could you see a possibility for that here?). Make clear connections from ideas to implementable actions
    - Never say no to a colleague if they ask for a meeting; make time to sit down and speak because it ensures that lines of communication remain open and active.
3. Public calls
    - Calls from the general public can be incredibly helpful. It is crucial to make sure that when called, the department in question can easily connect to those working in sustainability either so the caller can be informed or so that department knows who to ask to answer the question properly

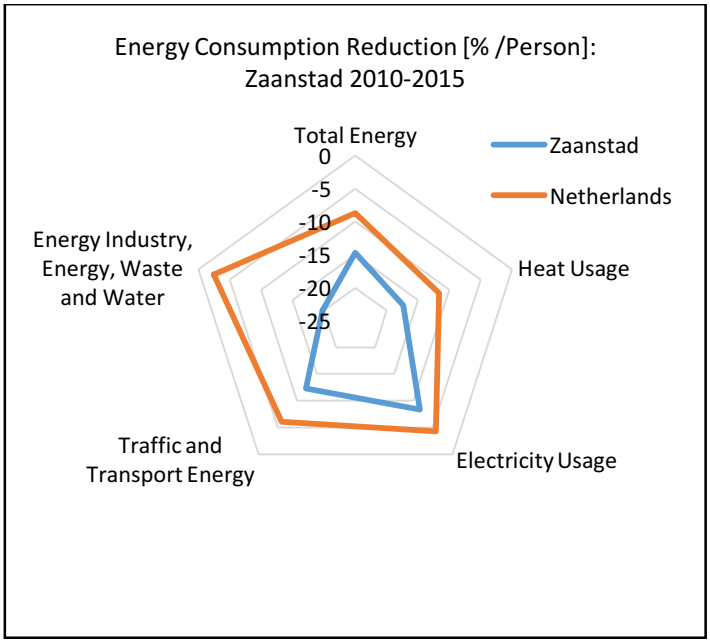
Documents:

1: Nijmegen Coalitieakkoord 2014-2018

4.13 Zaanstad

Area [km^2]	83.2	FTE	7.56
Population [2016]	153579	Climate Budget	€ 1-1.5 million
Population Density [People/km^2]	1845	Climate Budget per Capita	€ 8.00
Population Growth [2010-2016]	5526	Total Environmental Budget [2016]	€ 5,794,000
Duurzaamheidsmeter	n/a	Total Budget [2016]	€ 452,916,000





Status of the municipality 2010-2015: Percent per capita

Emissions*:	Energy Consumption:	Renewable Energy:
-13%	-15%	2%

Status of the municipality 2010-2015: Difference in Annual Statistics

Emissions [Tons]*	Energy Consumption [TJ]	Renewable Energy [TJ]
-100570	-1583	239

*The total emissions within Zaanstad are not recorded for 2015; these numbers reflect the total emissions reduction from 2010-2014

Registered PV [MWp]	Wind Energy [MW]	LED Public Lighting
5.9	7.8	2.4%

Goals:
~~2020: Climate Neutral~~
2020: 100 Kilotons emissions reduction
Climate Neutral: No year stated

Klimaatverbond membership: Yes

Covenant of Mayors membership: No

Point of Contact: Klimaschutzmanager

4.13.1 Municipal Status

Zaanstad is one of the few municipalities within the Netherlands to have achieved an emissions reduction greater than the -12.5% required to achieve an emissions free municipality by 2050. However, the greatest share of this reduction, nearly half of the total reduction per capita, occurred between 2010 and 2013 in Industry, Energy, Waste, and Water. This is mirrored by the energy consumption of the municipality with a significant reduction in energy intensity in the same sector as well as in heat consumption. While there are significant ambitions within Zaanstad to increase the renewable energy share, it is currently below the national average at around 2%.

The most current climate plan found for Zaanstad, ZaansGreen2.0, is a clear strategy on how the municipality intends to implement actions to achieve its goal of a 100 kiloton reduction by 2020, approximately 1/9 of total emissions. The municipality had previously set the target for climate neutral in 2020, but this was removed and no firm date was added to replace it. The strategy includes energy consumption data per sector within the municipality but does not include a sectoral emissions baseline. However, the strength of the plan is in the details of the role of the municipality, outlining where and how the government intends to engage external actors in order to implement climate action. In addition, the climate plan includes a rough breakdown of costs to implement the current objectives, juxtaposing the municipal budget and expected costs. This clearly shows the level of external investment required to achieve the municipal climate goals.

While there are several areas of action required, the municipal strategy within the climate plan remains relatively consistent, outlining 10 levels which the government can pull to engage external parties:

1. Messaging: Awareness, understanding, and urgency
2. Credible organizers: person, organization, or brand
3. Personal cost-benefit analysis
4. Social cost-benefit analysis
5. Personal value-fitting with identity and image
6. Social behavior change
7. Routines: rational and emotional functions
8. Personal qualms / relapse risk
9. Physical and organizational context
10. Social context: policy and stakeholders

Using these ten levers for action, the municipality intends to work with external actors to continue its progress towards its emission free target.

Starting in 2016, the municipal government began enforcing the Environmental Protection Act, mandating renovations in large-energy consumers. However, a 5-year payback time for renovations can be difficult to assess, in particular when companies do not want to invest in such plans. Multiple reports on prospective renovations and be written to produce conflicting assessments of payback times. Given large budgets, companies can take the upper hand in such negotiations if further data are not gathered. As a result, municipal health, noise, and safety

inspectors have been given trainings on climate and sustainability and are expected to include such reports on their routine inspections. In this way, the municipality can monitor companies' emissions and energy consumption. With such information, mandatory renovations can be justified and the inspectors will have the opportunity to examine the extent that such required actions are implemented.

According to the Klimaschutzmanager, project sharing between municipalities must increase. With climate targets looming, it is important to facilitate collaborations which can reduce the necessity for repeated studies and plan development. Pilot project results, implementation plans, project failures are not communicated, forcing individual municipalities to act in isolation from one another. In addition, given the economy of scale of some projects, strategies to implement projects with large numbers of municipalities should be developed to streamline the budgeting and implementation processes.

4.13.2 Good Practice

1. Energy Cafés: Public engagement
~1 meeting per month
Budget: €1000-€2000/meeting
FTE: 1 full-time week per café

Energy cafés in Zaanstad began as a way to activate the community, engaging the public in municipal climate action. Given the latent mistrust of governmental organizations, the cafés have been successful at engaging citizens with direct municipal contact kept to a minimum. Each café is organized at a local business and a speaker is invited to give a talk and run a workshop on a specific topic. These meetings are advertised on the municipal website and social media, as well as by suggesting those who approach the government interested in sustainability and climate attend to learn more about these topics.

While there have been no specific goals, other than engagement, or outcomes from the cafés, several effects have been felt. The public became increasingly aware of city plans and, in particular, of the ability to collectively purchase solar panels and insulation with municipal assistance. As a result, the local PV companies formed a cooperative in response to the increase in demand for their products. As the discussion of turning off the gas has gained prominence within the Netherlands, attendees were far more receptive to alternative options for heating. This was directly felt when the housing organizations were convincing their tenants to agree to a change in the future heating plans for their buildings, a process which requires 70% assent.

2. Company Energy Consortium

Prior to 2013, there were no large consortia of companies within Zaanstad with a climate focus. Rather than approach this problem as the municipal government, the manager of the local industrial park was asked if he would be interested in beginning such a consortium. This would distance the municipal government from the initial stages of the project. Once companies were interested, they were gathered in 2013 to sign a letter of intent to focus on sustainability and climate. This

commitment was largely for publicity and there were no stipulations which must be fulfilled in order to join. In the end, 35 companies signed.

This consortium took greater interest in sustainability after two events which made their waste heat a potentially viable product: In May 2016, the Dutch government announced its plans to wean the country off natural gas; On December 6th, 2016, the national energy agenda gave municipalities joint power over the energy transition. This dramatic change gave the municipality far more power to engage in the heat transition. Not only that, but the goal to turn off the natural gas cemented a potential business case for heat within the company consortium. While societal benefit and sustainability have been included in their planning for distributing heat, they are not substantial drivers to act.

When discussing heat distribution, the consortium and the municipality made a role for the housing organizations at the table. In this way, the demand side could take charge of their future position, using studies to show the extent of change and cost which would be required to continue using natural gas in their buildings. The final decision was made with the housing organizations, DSOs, service providers, and heat producers all negotiating at the table. This was made possible by the existence of the energy consortium *and* the energy cafes which convinced residents to agree to such a change.

Future plan: Renovation of building stock

A large percentage of the building stock in existence today will remain in 2050. In order to achieve climate targets, these existing buildings must be renovated to a higher energy standard. Currently within the municipality, there exists the capacity to renovate 50 houses/year, this rate must be increased to over 600 houses/year according. However, convincing homeowners and housing organizations to do so can be incredibly difficult. As a result, the municipality has the goal to create a database of the renovation cycles of buildings. This way, buildings which are approaching the need for renovation can be targeted for energy renovations.

Documents:
Zaanse Energie Agenda

5 Results of the Analysis

The results of this study are divided into two sections: The current status of climate action, which discusses the results of the quantitative and qualitative analysis; The path towards the future, which analyzes those good practices form the case studies. In this way, the research questions will be addressed, building towards the final conclusions and analysis of the overarching question of the study. Furthermore, the limitations of these findings will also be addressed to reiterate the context in which this research was conducted and the assumptions which were made at the outset.

5.1 Current Status of Climate Action

In this section, the results of the analysis of local climate action will be discussed. I will progress through municipal climate actions proposed by the WWF: GHG inventory, target setting, action plan development, plan implementation & monitoring (WWF 2015). The results of the quantitative and then the qualitative analysis will be discussed in detail and these results will place the current situation of climate implementation and monitoring within the Netherlands in the context of what can be proven, highlighting both strengths and weaknesses in those available data. Section 5.2 will then build upon these results to show where local climate action within the Netherlands can progress and those good practices which could speed that process.

5.1.1 GHG Inventories, Target Setting, and Plan Development

The results of this section are drawn from in-person interviews as well as from climate documents published by surveyed municipalities. Further results will be explained in the following sections (See Table 11 for more details), but it is critical to understand the processes leading to the implementation and monitoring which are so critical for good practice development.

As defined by the WWF, the first climate action which can be taken by municipalities is a GHG inventory with reference to a base year to which future emissions can be compared. Of the municipalities surveyed, eight of the thirteen published GHGe inventories and two, those which had targets focused on energy efficiency, published inventories based on their energy consumption. However, while three did not publish such inventories in the climate documents surveyed, the Klimaatmonitor has publicly available sectoral data on emissions, energy consumption, renewable energy production, and a wide variety of other indicators (Rijkswaterstaat 2017). As such, whether a local climate document publishes an inventory in their documents or not is less relevant because of this readily available and standardized source of information. In fact, it may be an attempt by civil servants to focus more energy on planning and implementation in their publications as their GHG inventories are already monitored. The question remains, however, to what extent are emissions baselines used when designing and implementing climate actions?

Beyond having an open database of municipal-level climate data, every municipality surveyed had developed climate targets: most with a short-term goal(s) to be achieved between 2020-2030 followed by the long-term goal of becoming climate/energy neutral at the latest by 2050. In addition, according to interviews with members of the Klimaatverbond and VNG, nearly all Dutch municipalities have published climate targets – at least 90% of them. However, publishing a target was insufficient to motivate other actors to buy into them. In Eindhoven, it was particularly

important to have clear numeric goals as opposed to "Energy Neutral" because they could be more easily understood. Other strategies were used to push other governmental actors to support climate projects, as in Almere, a study was commissioned to show the cost of inaction.

Finally, every municipality surveyed had published climate documents and have civil servants dedicated to their planning and implementation. However, while such documents existed, the quality of the planning was highly varied, and, within this study, no true Action Plan was found (see Table 7): an action plan requires an emissions reduction targets, GHG baseline, defined actions, required budget, stakeholders, implementation plan, and monitoring scheme). A conspicuous absence was that of clear monitoring schemes for municipal actions; I did find project reviews which evaluated progress of past climate schemes but was unable to find methodologies or other information on how this was performed. Furthermore, none of the municipalities surveyed had written a Strategy to achieve their long-term climate goals. These findings supported the findings from Krause's 2011 paper that planning actions were the weakest point of climate documents surveyed.

Table 7: Aspects present in climate documents from thirteen municipalities with case studies

Target	13/13
GHG Emissions Baseline per Sector [y/n]	8/13
Defined Actions	10/13
Budget Per Action	2/13
Stakeholders	12/13
Implementation Plan	1/13
Monitoring Scheme	0/13

Overall, documentation on climate and sustainability from a municipal level was omnipresent in this study. No municipality lacked at least some level of climate roadmap and all have access to data which can both be used to benchmark their own efforts as well as compare progress to other municipalities. Further, it must again be noted that this evaluation was carried out on the most recent climate document found or sent to me by climate actors at each municipality. On several occasions, I was told that more detailed documents excited but were not open to the public. However, given this limitation, it is difficult to evaluate the level of planning or preparedness of Dutch municipalities – in particular when assessing them on the availability of an implementation plan. The next two sections, however, will analyze what can be derived from those data, and if, given the depth of the information available, further conclusions can be drawn about the status of implementation and monitoring efforts within SMCs in the Netherlands.

5.1.2 Implementation and Monitoring: Results of the Quantitative analysis

As discussed earlier, a significant number of quantitative indicators were compiled during this study. Climate data (emissions, energy intensity, and renewable energy) from the Klimaatmonitor were combined with other city indicators to then analyze what could be proven using such a dataset. These indicators were codified in Table 2. The quantitative portion of the analysis alone will focus primarily on RQ 3: Are currently available monitoring data sufficient to prove good

practice? Given the large number of indicators associated with this analysis, only those comparing variables to emissions will be shown in the body of the report, the rest can be found in Appendix A: Quantitative Analysis Charts. Amstelveen, Den Bosch, and Groningen were chosen to represent the 13 Dutch case studies performed for of this research because they represent the broad range of populations, FTE, and climate budgets included within this study (factors seen in literature to play an important role in climate action (Reckien, Flacke et al. 2015); those data from other municipalities discussed below is available in supplementary data. In addition, when analyzing the graphs for all municipalities, similar trends emerged, so these three municipalities were chosen to represent those broader municipal patterns.

The first step to assessing good practice using those quantitative indicators available to this study, is to show conclusively that progress, namely emissions reductions, have occurred. To assess this, the municipal emissions per capita were calculated. All municipalities could then be compared with one another based on the amount of and percent decrease in emissions per person. As can be seen in Figure 3 below, the three municipalities have a small decrease in emissions over the 5-year period from 2010-2015. One immediate observation is the reduction between the years 2010 and 2011 in nearly every municipality and the subsequent increase in emissions in 2012 with respect to 2011. There is a similar phenomenon observed between the percent per capita emissions between 2013-2014 and 2014-2015, where the rate of emissions from individual municipalities as well as national emissions decreases and then increases dramatically. Given these near ubiquitous jumps, it is likely related to power production on a national scale due to an environmental event or other source which affected all Dutch municipalities. However, since those data in the Klimaatmonitor are temperature adjusted which would account for changes in weather patterns, further research is required to understand such trends.

Coupled with the annual total per capita emissions for each municipality is the percent change per year. When examining these figures, it becomes immediately apparent that while a reduction in emissions occurs in each of these three municipalities, those annual reductions are not consistent over the time frame, fluctuating each year. However, what remains consistent both in the total emissions and percent per capita change is municipal emissions mirroring the nation trends. It is likely, therefore, that this is a reflection of changes to national power mix (e.g. the opening or closing of a coal plant, installation of large renewable electricity production). This can be seen in the emissions factors used by the Klimaatmonitor, Table 8, which are used to calculate the Scope 2 emissions resulting from energy consumption at the point of use.

Table 8: Annual emissions factors for electricity and heat for the Netherlands

	Electricity [ton/kWh]	Heat [ton/GJ]
2010	0.00046	0.035759
2011	0.00044	0.035759
2012	0.00047	0.035759
2013	0.00048	0.035749
2014	0.0005	0.035739
2015	0.00053	0.035739

While the emissions factor for heat remains constant over the five-year period, that for electricity fluctuates to replicate the national energy mix. From 2010-2011, there is a decrease in the

emissions per kWh, which then increases to slightly greater than its former level. However, emissions factor increases between 2013-2014 and 2014-2015, suggesting that another factor may be responsible for the decrease in emissions between 2013-2014 and the overall increase seen between 2014-2015.

What is critical is that the rate of change per year shifts dramatically in comparison to the emissions reduction, even though it appears that the per-capita emissions remain relatively stable though decreasing over the entire period. As can be seen in Table 9, the Standard Deviation from the mean of per capita emissions reduction is between 3%-4% for these three municipalities, and averages nearly 4.5% over the entire Netherlands. This suggests that while emissions reductions are occurring, the rate which can be calculated potentially has an error of ±4%. With overall reductions of 13%, 10%, and 5% in Amstelveen, Den Bosch, and Groningen respectively (again, the other municipal graphs can be found in Appendix A and exhibit similar trends), it is difficult to claim what the results of a local climate strategy as due to its implementation given such wide fluctuations *and* the mirroring of national statistics as discussed above. Since these data are insufficient to capture a strategy's impact, further indicators were found and compared to the emissions baseline to try and connect each one to emissions reductions.

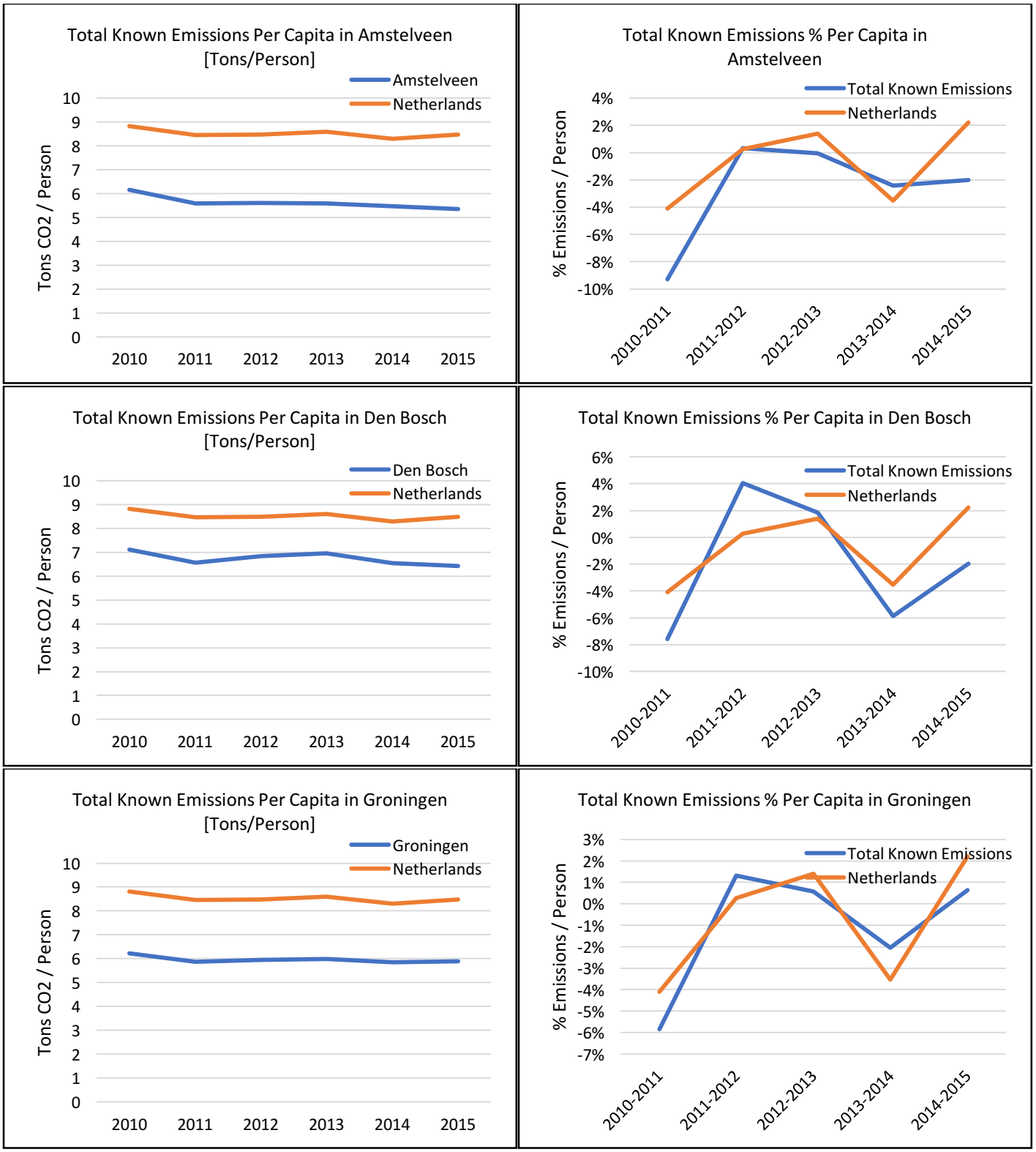


Figure 3: Emissions per capita and percent emissions per capita for three Dutch municipalities from 2010-2015

This phenomenon of greatly fluctuating emissions reductions is shown in Figure 3 for all Dutch municipalities. The change in emissions from 2010-2015 for the majority of municipalities fell between -20% and 20% and the standard deviation of the rate of emissions reduction predominantly remained below 10%. However, for larger changes in emissions over the five year period, the standard deviation also increases dramatically. Alphen aan den Rijn, the municipality which achieved the greatest emissions reduction within the boundaries of the study, achieved a 36% reduction in per capita emissions has a total standard deviation of 14%. However, 94% of the emissions occurred between 2013-2014, causing a 35% difference in the rate of emissions seen in over the 5-year period. This is also reflected in emissions per sector as the drop is due to large decreases in emissions in the built environment and traffic and transport. When examining the energy intensity of the municipality for that year, the heat consumption decreased from 46 to 28 GJ/person, and the electricity consumption dropped nearly 6 GJ/person. This was accompanied by a reduction in renewable energy production within the municipality by around 25%. These data together suggest a sudden change to the conditions of the municipality as opposed to the successful implementation of a climate plan. Unfortunately, due extreme circumstances, a civil servant was unable to be interviewed at Alphen aan den Rijn to further understand what occurred between 2013-2014 in the municipality.

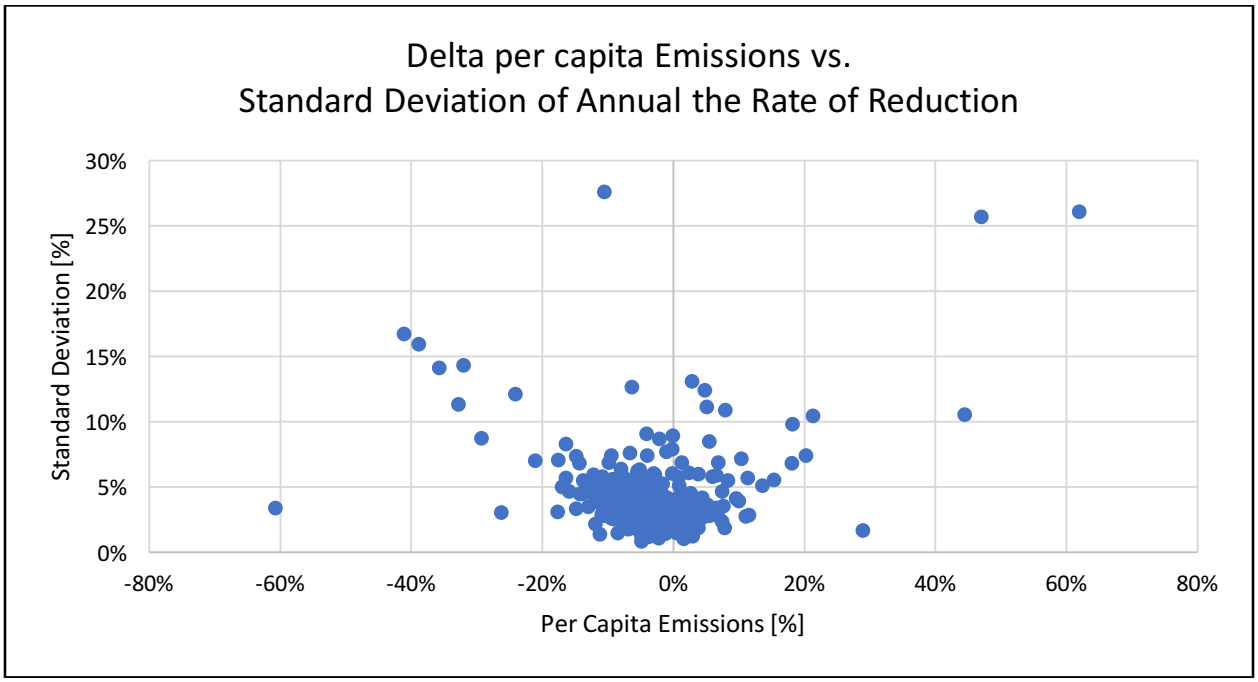


Figure 4: Comparison of the per capita emissions reductions to the standard deviation of the annual percent per capita change in emissions for all Dutch recorded municipalities 2010-2015

While these data do not indicate good practice, 14 out of the 18 surveyed Dutch municipalities achieved an absolute emissions reduction between 2010-2015 and 16 achieved a per capita emissions reduction over the same period (see Table 9). This indicates that while those data available are not sufficient to identify a specific project as a good practice, the overall trend of emissions reductions could correlate to specific indicators, either quantitative or qualitative, linking such an indicator to an overall good practice as observed in the Netherlands.

Table 9: Quantitative indicators compiled for interviewed Dutch municipalities

Municipality	Almere	Amstelveen	Arnhem	Breda	Culemborg	Den Bosch	Eindhoven	Goeree-Overflakkee	Groningen
Population	206603	89284	155586	182813	27813	152479	226818	48594	201860
Change in Population	7490	6806	5748	7012	60	10822	8719	146	10961
Area [km2]	249	44	102	129	31	92	89	422	834
Population Density	830	2025	1532	1421	893	1661	2552	115	2410
Per Capita Emissions 2015									
5 year Absolute Change [Tons]	-17683	-29096	-22946	-84337	-7777	-26950	8310	-12124	323
5 year %per Capita Change	-6%	-13%	-6%	-10%	-5%	-10%	-3%	-4%	-5%
Standard Dev. Annual Change	1%	3%	n/a	3%	4%	4%	3%	4%	3%
Per Capita Energy Consumption 2015									
5 year Absolute Change [TJ]	-1179	-835	-914	-1231	-236	-1035	-1082	-382	-969
5 year %per Capita Change	-13%	-19%	-10%	-11%	-12%	-14%	-9%	-8%	-11%
Standard Dev. Annual Change	n/a	3%	n/a	4%	4%	4%	3%	3%	1%
Per Capita Renewable Energy 2015									
Total Renewable Energy [TJ]	535	134	499	1128	84	507	530	499	281
% Renewable Energy	5%	2%	4%	7%	5%	4%	3%	11%	1%
kWp Registered PV	12463	3175	5037	9525	2106	9057	10813	7260	9666
Delta kWp Registered PV	11394	3024	4712	9161	1950	8783	10358	5691	9084
MW Wind	36.5		0.1	9.85	6	2.3		74.99	0.08
% LED Public Lighting [2016]	3%			11%	14%	13%		12%	
FTE	4.7	6.50	10	5	0.8	4	5	2	16
Climate Budget [€]	€ 925,000	€ 120,000	€ 506,000	€ 875,000	€ 75,000	€ 230,000	€ 750,000	€ 75,000	€ 1,800,000
Climate Budget per Capita	€ 6	€ 1	€ 3	€ 5	€ 3	€ 2	€ 3	€ 2	€ 9
Total Environmental Budget [€]	€ 2.87 M	€ 1.46 M	€ 5 M	€ 3.33 M	€ 0.92 M	€ 6.35 M	€ 10.29 M	€ 1.86 M	€ 2.26 M
Total Municipal Budget [€]	€ 715.1 M	€ 210.14 M	€ 732.35 M	€ 610.68 M	€ 77.1 M	€ 727.17 M	€ 879.59 M	€ 128.82 M	€ 989.44 M

Municipality	Haarlem	Haarlemmermeer	Helmond	Leeuwarden	Leiden	Maastricht	Nijmegen	Wijk Bij Duurstede	Zaanstad
Population	159179	145762	90527	108719	123930	123164	173,513	23490	153579
Change in Population	7470	1144	1567	13059	4646	2869	7841	269	5526
Area [km2]	32	185	55	167	23	60	58	50	83
Population Density	4960	787	1653	651	5326	2052	3012	467	1845
Per Capita Emissions									
5 year Absolute Change [Tons]	-20871	43940	31058*	-728	-10714	-28628	-82763	-1358	-100570
5 year %per Capita Change	-8%	2%	4%	-12%	-6%	-5%	-12%	-2%	-13%
Standard Dev. Annual Change	3%	3%	3%	6%	3%	5%	4%	1%	4%
Per Capita Energy Consumption									
5 year Absolute Change [TJ]	-989	-852	-454	-614	-689	-849	-1328	-91	-1583
5 year %per Capita Change	-15%	-5%	-8%	-1775%	-12%	-9%	-13%	-8%	-15%
Standard Dev. Annual Change	3%	3%	3%	5%	4%	n/a	n/a	1%	n/a
Per Capita Renewable Energy									
Total Renewable Energy [TJ]	117	528	140	239	98	465	271	34	239
% Renewable Energy	1%	3%	2%	3%	1%	4%	2%	3%	2%
kWp Registered PV	4526	9438	3979	10831	3214	6757	8727	2089	5883
Delta kWp Registered PV	3934	8961	3855	9306	2818	6485	8049	1954	5587
MW Wind	1	13.35		5.18					7.78
% LED Public Lighting [2016]	20%	21%		12%	5%	9%	5%	25%	2%
FTE	8	5	7.5		8	2	5.5	0.8	7.56
Climate Budget [€]	€ 1,500,000	€ 500,000	€ 400,000		€ 2,333,333	€ 800,000	€ 600,000	€ 30,000	€ 1,250,000
Climate Budget per Capita	€ 9	€ 3	€ 4	€ -	€ 19	€ 6	€ 3	€ 1	€ 8
Total Environmental Budget [Million]	€ 3.63 M	€ 9.82 M	€ 4.69 M	€ 1.82 M	€ 3.92 M	€ 3.94 M	€ 6.35 M	€ 0.5 M	€ 5.79 M
Total Municipal Budget [Million]	€ 515 M	€ 402 M	€ 396 M	€ 502 M	€ 460 M	€ 601 M	€ 737 M	€ 46 M	€ 453 M

The following analysis was conducted on those indicators found in Table 9, the orange point in the graphs below represents Bremen, Germany which was also surveyed for this study. In addition, while other graphs can be found in Appendix A: Quantitative Analysis Charts, those plots were found unnecessary to explain the phenomena found in this analysis. They were included to first, show the analysis had been done and second, to reinforce the conclusions arrived at in this study. Table 10 below shows a descriptive statistical analysis of the key quantitative indicators analyzed in this study.

Table 10: Descriptive statistical analysis of critical quantitative indicators

Indicator	Median	Mean	Standard Dev	Range
Population	149121	132984	57692	23490 to 226818
Change in Population	6277	5675	3874	60 to 13059
Area [km2]	84	109	96	23 to 422
Population Density	1657	1900	1369	115 to 5326
Per Capita Emissions 2015				
5 year Absolute Change [Tons]	-17683	-23175	35095	-100570 to +43940
5 year %per Capita Change	-6%	-6%	5%	-13% to +4%
Standard Dev. Annual Reduction	3%	3%	1%	1% to 6%
Per Capita Energy Consumption 2015				
5 year Absolute Change [TJ]	-883	-851	377	-1583 to -91
5 year %per Capita Change	-12%	-12%	4%	-19% to -5%
Standard Dev. Annual Reduction	3%	3%	1%	1% to 5%
Per Capita Renewable Energy 2015				
Total Renewable Energy [TJ]	276	352	259	34 to 1128
% Renewable Energy	3%	3%	2%	1% to 11%
kWp Registered PV	7009	6919	3189	2089 to 12463
Delta kWp Registered PV	6088	6395	2974	1950 to 11394
MW Wind	6	14	22	0.08 to 74.99
% LED Public Lighting [2016]	12%	12%	7%	2% to 25%
FTE	5	5.8	3.6	0.8 to 16
Climate Budget [€]	600000	751137	634065	30000 to 2333333
Climate Budget per Capita	3.4	4.9	4.3	1 to 18.8
% of total Environmental Budget	9%	21%	21%	4% to 80%
Total Environmental Budget [€M]	3.8	4.2	2.7	0.50 to 10.3
Total Municipal Budget [€M]	509	510	263	46 to 989

Examining those data in Table 10, it becomes clear that even within a relatively small range of municipal sizes, there is a wide breadth of local circumstances. As will be shown in further detail in the figures below, while the variety of monitored quantitative indicators available is impressive, it is difficult to find any correlation between them to show concretely that any one leads to an increase in climate action.

As discussed in the introduction, the municipal environmental and climate budgets could be crucial for the successful implementation of projects. Without funds to allocate, it is possible that any municipal project would stall, and, ultimately, have little or no effect on the overall emissions. This could also be one of the root causes for the lack of upscaling of projects or the ability of local governments to implement new ideas or disseminate good practices as, without funds, civil servants may lack the capacity to do so. While the environmental budget is available for all Dutch municipalities from Openspending.nl, the climate budget, focused solely on climate and sustainability measures was surveyed from both the municipal action plans and from in-person interviews. As listed in Table 10, there appears to be no trend in the percentage of the total environmental budget allotted to climate – between 4% and 80% across 18 municipalities. While the budget may play some role in the implementation of projects, as can be seen in Figure 5, there is virtually no correlation between those climate budgets in interviewed municipalities to the per capita emissions reduction ($R^2 = 0.00254$).

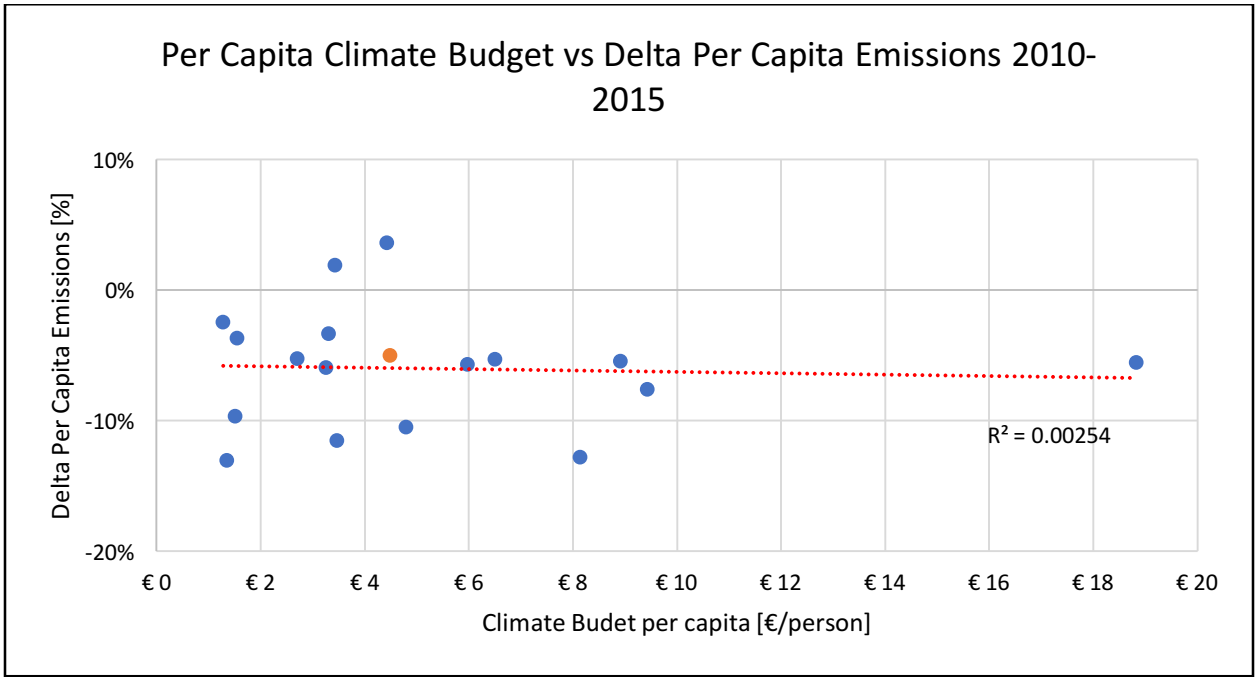


Figure 5: Comparison of the per capita climate budget to the emissions observed in surveyed municipalities

While the climate budget for all Dutch municipalities is not available, the environmental budget is published annually online by Openspending.nl. While this is not money specifically allocated to climate projects, the climate budget does fall under the umbrella of the environmental budget and, therefore, it is used as a proxy to examine if a link can be found to emissions reduction. However, given the extreme variation in the percentage the climate budget represents of the total environmental budget, I am unable to make a valid assumption about the climate budgets in other Dutch municipalities.

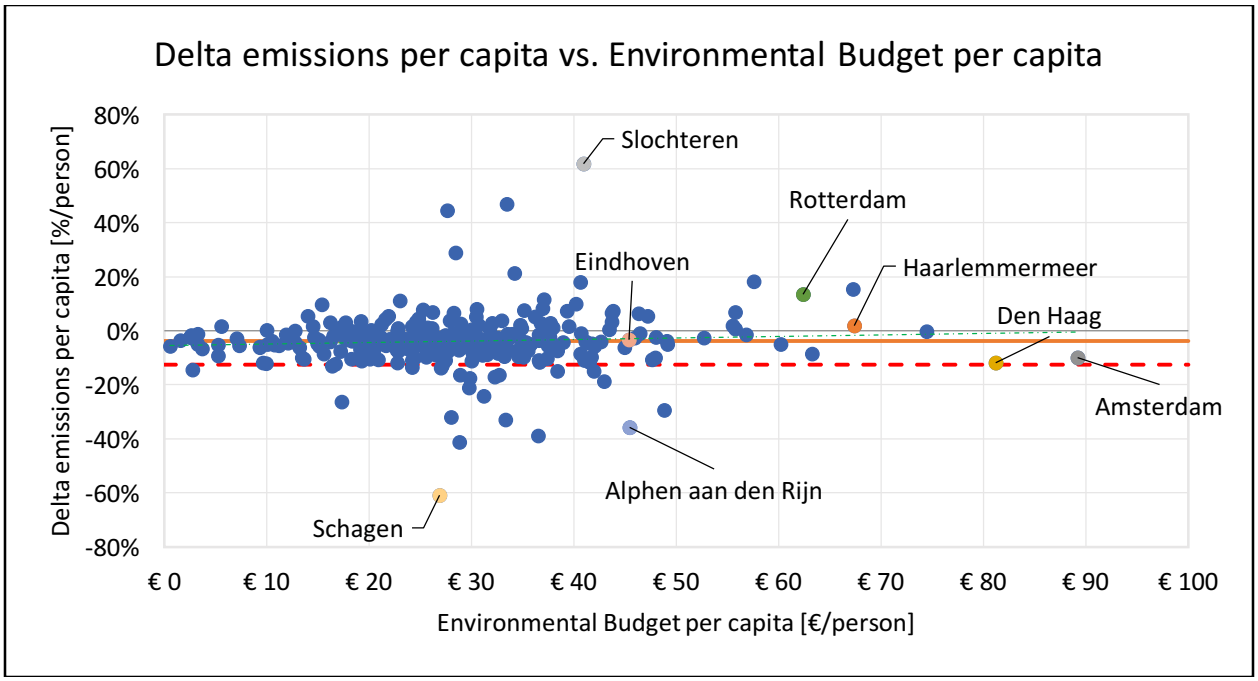


Figure 6: Comparison of the emissions between 2010-2015 and the environmental budget per capita in Dutch Municipalities

Figure 6 shows how the per capita emissions reductions correlates to the environmental budget per capita. The orange line represents the total emissions reduction recorded for the Netherlands, and the dotted-red line at -12.5% represents the emissions reduction necessary to be on track for climate neutral by 2050, a goal that nearly all Dutch municipalities share; the green is the line of best fit, which, rather than showing a decrease in emissions as a result of increased budget per capita, it shows a slight increase in emissions per capita as budget increases. As is seen in, there appears to be no correlation between an increase in the environmental budget per capita and a reduction in CO_2e emissions between 2010-2015.

However, as can be clearly see in Figure 6, the municipalities are clustered around the national emissions as and increase slightly over the period ($R^2 = 0.0027$) as budget increases. It is unlikely that the budget alone could be used as a proxy for good practice, that with a certain amount of money allotted towards the environment or climate (Figure 4) would lead to a given emissions reduction. To further explore the relationship between the municipal environmental budget and emissions, all Dutch municipalities were filtered based on their score Duurzaamheidsmeter score. The survey ranked responding municipalities based on their climate readiness and the program culminated in 2014. The municipalities plotted in Figure 6 were then filtered to those which achieved a score above 50% on the Duurzaamheidsmeter and plotted again in Figure 7 below. Once again, however, regardless of their ranking on climate preparedness, there appears to be little correlation between an increase in environmental budget per capita and a decrease in CO_2e emissions. Furthermore, the line of best fit, seen in green, now aligns nearly perfectly with the average emissions decrease across the entire Netherlands.

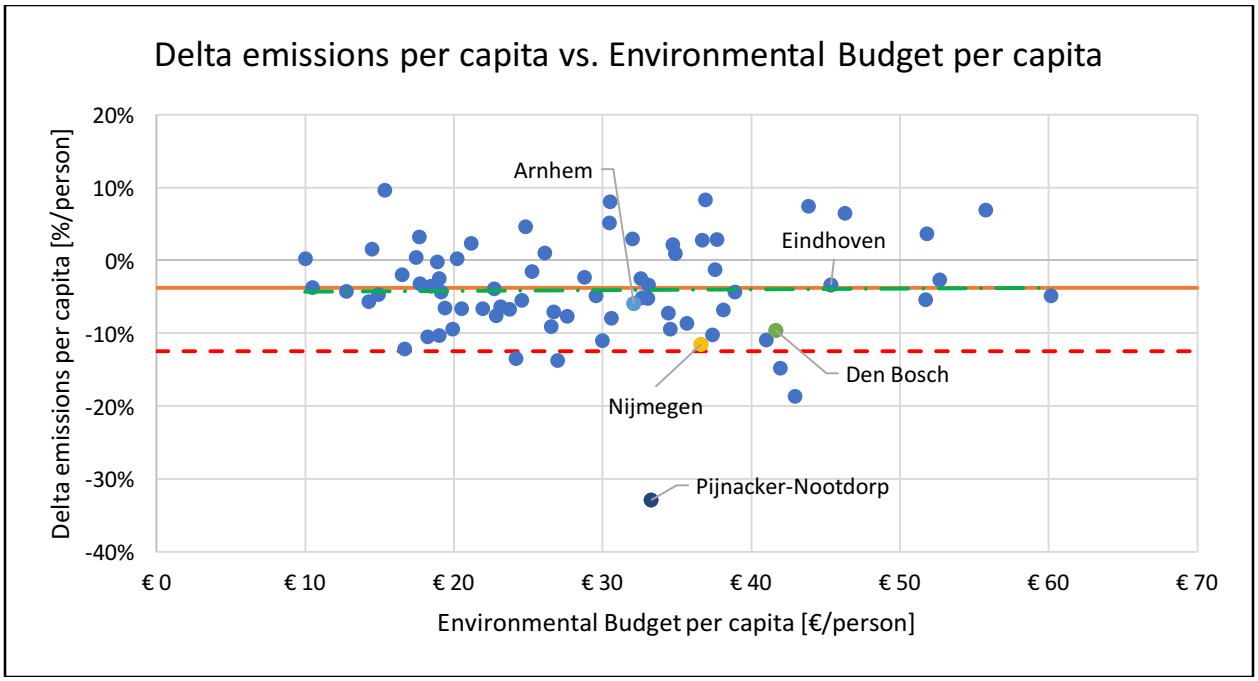


Figure 7: Emissions vs Environmental Budget per capita for municipalities which achieved a greater than 50% Duurzaamheidsmeter score

Since the climate budget could not be directly linked to the observed emissions reductions, they were then compared to the FTE on climate employed at each of the surveyed municipalities Figure 8. Similar to what was seen in previous figures, FTE shows virtually no correlation to the change in emissions from 2010-2015 ($R^2 = 0.00254$). While the number of municipalities interviewed are not sufficient to show causation, it would be expected that for both of these two observed variables that some correlation would be observed to the change per capita emissions.

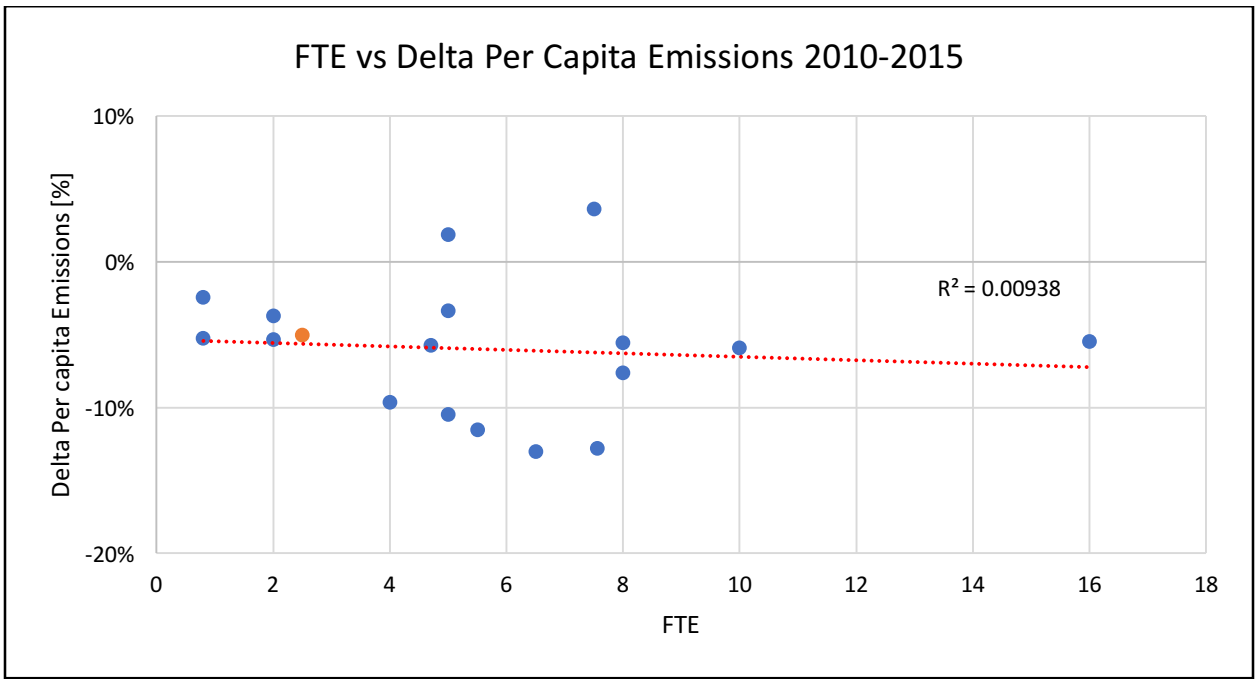


Figure 8: Comparison of the Full Time Employees (FTE) to the emissions observed in surveyed municipalities

Given that municipal capacity and budget focused on climate action could not be linked conclusively to emissions reduction, another indicator, population, was considered. With the large number of citizens initiatives and facilitating activities which will be discussed in Section 5.2, the ability of a municipality to implement meaningful climate actions could be linked to its size. While there is a stronger correlation ($R^2 = 0.055$) than seen between the emissions, budget, and FTE, this is still lose and no conclusion can be made linking the municipal population and the emissions observed emissions reduction.

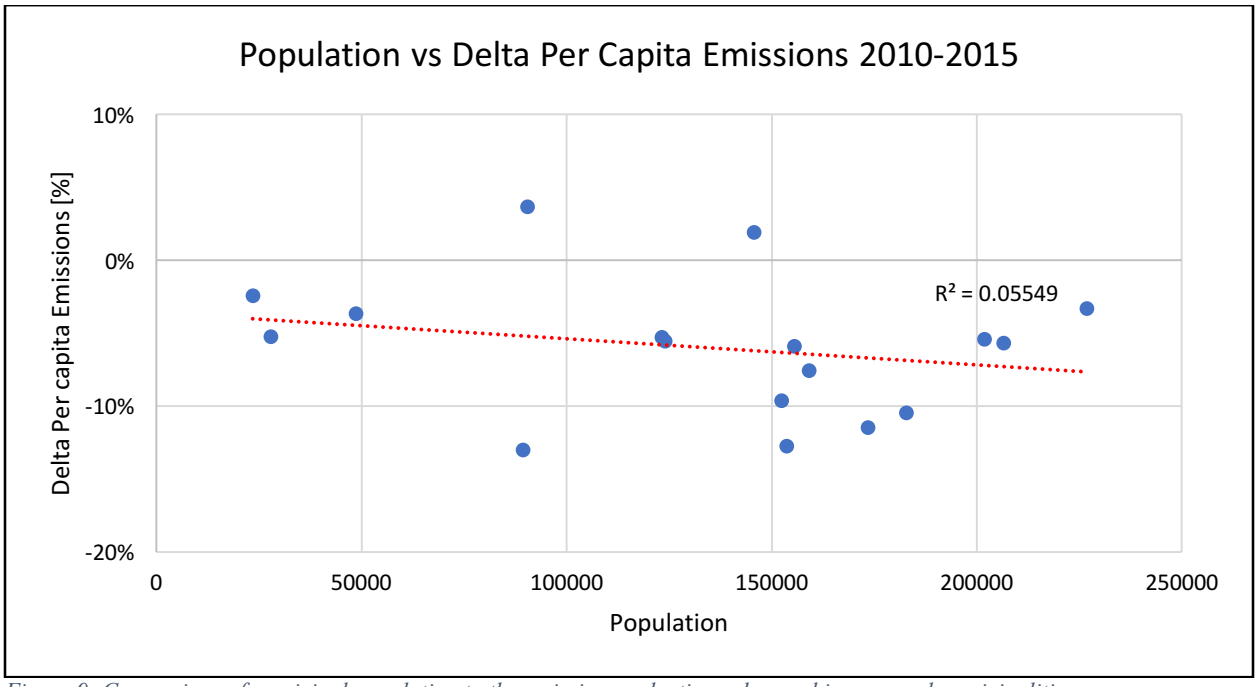


Figure 9: Comparison of municipal population to the emissions reductions observed in surveyed municipalities

To further explore the relation between the emissions reduction and population, those data for the entire Netherlands were plotted in Figure 10. The four largest municipalities were excluded from the graph to better show the relationship between population and emissions reduction; those data, if included would not change this analysis and that plot can be seen in Appendix A: Quantitative Analysis Charts.

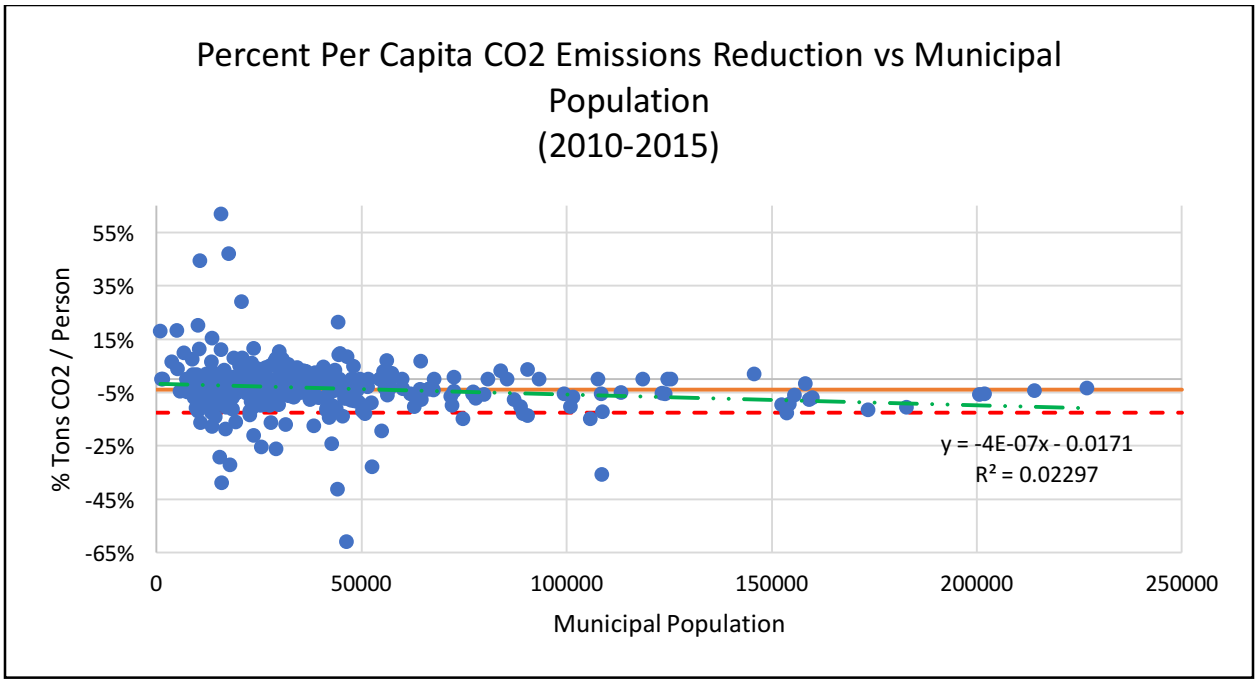


Figure 10: Comparison of the change in emissions per capita and the municipal population for the Netherlands. The orange line is the Dutch average emissions reduction and the dotted red is equal to -12.5%, the reduction required for carbon neutral in 2050.

While it appeared that there may be some slight correlation between emissions reduction and population based on Figure 9 with those few data points available, those data shown in Figure 10 clearly show otherwise. While a line of best fit demonstrates a slight decrease in emissions with regards to population increase (R^2 = 0.023. With a large number of small municipalities, 312 of 392 have fewer than 50,000 inhabitants, there are a few which exhibit anomalous behavior with a large increase or decrease in emissions. This could be due to the scale of change possible in a small municipality, as the opening of closing of one factory or business could have a dramatic effect on municipal emissions. However, it can be easily seen that the majority of municipalities are falling behind the 2050 climate-neutral target – climate neutral in 2050 was translated to an annual reduction target of 2.5% based on linear interpolation –with only 30 out of the 390 achieving or exceeding this target.

Finally, the relationship between the score of the Duurzaamheidsmeter and emissions reduction was tested. Since the Duurzaamheidsmeter survey was aimed to show the state of implementation and climate preparedness of municipalities, a score of above 50% was assumed to be relatively farther along and, thus, used as a baseline for Figure 11 & Figure 12 below.

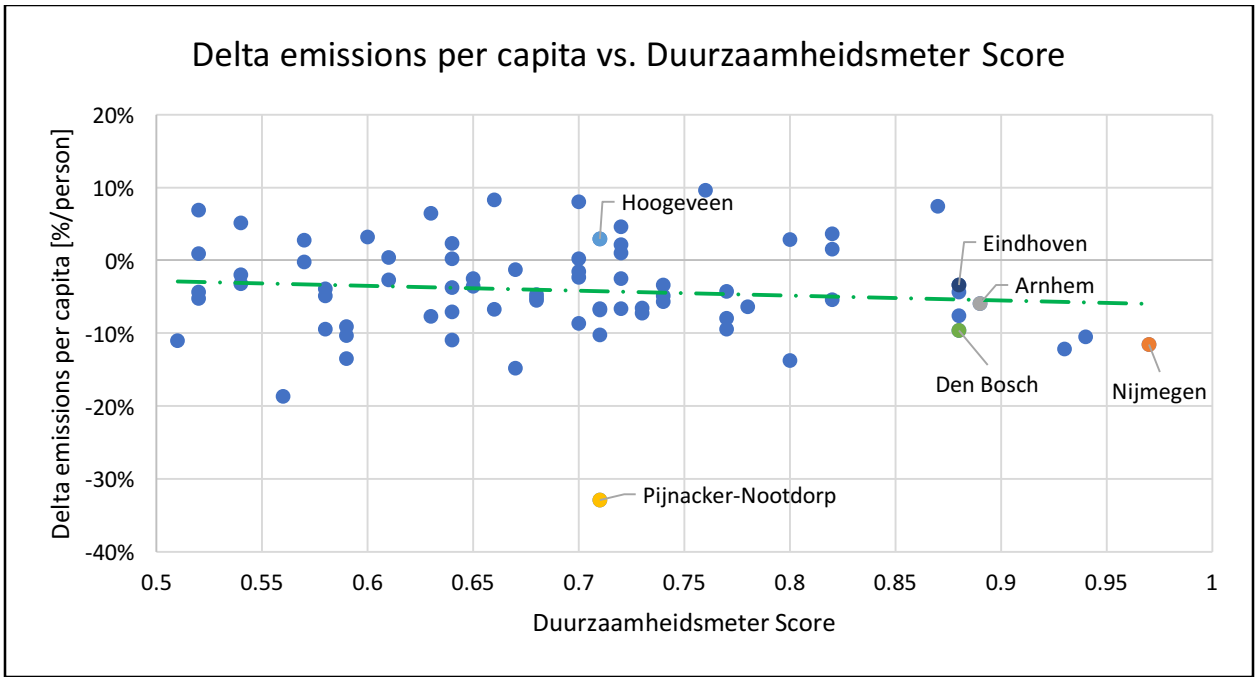


Figure 11: Change in emissions per capita for Dutch municipalities which achieved a Duurzaamheidsmeter score of greater than 50%

While there appears to be a slight correlation between the Duurzaamheidsmeter score and an emissions reduction, further filtering was required to fully explore this relationship. It was found, however, in Figure 12 below that for municipalities with greater than 50,000 inhabitants, there exists some correlation between the increase in the survey score and emissions reduction (R^2 = 0.0376).

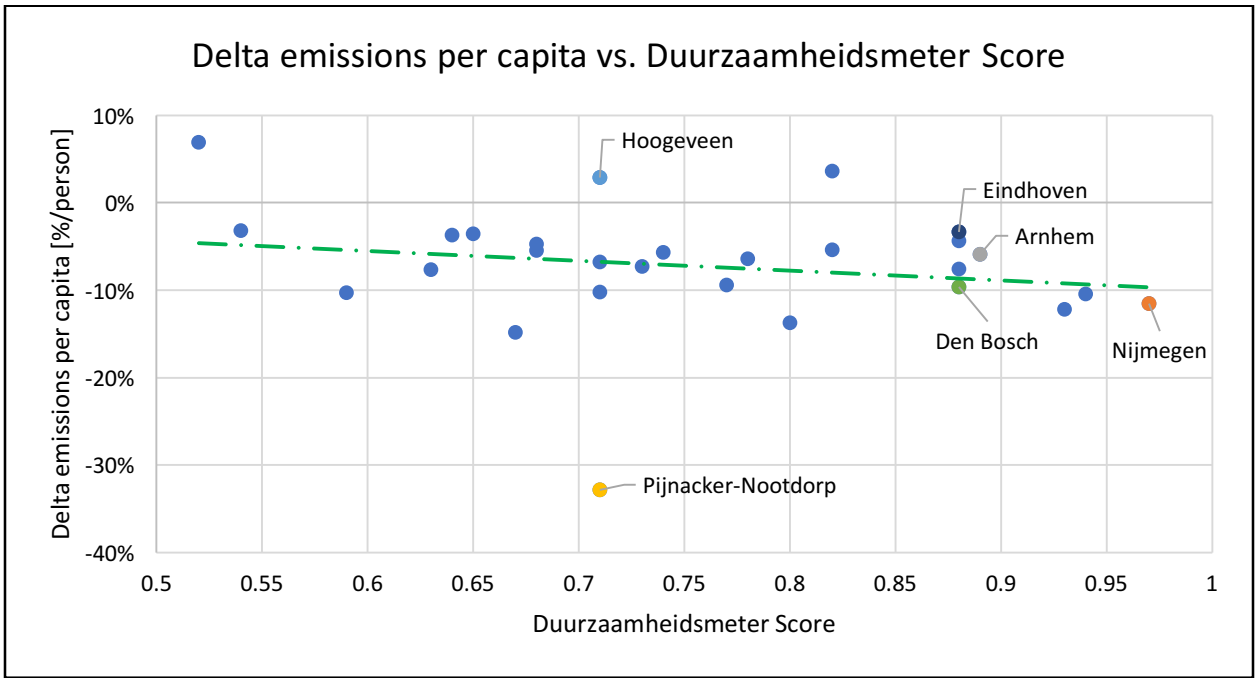


Figure 12: Change in emissions per capita for Dutch municipalities which achieved a Duurzaamheidsmeter score of greater than 50% for municipalities with a population greater than 50,000

While a large number of indicators were analyzed in this part of the study, only the Figure 12 above was found to have a meaningful correlation to a reduction in emissions, energy intensity, or an increase in renewable energy. In this case, further study will be required to understand this potential relationship between the emissions and Duurzaamheidsmeter score. Given that the Duurzaamheidsmeter survey was separated into three areas (People, Planet, Profit) and measured not only preparedness but also capacity, policy, and climate actions, it is possible that the results from one of those question sets would more strongly correlate to emissions reductions. Such a further study could test whether specific indicators monitored within the survey could also be correlated to emissions reductions. If this be so, then such a correlation could lead to better understanding which factors would lead municipalities to more efficient climate action plans.

As more data is added to the Klimaatmonitor, increasing the number of years, it is possible that trends will emerge from those data and conclusively indicate that good practices were taken. However, at this time, no broad correlations can be drawn. Included in Appendix A are a number of graphs which explore the relationship between emissions and other quantitative indicators: % LED public lighting, % Homes with an energy label, and installed PV [kWp/1000 homes]. None of these relationships yield any results which correlate strongly to a reduction in municipal emissions. It is possible that such correlations will be made when more data is available per municipality. However, currently, there is little that can be stated firmly that would link municipal climate actions to the observed emissions reductions. At the same time, programs could be highly effective with the positive results offset by some other effects; this was seen by the increase in the emissions factor per kWh (Table 8). Further study is required to investigate this potential outcome and isolate those factors causing the emissions increase.

5.1.3 Implementation and Monitoring (continued): Results of the Qualitative analysis

The main body of this section will be dedicated to answering research questions 1 & 4: RQ1 What is the main role of municipal governments in local climate action? RQ4 Are there other indicators which show progress towards achieving climate targets? While the previous section on quantitative analysis sought to conclusively answer RQ3, this section will assess the availability of other indicators in combination with current monitoring data in order to effectively monitor climate action. The compilation of all qualitative indicators found in this study can be seen in Table 11 below.

When discussing municipal power (where municipal actors state they have the ability to implement climate mitigation actions), the design of this study was to view power from the perspective of the municipal climate actor. While, objectively, other conclusions may be drawn, it is the perspective of these civil servants that will ultimately govern which sorts of actions they pursue. Informed by the municipal action plans on the strategies being written, the in-person interviews were used as the first step to understand where climate actors viewed their power base. As discussed in Chapter 2, there are four main styles of government which have become accepted in the literature: governing by Authority, provision, enabling, and self-governing (Bulkeley 2006). Actions are coded per municipality by the number of actions per government style found in the good practices followed by the number of actions in their action plan: Almere had 3 good practices of government by enabling and 8 actions of enabling found in their climate strategy (3:8). For more information on these unique modes of action, refer to Chapter 2.

Table 11: Breakdown of qualitative indicators for all municipalities with a written case study

Municipality	Almere	Amstelveen	Arnhem	Den Bosch	Eindhoven	Goeree-Overflakkee
Short-Term Goal	2023: Reduce Emissions 80-95%	2015: Sustainable Municipal Procurement 2030: Fossil Free Municipal Organization	1.5% annual energy savings 2020: 14% RE 2023: 16% RE	Climate Neutral Municipal Organization 2020	2025: Fossil Free Municipal Organization 2030: 55% CO2 Reduction	Climate Neutral 2020
Long-Term Goal	2050 Climate Neutral	2040: Zero Emissions	2050 Climate Neutral	2050: Climate Neutral	2050: 95% CO2 Reduction	n/a
Outreach/Initiatives						
Citizens Energy Cooperatives	2	n/a	3	1	2	n/a
Local Company	n	y	y	y		
Commitments/Consortia Members		28	120	50		
Interdepartmental Work	y	y	y	y	y	y
Klimaatverbond	0	1	1	1	1	0
Covenant of Mayors	28 Apr 2015			8 Sep 2008	10 Jun 2008	
Main Municipal Role						
Governing by authority						
Self-governing	2	2	2	2	2	2
Governing by provision						
Governing by enabling	1	1	1	1	1	1
Action Plan						
Short Term Documents	Strategy	Strategy	Strategy	Strategy	Strategy	Roadmap
Long Term Documents	None	Roadmap	None	*Not Public	Roadmap	n/a
GHG Emissions Baseline per Sector	y	y	y	y	y	n
Climate Actions						
Document Name	Almere Energie Werkt	Energiebeleid gemeente Amstelveen 2013-2016	New Energy Made in Arnhem	Energietransitie -programma 's-Hertogenbosch 2016-2020	Klimaatplan 2016 - 2020	Publicatie Een groen en innovatief eiland om trots op te zijn
Date of Publication	26-3-15	Feb-13	May-15	Sep-16	19-12-2016	Sep-16
Program Duration	2015-2018	2013-2016	2015-2020	2016-2020	2016-2020	2016-2020
Governing by authority	0:1	0:3	0:15	0:6	1:1	1:0
Self-governing	1:3	0:5	0:30	0:8	0:5	1:0
Governing by provision	0:2	0:3	0:13	0:2	0:1	0:0
Governing by enabling	3:8	1:14	2:31	2:19	1:7	0:0

Municipality	Groningen	Haarlemmermeer	Helmond	Leeuwarden	Maastricht	Nijmegen	Zaanstad
Short-Term Goal	2025: 50% CO2 Reduction	Energy Reduction -1.5% per year 2018: -5% 2023: -12% 2020: 14% RE		2020: 20% Energy Saving with respect to 2010 & 16% RE	2020: 20% CO2 reduction	2014-2018: 10% energy savings 2032: Carbon Neutral	100 kilotonnes reduction 2020
Long-Term Goal	2035: Energy Neutral / Emission free	2050: 60% Emissions reduction Transport	2035: Climate Neutral	2050: 80-95% CO2 Reduction	2030: CO2 Neutral	2045 Fossil Free	Climate Neutral [No year]
Outreach/Initiatives							
Citizens Energy Cooperatives	2	2	3	2	1	2	n/a
Local Company	y		y		y	y	y
Commitments/Consortia Members	20		40		20	19	35
Interdepartmental Work			y		y	y	y
Klimaatverbond	1	1	1	1	1	1	1
Covenant of Mayors			3 Nov 2009			23 Jan 2008	
Main Municipal Role							
Governing by authority							
Self-governing	2			2	2	2	2
Governing by provision							
Governing by enabling	1	1	1	1	1	1	1
Action Plan							
Short Term Documents	Strategy	Strategy	Strategy	Roadmap	Strategy	Strategy	Roadmap
Long Term Documents	Roadmap	Roadmap	n/a	n/a	Roadmap	Roadmap	Roadmap
GHG Emissions Baseline per Sector	y	y	n	n	n	y	n
Climate Actions							
Document Name	Groningen geeft energie	Haarlemmermeer naar een circulaire samenleving Duurzaam 2015-2018	Programmaplan Duurzame en Gezonde Stad	Energieagenda Leeuwarden 2016-2020	concept bijlage uitwerkingsplan LEA 2015-2018	Duurzaamheid in Uitvoering 2013-2017	Zaans Groen: Ingrediënten voor de Zaanse Energie Agenda 2.0
Date of Publication	Mar-15	Jul-05	30-1-2017	24-2-2016	13-5-2015	2/12/13	Mar-16
Program Duration	2015-2018	2015-2018	2017-2020	2016-2020	2015-2018	2013-2017	n/a
Governing by authority	0:5	0:5	0:1	0:0	0:1	0:5	0:0
Self-governing	0:4	0:15	0:1	0:0	0:2	1:16	0:0
Governing by provision	0:4	0:2	0:0	0:0	0:1	0:7	0:0
Governing by enabling	2:8	2:18	1:5	2:0	1:8	2:22	2:0

During the interview, each civil servant was asked both explicitly and implicitly where they view their main sources of influence; where they have the power to act. Universally for all Dutch municipalities, enabling was the first and only answer. While every overall strategy proposed had elements of multiple governing styles, enabling was viewed as the method best suited for implementing actions. This can be seen in the table under the heading of the main municipal role, as each civil servant stated explicitly that this was their most powerful method for action as well as in Table 12 below.

Table 12: Descriptive statistical analysis of selected qualitative indicators from Table 11

Outreach/Initiatives	**Frequency**	**Relative Frequency**
Citizens Energy Cooperatives	10/13	77%
Local Company Commitments/Consortia Members	8/13	62%
Interdepartmental Work	10/13	77%
Klimaatverbond Member	11/13	85%
Covenant of Mayors Member	5/13	38%
Main Municipal Role		
Governing by authority	0/13	0%
Self-governing	11/13	85%
Governing by provision	0/13	0%
Governing by enabling	13/13	100%
Action Planning		
Short Term Documents [Strategies]	10/13	69%
Long Term Documents [Strategies]	0/13	0%
GHG Emissions Baseline per Sector	8/13	62%

In addition, to simply asking where municipalities had the power to take climate action, the most recent climate strategy (generally referred to as action plan) from each municipality was analyzed – see Table 7 for further information with regards to the elements present in local climate strategies. While none of these documents qualify as an Action Plan as defined in Section 2.2, most of them have included some elements of concrete actions to be undertaken in sufficient detail for analysis.

As can be seen in Table 11 & Table 13, this places both the overwhelming majority of actions discussed as good practice and the greatest percentage of those listed in sustainability documents in favor enabling as the preferred style of governance: 140 out of the 307 climate actions categorized in action plans and 21 out of the 26 in good practice fell under enabling. This may suggest that governance by enabling is linked to better project implementation, but further research is required to better understand this relationship. And, while other forms of governance were not

favored when speaking about good practices, the ratios between the governance styles in municipal climate documents was far more balanced.

Table 13: Frequency and relative frequency of actions present in good practices and climate documents

Climate Actions [Frequency]	Good Practices	Action Plans
Governing by authority	2	43
Self-governing	3	89
Governing by provision	0	35
Governing by enabling	21	140
Total	**26**	**307**
[Relative Frequency]		
Governing by authority	8%	14%
Self-governing	12%	29%
Governing by provision	0%	11%
Governing by enabling	80%	48%

However, this by no means is an indication that other methods of governing are not used in climate action within the Netherlands. Indeed, there is one action based on governing by authority which was very commonly discussed which bears mention here: enforcement of the Environmental Protection Act. While the Environmental Protection Act has been in place since 1993, through the 18 Dutch municipalities as well as several other actors surveyed in this study, it was found that the stipulation mandating any renovation with a 5-year payback time for large energy consumers was seldom enforced. A common message from climate actors during our interviews was, "we don't have the power to act." In this instance, however, the power was granted in 1993 and in many cases, it still has yet to be used. In fact, in Eindhoven, a group of companies approached the municipality requesting that the act be enforced which precipitated the municipality enforcing the act as of January 1st, 2017.

To supplement those climate data available, the goals and climate documents of surveyed municipalities were further analyzed to decide if these could be used as proxy indicators for good practice. Each municipality surveyed, with the exception of Zaanstad, had climate goals to be achieved by a certain year – no later than 2050. While some are more ambitious, particularly Goeree-Overflakkee targeting climate neutral by 2020, none of these goals, in and of themselves, indicate any greater or lesser level of preparedness of a municipal government. Further, each most recent strategy was analyzed based on those criteria in Chapter 3 to assess whether the document be a Plan, Strategy, Roadmap, or nothing at all. Out of the 13 Dutch municipal case studies, ten wrote strategies and three only wrote climate roadmaps: Goeree-Overflakkee, Leeuwarden, and Zaanstad. However, when comparing these results to their emissions reductions in Table 9, these municipalities recorded -4%, -12%, and -13% respectively over the 5-year period. Despite the lack of concrete plans, the municipalities were still able to achieve emissions reductions, demonstrating that the lack of a climate strategy is not an indicator of underperformance. The long-term plans were also examined, zero wrote strategies and 7/13 of the municipalities had roadmaps towards their end goals, but again, when compared with other indicators, this yielded no further insights.

This study was conducted to better understand climate action in SMCs in the Netherlands. However, in the course of my research, I had the opportunity to survey municipalities outside of the population range of 50,000 to 250,000. Those additional municipalities surveyed, Culemborg and Wijk Bij Duurstede in the Netherlands and Bremen in Germany provided some insight into how the population and capacity of a municipality can make on the scale of climate action available. The two small Dutch municipalities focused mainly on small actions, encouraging other actors to invest time or resources into climate-friendly policies. With only 0.8 FTE focused on the environment, not only climate, limited possibilities existed, and both civil servants interviewed stated that they spend nearly 1 FTE of time on climate alone and, in addition, had many other projects which required their attention. In Bremen (see the case study in Appendix B), while the conditions were relatively different, with a larger population and located in Germany, the strategies discussed and barriers experienced were similar to those I had learned of in the Netherlands. From this limited exposure, I believe further investigation is warranted to learn where differences arise and to what extent they effect the overall outcomes of climate action.

Several other indicators were compared and combined with each other in an attempt to codify a method to indicate good practice was taken in a given municipality. The formation of an energy consortium and number of members, the number of energy cooperatives, as well as the membership to larger organizations focused on climate (Klimaatverbond and the Covenant of Mayors). However, regardless of how these indicators were combined, those municipalities which achieved a greater emissions reduction over the period of 2010-2015 could not be distinguished from those who had not. This forces me to conclude that quantitative and qualitative indicators currently available are insufficient to show good or best practice either on a project or municipal level.

5.2 Path Towards the Future

This section will compile and analyze those good practices discussed in the interviews recorded in this study. While this is by no means a comprehensive list of actions which can and should be taken by local climate actors, I aim to show what worked and how in order to further develop others' tools to implement climate actions (section 5.2.1). Furthermore, since it has been shown in the previous section that current monitoring efforts are insufficient to conclude objectively that a given action/strategy is a good or best practice, I will also make recommendations for future efforts and projects which I have currently found to be lacking.

5.2.1 Analysis of Identified Good Practices

The following Chapter will analyze good practices discussed in the expert interviews. This is by no means a comprehensive list nor will it provide the archetype of all successful municipal climate actions. This is the summation of those implemented actions which were discussed to a depth from which comparisons could be made to those actions taken in other municipalities, the most common of which will be discussed below. Additional actions were discussed in each interview, nearly all of which overlap directly with those analyzed in the section below.

5.2.1.1 Public Engagement

Occurrences: Almere, Arnhem, Goeree-Overflakkee, Zaanstad

Direct public engagement was seen as a crucial role of the civil servants in every interview conducted. During four interviews, a practice of public engagement was recounted as a good

practice: two with regards to energy ambassadors and the others with community meetings. Both methods of engaging the public yielded positive, if indirect results towards achieving climate targets. However, these strategies require minimal investment from municipal actors be it in time, budget, or direct engagement; once started, they can begin to self-perpetuate.

Both Almere and Arnhem invested in creating energy ambassadors within their municipalities. In Arnhem where municipal teams focused on engaging citizens already existed the challenge was to train them on climate, whereas in Almere, the program had to be started from scratch. In both cases, trainings were provided free of charge for interested participants: presentation skills, sustainability information, other skill development. No large search was conducted, merely those who had completed renovation projects or had contacted the municipality directly to get involved in climate and sustainability were invited.

The aim of these programs was not only to educate their respective communities on climate projects and potential individual savings but also to create a direct channel between citizens and civil servants. However, the information and point of contact is always someone known in the community: a neighbor, friend, colleague as opposed to the civil servant directly. Both municipalities found that when the flow of information came from the municipality directly that it was ignored and sought a different option. While the direct benefit of spreading ideas for individual climate actions to homeowners was successful, the ambassadors also assisted in building a network of interested citizens which could be called upon for community meetings or other municipal functions. In addition, the municipality also has access and direct contact with those interested in any number of given projects, creating a direct line of support from the local government to new projects.

Energy cafes or other local meetings can be used to activate the community behind climate and sustainability. Civil servants in both Goeree-Overflakkee and Zaanstad have run a series of successful meetings in their respective municipalities. The cost is relatively low, between €1000-€2000/meeting requiring between 25-40 working hours to implement. When designing each workshop, a specific theme was chosen and advertised not only to the general public but also to civil servants in other municipal departments (if the event is about E-Transport, invite those involved in mobility and infrastructure). Their participation in such events lends credibility to the proceedings and encourages the public to take the workshop seriously. Additionally, workshops should be centered around individual participation in small group activities. With a stage and presentations, naysayers can easily vocalize their opinions and extort attention from the proceedings. However, in a workshop setting, discussions are facilitated and no stage is given for a loud, negative comment.

However, if it is a goal to create a local network interested in climate and partnered in some way with the municipality, it is crucial to maintain lines of communication with such a group. In Arnhem, civil servants were discussing a new project with the grid operator without any immediate implications without alerting the broader public network. But, when the project leaked, the local climate network involved with the municipality felt betrayed even though only a future study was to be completed. The issue wasn't the future project in and of itself but that the network was not made aware of the planning process.

Lessons learned: Almere, Arnhem, Goeree-Overflakkee, and Zaanstad

1. Concrete aims: Any community engagement project must have a clear definition from the outset: each workshop must have a theme or the ambassadors a mandate to encourage action in certain areas.
2. Work with those already interested: Seemingly an initiative observation, but it is critical to engage those actors already interested in climate.
3. Use and monitor what resources are available: This includes monitoring and maintaining a list of interested private citizens and initiatives within the municipality; without such a list of contacts, searching for energy ambassadors/coaches would have been far more difficult.
4. Get municipality out of the picture: The public mistrusts government. In response, push others into the forefront and keep the municipal role in the background.
5. Respect the network: Maintain communication and discussion of current and future plans to avoid breaches of trust.

5.2.1.2 Citizen-Led Energy Cooperatives

Occurrences: Eindhoven, Groningen, Haarlemmermeer

As can be seen in Table 11, ten out of the thirteen Dutch analyzed municipalities are home to citizen-led energy cooperatives. As was outlined in a 2016 report from the locale energie monitor, citizen-led energy cooperatives are annually increasing the scope and impact of their actions to mitigate climate change and the number of cooperatives within the Netherlands also continues to rise (Schwencke 2016). Three of the interviewed municipalities (Eindhoven, Groningen, and Haarlemmermeer) mentioned their interactions with such organizations as good practice. Thematically, these actions follow similar guidelines to those from Public Engagement, but how the municipality is involved with such projects differs.

In each case, the municipality was approached for some sort of guidance or support which was then provided to the organization. However, rather than being dependent on the municipality for organization or management, the energy cooperatives maintained their independence, allowing them to pursue their own, individual targets. Building positive relationships with these organizations builds the local government's capacity for action, as it was found in Groningen, that members of the cooperatives can be first adopters for new ideas and provide the groundwork/social infrastructure for future municipal climate action. Here, having the knowledge of what each organizations' goals are allowed the municipality to potentially support the cooperatives when asked, in whatever capacity required with the end goal of increasing the cooperative's ability to implement climate actions. In each case, large solar projects were planned within the municipal boundaries with minimal or no influence from the local government: Eindhoven, over 4,000 solar panels installed; Groningen, the project aims to install 7,777 panels within the municipality.

Lessons learned: Eindhoven, Groningen, Haarlemmermeer

1. Support interested parties, be it with a loan, annual support, permitting, or a municipal building for a pilot project.
2. Monitor cooperative goals and develop relationships. Given the citizen cooperative's ability to implement large projects, their active membership can be incredibly useful when working towards developing future action plans, implementing policies, and monitoring projects.

3. Matchmaking. When someone calls the municipality looking to get involved in climate or sustainability, make sure they are connected to others with similar interest *and* record their information for future projects.

5.2.1.3 Municipal Actor Engagement

Occurrences: Almere, Goeree-Overflakkee, Nijmegen

The breadth of impact resulting from nearly any direct municipal climate mitigation action requires the involvement or several municipal departments. As such, climate actors have been required to redefine their roles both internally, within the municipal government, and externally. This prerequisite change entails a far more networked approach to climate action. Civil servants in both Almere and Nijmegen, stated clearly that without a supportive local intragovernmental network, climate targets were nearly impossible to achieve. This notion was supported from nearly all other climate actors surveyed.

The major changes were focused on how working relationships with other civil servants were built. Engaging other departments by sitting with their teams, learning about their current projects, and never saying no to a meeting were crucial aspects. Additionally, the conversation about climate had to be changed in order to facilitate successful discussions. Rather than trying to force others to approve climate projects, look for synergies and matching goals where climate projects could fit into another department's goal. Problems, barriers, and ideas to overcome them were discussed using climate as a solution to a problem. In the case of Almere, a disruptive colleague was converted from the most staunch opponent to the greatest supporter of climate projects through listening, building respect, and not fighting his truth.

5.2.1.4 Company Consortia

Occurrences: Arnhem, Den Bosch, Eindhoven, Groningen, Helmond, Leeuwarden, Maastricht, Nijmegen, Zaanstad

Nine of the 13 actors interviewed for case studies listed the creation of a consortia of companies as a good practice. While these good practices represent a broad range of investment from the local government, a number of common steps were followed to establish such groups.

1. Activating interested parties: To start any project, find those who are already interested. To start a consortium of interested companies/organization, the existing municipal network can be activated. Calls, letters, and word of mouth can be used both introduce the idea of taking climate action. Commitments are not initially necessary and should not be discusses as this may deter investment.

2. Workshops/Meeting: In some cases a/several workshop(s) were scheduled to begin building a network around climate action. Any interested parties were invited and, at the end of a meeting (if there be several), were encouraged to extend those invitations to others who might also be interested. Additionally, other municipal actors were invited which, as previously discussed, lends credibility to the proceedings and shows the level of interest across municipal departments. It was also found that messaging about business and economic incentives were particularly useful, be it the municipality will preferentially accept tenders from this group of actors or if there be a clear business case. Climate is attractive to the public and shows good PR, but profits motivate the companies.

*Some municipalities ended here with a network established. This can be capitalized on as it builds relationships for future projects and advice, but falls short of directly impacting any municipal climate targets.

3. Commitments: Regardless of the commitment any requirement will push those who have joined and are willing to sign to act. This is a crucial step as it binds the group together. In addition, in several cases, future meetings were held at a given company/organization's workplace to showcase their implementation. If problems are encountered, they can be directed to the network because it is likely that another party will have also experienced it.

   *To encourage signatories, engage the press. Publicize the signing of any commitment, highlight the contribution and how it will be both good for the economy and the environment. If companies see the free advertising, how they will be placed first, this will push them to sign.

4. Monitoring: This is a clear piece of the projects which has been missing. While several municipalities initially suggested that they would monitor all projects, the time and effort quickly grew beyond the available resources. Self-monitoring or other schemes which put the impetus to the established organization could be more successful.

5. Continuing Role: In each case where the consortium resigned a commitment, the municipal actors pulled out of the leading role, becoming a regular member. While the municipality is required to activate the other actors, once initiated these consortia seem to self-perpetuate.

5.2.1.5 Project Creation

Occurrences: Amstelveen, Nijmegen, Den Bosch, Leeuwarden

Instinctually, municipal actors may want to take the lead on large projects (wind turbines, sustainable transport, large numbers of home renovations), however it is precisely the opposite role which has been repeatedly highlighted by civil servants in interviews. This is not to say that immense amounts of work aren't done, no, but it is the perspective which guides those projects which is important. In the cases of sustainable transport in Amstelveen and the wind turbine construction in Nijmegen, the municipal lead did not work. It was ineffective for a variety of reasons. However, in both cases, when an interested external party made their interest known, both municipalities allowed the external actor to attempt to implement what they themselves could not.

While the municipality was unable to implement their plans alone, it is likely that their efforts paved the way for the others' success. Such a strategy was intentionally employed in Leeuwarden and Den Bosch when attempting to increase the renovation rate of residents. The pilot projects began in a similar way with civil servants taking advantage of interested parties. Simultaneous to recruitment of pilot projects, the civil servants sought out building contractors and designers who may be interested in such work. By making those connections and pre-negotiating rough project details, when asked for costs, the municipal actors knew both what could be currently done *and* what sort of discounts might exist if/when the project scaled up. Finally, and crucially, these projects were publicized. In the case of Den Bosch, those pilot home owners were encouraged to

spread the word through their communities; in Leeuwarden, the Press was called and the housing organization was made headline news.

In both of these instances, interested parties were connected with and wound up driving the projects through completion. And, given their success, such interested parties are more likely to work with the municipality again on another project. For this reason, it is crucial for the climate office to maintain a pipeline of citizens and other actors interested in climate.

5.2.1.6 Overall Findings

Highlighted in these more general actions is the shifted role of the civil servant from a policy maker to a network node: governing by enabling was the governance style used in each of these more general good practices. In order to successfully manage these sorts of actions, continued effort must be made on behalf of the municipality to develop, monitor, and engage all actors within the municipality, positioning itself as an umbrella of support which can foster ideas, provide resources, and make meaningful connections. Fundamentally, successful actions are necessary to mitigate climate change, and while it may be important politically to have one's name on a successful implementation, that does not change the reduction in emissions, energy intensity, or increase in renewable produced by the project. Finally, further investigation is required to show how different approaches could be successful to implement projects, how collaboration could increase the rate and reduce the cost of climate actions, and what monitoring practices will be required to concretely show that action X produced result Y.

6 Discussion and Reflections

The culmination of this research project is to place my findings in the context of current academic thought as well as to make recommendations for further research and for climate actors in SMCs. The first section of this chapter will be dedicated to the academic field and further avenues of research which I believe should be pursued; the second will be focused on the broader implications of this study for policy makers and civil servants and will expand in more depth on observations and comments made during my interviews with civil servants and others focused on climate action.

When reviewing my work, I find that one of the greatest limitations was my lack of initial preparation for conducting case study research and interviews with climate actors. I learned a great deal over the course of this research both with regards to climate action as well as how to conduct this sort of project; however, I see that the information I gathered both when surveying climate documents as well as in my interviews is incomplete. My initial research was focused on city climate action in general, focusing on large organizations publishing work on city climate action. This broadened my view of this study beyond the Netherlands, but it also forced me to learn significant pieces about local climate action in my first interviews. I then missed the opportunity to ask more pointed questions of those civil servants because I did not have the education required to understand the initiatives and structure of Dutch local climate action. It is therefore possible that indicators which could have been linked to good practice are available, but I was and am still unaware of where to begin.

One further aspect of this work which I found to be of critical importance was my reliance on translation, both in climate documents and when speaking with climate actors. All of my work had to be conducted in English, and this could have resulted in unforeseen errors due to an improper understanding of what was written or said. I worked to minimize this effect by ensuring that all my notes had been edited and approved by my interviewees in the week after our discussions. In addition, working closely with Dutch colleagues allowed me to question and confirm that I had correctly interpreted the ideas from the translations I used.

6.1 Reflections and Implications of the Research in the Academic Field

As was discussed in Chapter 2, which there are four basic governance strategies available to implement climate actions (Bulkeley 2006), a consensus has yet to be reached in literature which mode is most prevalent and most effective (Bulkeley 2006, Bulkeley 2013, Giest 2013, Hoppe, van der Vegt et al. 2016). In this study, I found from both surveying those climate strategies published by Dutch municipalities and interviews with civil servants, that governing by enabling is the predominant method used to implement climate actions, accounting for 80% of the good practices discussed and 46% of the total climate actions surveyed. Self-governing actions were second in prominence used for 12% of the good practices and 29% of the total actions. This result builds upon the assertion from Bulkeley's 2006 paper that governing by enabling is on the rise, and contradicts somewhat the findings from Hoppe et al 2016 which found in four Dutch municipalities that enabling was hardly used.

From my perspective, it is interesting to note that universally, those civil servants interviewed stated that governing by enabling was the key to Dutch local climate action. They described their role as one of a facilitator, enabler, motivator, and network node, using the knowledge and resources at their disposal to allow others to take meaningful climate actions. However, this is not

to say that other forms of governance were not desirable or unused; rather, that their current situation limited the areas where they felt they had the ability to act from a position of authority to mandate climate actions. However, it is interesting that while most of the good practices discussed were focused on enabling (80%), less than half of all the actions recorded in municipal documents were enabling focused. One other factor commonly cited for the success of enabling was the rate of change in the fields of climate and sustainability, and that municipal governments – and government in general – is not agile enough to legislate climate action.

One explanation for the focus on enabling is the need for swift action, and enabling has been found to be more efficient than other methods of governance and so is the focus of civil servants' attention. The cause could also be the lack of municipal power or the lack of intra-municipal coordination to mandate change. However, regardless of the cause and governance style, all of the municipalities surveyed – and nearly all within the Netherlands – have climate targets. So, if local governments are focusing on facilitating others to achieve those goals, who then bears the responsibility to achieve them, in particular now when it appears that the Netherlands as a whole is falling behind local and national emissions goals?

The prioritization on enabling does beg the question: will it lead to achieving climate targets? Currently, there is little data which could either support or refute this claim, but, given the universal focus of local climate actors to facilitate others' actions, a critical eye should be kept on progress to ensure that progress is still being made, regardless of the approach. It is important, then, to further explore how to measure the progress of climate action on a project as well as on a municipal level. As was shown in Chapter 5, there is little which can be shown linking action implementation to emissions reductions. However, since a large share of emissions are due to electricity consumption, it is possible that the effect of climate actions is lost because of the increase in the emissions factor of the Dutch energy mix (see Table 8). So, the search for other indicators, outside of emissions and energy intensity, must be found which can accurately monitor progress.

Coupled with the findings regarding the focus on governance by enabling, were those which were found which may modify the theory of change proposed in Hoppe et al. 2016. The most apparent of which was the effect of independent citizen's energy cooperatives in Dutch municipalities and their ability to act independently of the influence of the municipal government. Local climate policy was claimed to be implemented in action arenas, where citizens, interested parties, and government connect to produce climate actions (Hoppe, van der Vegt et al. 2016). However, it was found in several cases, most notably in Groningen and Eindhoven, that such cooperatives could take climate actions directly, independently of the local government. Furthermore, it was found in (Schwencke 2016) that energy cooperatives have the ability to implement projects in excess of 7MWp of solar panels. As a result, an additional path to action has been added between Local Characteristics and Intended action – representing the direct effect local energy cooperatives can have on mitigation actions.

In addition to the ability of citizens' energy cooperatives to implement climate actions, it was found that participants in the local action arenas can have an effect on municipal policy output. In Eindhoven, a group of companies approached the municipality and asked the local government to enforce the Environmental protection act, requiring companies to take efficiency measure when the payback time of the renovations is under five years. As a result, the local government changed

its practice and, as of January 1st 2017, began enforcing the national legislation. In this example, government policy was directly changed by interested parties in the local action arena, and, as a result, an arrow should be placed originating from the action arena to the Municipal organization.

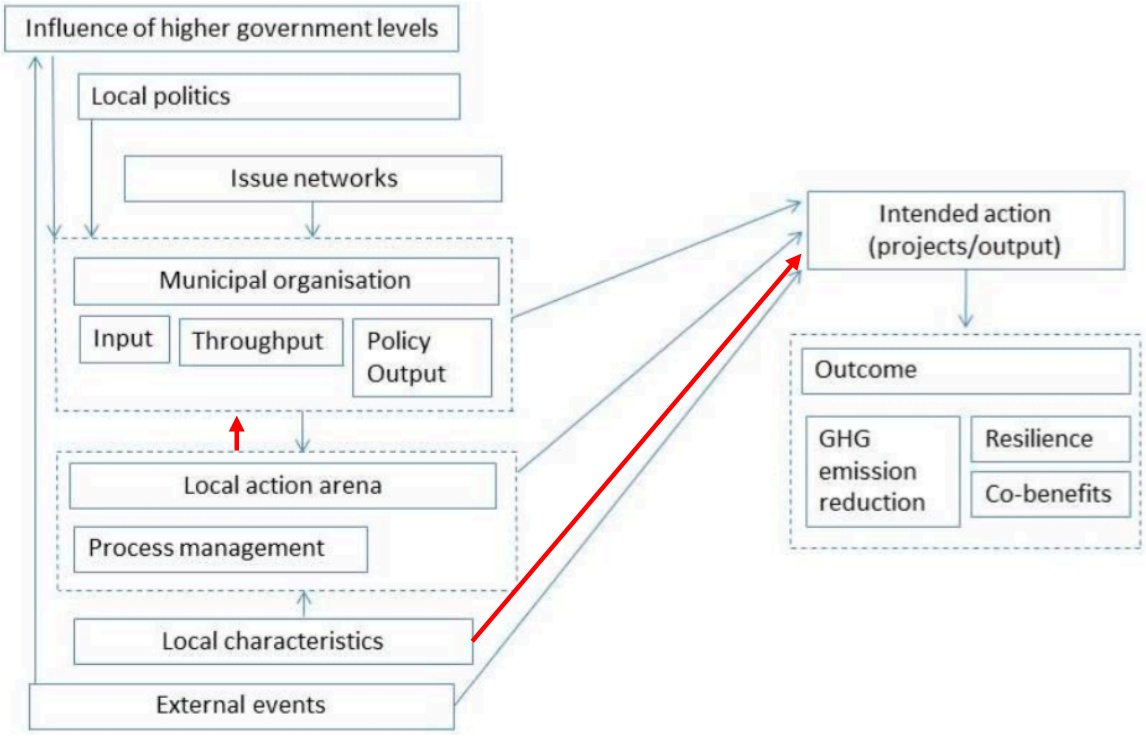


Figure 13:Updated theory of change with additions to the original figure from (Hoppe, van der Vegt et al. 2016)

It is possible, however, that enabling, while a useful approach to engage the public, is ineffective when it becomes the main strategy when striving to implement climate actions in the Netherlands. Since no strong correlation could be found between any of those indicators recorded and emissions reduction, it is possible that the focus on facilitating at a local level is not a means by which climate targets can be achieved. Further exploration is required before any weight can be placed behind this suggestion as there is too little data to show broad trends.

One major element present in the theory of change is the municipal policy output which can then lead to climate actions and projects. At the outset of this study, climate "Action Plans" were extensively surveyed in order to build an understanding of what actions municipalities planned to implement. However, it was consistently found, be it in the database from the Covenant of Mayors or local municipal documents from Dutch municipalities, that there is very little consistency, in length, substance or structure to the submitted "Action Plans". Simply put, most do not contain entirely defined actions, and, therefore, cannot be directly implemented. While it is possible that other documents exist in listing climate strategies in greater detail, they were not found, and I was told several times that such documents were not open to the public if they existed.

Given how many times I was told that understanding how to implement was a critical step, that climate actors don't understand what they can do to implement change, and that collaboration

between municipalities is minimal, a critical first step is in developed, critical, and public climate action plans. In addition, if the municipal government had clear actionable plans, then when specific actions are not implemented, answering "why didn't it work" could be broken down to the step at which the barrier occurred. Furthermore, external monitoring and collaboration could be streamlined because parties outside of the municipal government would know what is planned and what, in particular, has been achieved – assuming that the monitoring piece of the plan was faithfully implemented. However, it remains to be studied whether or not better action plans would lead to emissions reductions, and whether weak implementation is a result of weak planning.

While I have so far discussed the role of municipal governments in local climate action, it has been argued that local governments may participate in a variety of areas in technological transition change of socio-technical regimes. Geels suggests that cities may participate in three roles: First, local governments as primary actors; Second, the entire city could be viewed as a seedbed for testing and experimentation for the energy transition; Third, the city government's role is limited in comparison to other actors (Geels 2010).

In the role of a primary actor, in Dutch cities, civil servants were primarily concerned with their local building stock and other areas within the municipality over which they had control. However, in my interviews, this role as primary actor was not what civil servants are striving for. Enabling as a strategy and in how actions are approached dominates Dutch local climate policy, so while municipal governments may be an actor to some extent, they are mostly building a role as a network node, or a primary actor in a climate network. In this way, they aim to facilitate others to implement mitigation actions, encouraging large energy consumers and emitters to change practices as opposed to attempting to mandate change when local governments seldom have the authority to do so. It remains to be shown whether or not this strategy will lead to significant emissions reductions, and, ultimately, to achieving their long-term climate targets.

Extra-governmental organizations and networks in many cases look to municipality for support and guidance: in particular, energy cooperatives & coalitions as seen in the good practices. While the local government can initiate and/or shape organizations and goals, in the majority of cases I found that these organizations prefer the municipal role to diminish, remaining a passive observer or, when beginning as a founder, diminishing to that of a participant as opposed to primary actor/leader. Such climate organizations may include companies and industry within the municipality and, therefore may not be made in opposition to the incumbent regime's wishes. However, there is clearly a limit - the non-enforcement of the environmental protection act for instance – to what local governments will undertake which will directly affect incumbent energy regimes. Economic and other factors will dominate such discussions as opposed to sustainability. So, a critical role of the civil servant is then to find co-benefits which were shown to have between 50-350% of the direct total benefits of climate projects (Ürge-Vorsatz, Herrero et al. 2014).

In addition to this facilitative role, several civil servants were curious to learn how to scale up pilot initiatives. To me, this suggests that while municipalities are relatively successful at creating a niche for innovation to occur, the pathways to push a successful idea into the incumbent regime have yet to be fully explored or are unsuccessful. Furthermore, this lack of understanding could lead to a stagnation in successful local initiatives, which could then lead to Geels' third claim that city governments can only play a limited role in the transition (Geels 2010). This trend could be

further exacerbated given the focus on "innovative solutions" in Dutch climate practice. If adhered to, this criterion for funding then limits the opportunities for successful pilots to expand, either within or external to the municipality in which they were originally tested. That is because expanding a pilot project would no longer be considered innovative as the process, idea, or method would have already been tested, and unless other significant aspects were added, then the "innovation" would be lost.

Further broadening this discussion is whether the energy transition requires top-down governance, national to local, or situative governance, focusing on empowering local initiatives (Hoppe and van Bueren 2015). Rather than suggesting that one approach is correct, my research suggests that both are necessary and, if used properly, can lead to meaningful change. There are instances where the government is required to support local initiatives, to lead projects, to facilitate, and to enforce; the good practices discussed for each municipality highlight these different roles (e.g. the difference between the process which led to the construction of wind turbines in Nijmegen and Goeree-Overflakkee). The differences in implementation required demonstrate the nuanced approach local governments must take working in different ways depending on which area they are active in and to how far their power, knowledge, and capacity bases extend.

However, on the scale of the municipality, in the context of Borrás and Edler 2014 I have found that there are several primary agents of change as each with their own capacity to induce/inhibit change. The facilitative role taken on by local governments with regard to climate change defers the responsibility of achieving climate targets to other actors within the municipal boundaries. While this spreads the burden of implementing change, it also further decentralizes efforts. And, while each actor can effect some change, collective action is clearly required to achieve local climate targets. Furthermore, Borrás and Edler 2014 consider radical innovation a necessary precondition for socio technical and innovation systems; however, in the case of climate, no technical innovation is not required for much of the work which must be implemented (e.g. reinsulating houses). As a result, I find that this scheme does not adequately fit the energy transisiton to be used to analyze and reflect on what has been/must be done.

Finally, in conversations with the director of the Klimaatmonitor, I was told that, to the best of his knowledge, no studies have been conducted on this database, so despite the wealth of indicators present going far beyond emissions data, no conclusions, criteria, or ranking schemes have been developed for Dutch municipalities. A further investigation of these data, even just those for CO_2e emissions could provide critical insight into how climate mitigation is actually progressing in the Netherlands. With only a descriptive statistical analysis, I was able to show large annual variations between the yearly rates of emissions reductions, a standard deviation of around 4.5%. Even though many Dutch municipalities report reductions between 5% and 10%, this should be considered to be the reported rate of emissions ± 4.5%. At this point, more data is required to assess the progress of climate action in the Netherlands, as the fluctuations even in the 5-year data make difficult to draw conclusions.

6.2 Reflections on the Study for Policy Makers

As was mentioned in the introduction, this study began as a search for "plug and play" city implementation plans for climate actions. However, it quickly became clear that for Dutch municipalities, this was not an available option as local characteristics play such a significant role

in climate actions that the plan was revised to codify good or best practices from local governments which could be replicated to some extent in other municipalities. In this section, information and anecdotes from my interviews with climate actors will be presented as well as recommendations from my experience for future local climate actions.

Throughout the interviews, I was consistently surprised and dismayed by the lack of enforcement of the Environmental Protection Act. There was no good practice listed for its enforcement because, when it was enforced, such programs were only recently instituted, in Eindhoven on the 1st of January 2017, and, so, there was no result to be discussed other than the municipality had recently changed a policy. There were several reasons given for this: a lack of funding, experience, the fear of businesses moving to other municipalities, etc.…. However, given this legislation was written in 1993, to find it not enforced, in particular because of the potential impact on emissions, was shocking. This is one clear instance where local governments could quite simply – though perhaps not easily politically – have a meaningful impact on CO_2e emissions. One of the few interviewed municipalities which began enforcement, they instituted a training program city inspectors on sustainability to increase their ability to provide data when inspecting companies for health and other building codes. Another alternative was that a climate office was able to shift the responsibility for enforcement to the office of enforcement. So ideally, by putting the responsibility under the enforcement office's mandatory tasks, inspections would be conducted and monitored by the office with the most experience in such matters.

The lack of shared knowledge of implemented projects from other municipalities was another source of frustration both from civil servants as well as from parties external from the local government (NGOs, consultancies, companies). It was quite common to learn in my interviews from separate municipalities that they were working on the same or similar projects for the coming year. However, when I would then ask if they knew that municipality X,Y, or Z were also working on such a project, they would regularly answer, "no." In fact, when I asked each civil servant what they would most like to learn from my study they would reply that project failures and how a project failed would be the most interesting piece of information which could be shared though successful climate actions and their implementation plans would also be useful. Such cooperation would allow climate actors to learn from each other's mistakes and progress more efficiently rather than duplicating the time and resources required for action planning, consultancy reports, and projects.

Pilot projects were a particular talking point as nearly every civil servant had small projects which they wanted to scale but didn't know how, or they had ideas about a project to attempt but had no idea it had already been completed before. This is a gap which must be filled, not only in the communication about projects and their results but also in the standardization of such communication so it is easily found and consumed by civil servants. While I have heard of several intra-municipal efforts to connect private citizens to ideas for their own homes or neighborhoods (project websites, sustainability lokets, information offices), I was told consistently of the lack of inter-municipal data available. Theoretically, public projects should be monitored and the results/effects made available, but, in practice, I was told that such reports were prohibitively difficult to find, and one could spend entire days fruitlessly searching, even when a specific project was in question. However, such a database could easily become difficult to manage as the sheer number of project reports housed would, hopefully, be immense. This would require careful

curation and the decision to specify specific project indicators and clear reporting formats and timelines to ensure that those data would be lightweight enough for easy search and consumption by interested parties while remaining detailed enough to remain useful.

In order for such a database to be created without draining the valuable time and resources of local governments, simple quantitative indicators for project monitoring would have to be implemented, replacing those currently expected: emissions, energy intensity, and renewable energy projection. These require constant information gathering, potentially from multiple sources, in order to show those effects. However, if descriptive indicators were standardized which would suggest meaningful changes to emissions, energy intensity, or renewable energy production without directly observing them, the burden of project-level monitoring by the local government could be dramatically reduced. Additionally, given the existence and near universal monitoring currently conducted by the Klimaatmonitor on a municipal level, it is possible that with further study, such descriptive indicators could be directly linked to emissions reductions etc. Such a system could be designed to maximize the use of local and national expertise, while minimizing the current duplication of effort when municipalities create their own local monitoring schemes independent of the Klimaatmonitor.

It is also possible that if this database were created, then parameters for ranking projects could be found allowing the codification of good or best practices based on clear descriptive indicators. Two statistics of particular interest which I was seldom able to find were: euros invested by the municipality vs total project investment and euros invested vs total project impact. While several other metrics could be useful (e.g. FTE, emissions/energy intensity/renewable energy, stakeholders required), even these two would be incredibly useful for information sharing between climate actors. That coupled with detailed project development and implementation plans would greatly increase local capacity to plan and realize projects within municipal boundaries; it is very difficult to take action when the questions “what is possible?” and “how could we do it?” cannot be answered.

The lack of consistent, project-level monitoring was perhaps the most consistently frustrating piece of this study. I was so encouraged to learn how hard civil servants are working to enact difficult and novel solutions to curb municipal emissions, but was consistently dismayed that I could rarely find any meaningful source of project monitoring after construction, implementation, or project completion. The one study I was able to find measured the energy labeling of 88 homes, and found that in monitoring their consumption, 35% of them had delivered significantly a lower standard upon implementation than required by the energy label applied for (BouwTransparent 2013). Several municipalities published reviews of their previous plans, but such data is difficult to compare as the method of monitoring differs per location as well as the metrics collected.

As a result, the Klimaatmonitor became one of the few sources of monitoring data available. However, while the Klimaatmonitor is comprehensive, consistent, and updated annually, there are still some significant limitations preventing its broader use amongst Dutch municipalities. Many civil servants told me they did not trust those data available, preferring to implement their own local monitoring systems rather than relying on the free, nationally provided database. But, aside from general mistrust which was never adequately explained, those data in the Klimaatmonitor are around 1.5-2 years old: the information from 2015 was uploaded to the website in the spring of

2017. Policy makers find it difficult to use those data to show the effects of their actions as they must wait well over a year for quantitative data showing their effects. Finally, those data available are not typically not able to show the result of an individual action within the municipality.

Given the current limitations to monitoring data, I recommend introducing more direct, short-term indicators to monitor the progress of Dutch municipalities. While those data I collected (emissions, energy intensity, and renewable energy production) are useful to show the overall progress, they cannot show what has actually be done on the ground. Such new criteria would be recorded on a project-level basis per sector: e.g. for transport the number of charging points, electronic vehicles, etc.. could be used to show municipal progress. If such indicators were standardized in each sector and then it could be possible to first begin to rank municipalities on their effectiveness overall, and begin to describe good practices in greater quantitative detail. The urgent need for such data is highlighted by the study of the LKA which could only qualitatively assert that the over 10,000 actions implemented had positive effects on climate mitigation (kplusv 2015).

The title of Brooks 2017 publication, "No, Cities Are Not Actually Leading on Climate. Enough With the Mindless Cheerleading" reflects much of what I have found in my work. As I have shown, I cannot connect city climate actions with emissions reductions and those data I have closely reflect the change in the annual emissions factor for electricity production. City climate documents are not the Action Plans they claim to be, and good practices had to be taken at face value for lack of monitoring data. However, In each of my interviews, I found educated individuals, dedicated to making positive change in their municipality, using whatever tools available or able to be developed. To highlight their efforts, I wrote Chapter 8 to provide recommendations to spur climate action at a local level built upon actions, programs, and ideas discussed in my interviews with civil servants.

7 Conclusions

In order to respond to the overall research question, answers four sub questions must first be answered:

RQ1: What is the main role of municipal governments in local climate action?
As outlined in Chapter 2, there are four basic roles of government (Bulkeley 2006) which have become generally accepted in literature. While a consensus has yet to be achieved, this study found that, while all governance styles were present in local climate action, governance by enabling was most prevalent in local climate actions: 76% of good practices discussed, and 46% of all actions in municipal climate documents. Furthermore, it was the view of civil servants working in climate mitigation that facilitation and enabling were the most effective methods available when implementing climate actions. In addition, self-governing actions, those completed on municipal building stock or property, were seen as useful tools for the municipality to lead by example and as a way to establish a foothold for future climate actions within municipal boundaries.

RQ2: What current good practices have been implemented by Dutch municipalities to achieve mitigation targets?
Denoting good practice was a barrier to completing this study. While there are several good practice guides available for large/mega cities (C40 2017), when asking Dutch SMCs if they could implement such plans the answer was "no." The scale of action required was a common limitation cited, as well as governmental capacity and power available to implement large fundamental changes. This was also found in the literature that SMCs are typically overlooked when allotting resources and energy in favor of large urban centers (Hoppe, van der Vegt et al. 2016). With limited literature on known good practices and the criteria for evaluation, further research is required.

The civil servants interviewed described good practices which reflected their new role as facilitators, enabling other actors within the municipal boundaries to implement climate actions: Public engagement, citizen-led energy cooperatives, municipal actor engagement, company consortia, and project creation. Each of these general actions can be broken down in to the particular projects undertaken by the civil servants as described in Chapter 4. Both time, in order for municipal monitoring data to be published, and research, to show whether or not such actions are applicable in other municipalities, are required to prove whether or not such actions could be considered Best Practices. Furthermore, a scale is required to rank actions based on key metrics prior to any climate action receiving the designation of Best Practice.

RQ3: Are currently available monitoring data in the Netherlands sufficient to demonstrate good practice?
Those data available from the Klimaatmonitor are the only standardized source of emissions, energy intensity, and renewable energy data that I found for Dutch municipalities. While this database has an incredible wealth of quantitative indicators which were not explored by this study, I chose to focus on CO_2e emissions as a benchmark to prove good practices and climate progress in general. However, despite the availability of municipal-level data, I was unable to find those for individual projects. Therefore, while civil servants discussed projects which they believed represented a good practice within the municipality, I could not find quantitative data points to prove it. Indeed, in several cases, civil servants were unaware of their progress according to the

Klimaatmonitor and asked for the municipal-level figures per energy intensive sector. So, no, there is currently not sufficient data to demonstrate good practice on a project level.

Despite this setback, I decided to pursue a broader scope to see if those data available could show good practice on a municipal level as opposed to on an individual project level. Such a statistic could be used to quantitatively define frontrunner municipalities, as opposed to what seems to currently be a system of self-proclamation, and inspire those lagging behind their climate targets to collaborate with those which were on track. I examined municipalities based on annual per-capita emissions, energy intensity, and renewable energy to level the data, and coupled these statistics with other quantitative indicators. However, despite the wealth of data available to me, I was unable to show good practice on a municipal level or true frontrunner municipalities. Further understanding of what caused large jumps and annual variations in emissions is required to denote frontrunners and, in my opinion, to show that any municipalities are on trach to achieving their short- and long-term climate targets.

RQ4: Are there other indicators which show progress towards achieving climate targets?
Similar to what was found with regards to quantitative indicators, there was no correlation found between those qualitative indicators monitored and progress towards achieving climate targets. This was perhaps prohibited by the standard to which qualitative indicators were compared to designate "progress." If, as discussed previously, a scale for project monitoring or denoting good practice be implemented, it could perhaps be used as well for benchmarking municipal climate action qualitatively, thus leading to a fuller understand of local climate actions and their successes municipal successes.

Overall Research Question: What are good practices for Dutch SMCs and are there demonstrable effects linking them to climate targets?
The following good practices were found as a result of interviews with civil servants in Dutch SMCs. While I have shown that there are no consistent indicators which can be used to link these good practices to achieving climate targets, their success may be found when more data exists at a municipal level. Table 14 is by no means an exhaustive list of good practices which were discussed or can be taken at a municipal level. These are, however, the collection which I could write thoroughly enough about to include in my case studies.

Table 14: Collection of good practices listed in interviews with civil servants

Public Engagement	**Energy Ambassadors** (Almere) **Energy Scans** (Almere) **Subsidy Schemes** (Almere) **Public Engagement** (Arnhem) **Wind Turbines: External Pressure** (Goeree-Overflakkee) **Energy Cafés: Public engagement** (Zaanstad)
Citizen-Led Energy Cooperatives	**Energy Cooperatives** (Eindhoven) **Energy Cooperatives** (Groningen) **Lisserbroek: Energy Cooperation** (Haarlemmermeer)

Municipal Actor Engagement	**How to engage Municipal Actors (**Almere) **Municipality: interdepartmental engagement** (Goeree-Overflakkee) **Engaging Municipal Actors: Redefining Role** (Nijmegen)
Company Consortia	**Creating a consortium of companies (**Arnhem) **Bosch Energy Covenant: Organization of Companies** (Den Bosch) **Heating without gas** (Eindhoven) **Company energy coalition** (Groningen) **Helmondse Energy Community** (Helmond) **Business involvement: Project teams** (Leeuwarden) **Platform COOL** (Maastricht) **Nijmegen Energy Covenant** (Nijmegen) **Company Energy Consortium** (Zaanstad)
Project Creation	**Sustainable Transport** (Amstelveen) **EnergyNul73 Homes: Zero Energy Homes** (Den Bosch) **MeerMaker: Municipal Company** (Haarlemmermeer) **Housing Organization** (Leeuwarden) **Large Wind Turbines: Engaging the public** (Nijmegen)

Nearly all of these good practices were based on governing by enabling. While this poses difficulties when monitoring the impact of such actions, I was encouraged to find the number of consortia which had been formed in interviewed municipalities. This along with the consistent increase in energy cooperatives as well as the extent of their projects within the Netherlands (Schwencke 2016), highlights that businesses and private citizens are willing to invest directly in climate mitigation projects.

Good practices were codified from civil servants, described in detail, and given a general form through which municipal governments can implement climate actions. While it was shown that current data cannot prove Good Practice, the current monitoring scheme was discussed and shown that while impressive, it is, as of now, inadequate. I believe that my study has posed far more questions than it has answered, and, as a result, I have several recommendations for future research which will both build upon what I have already done, and work to fill the gaps in this study allowing for a far greater understanding of local climate action.

7.1 Recommendations for Future Research

Given the limitations found in monitoring data, my main recommendation for further study is descriptive indicators which could be used to more easily monitor project implementation. Rather than monitoring emissions, if clear quantitative metrics could be compiled per project, then a base-level understanding could be built around what a municipality is accomplishing on a project level.

Such data coupled with annual quantitative metrics compiled by the Klimaatmonitor could be used to create a ranking system of frontrunner municipalities and, given the current depth of the Klimaatmonitor database, this could be relatively easily implemented for all Dutch municipalities. Furthermore, far more research must be done on those data in the Klimaatmonitor as, according to those involved in its curation, no studies have been done on their data.

Building upon the lack of concise and clear monitoring indicators is the lack of collaboration found between local governments with regard to climate actions. It was so common to hear in my interviews that knowing what to do or how to do it was a particularly difficult gap; however, it was equally as common to learn that meaningful inter-municipal collaboration was rare. Searching for a clear and useful way for municipalities to share projects, ideas, and collaborate on larger inter-municipal implementation schemes could be a huge step in overcoming this barrier. If done well, this could potentially lead to far more actions implemented and more efficiently.

Additionally, it would be important to study whether the current focus on enabling is leading cities towards achieving their climate targets. If this is not an efficient use of resources, then this practice should be changed; however, I was unable to find any data to show the effects of enabling as a main governmental practice. Furthermore, since I found that planning in surveyed municipalities was lacking details, particularly implementation and monitoring, a valuable future course of study would be to test whether better planning leads to more successful implementation. It would be valuable if it could be shown to policy makers which aspects of action planning were necessary for efficient project execution.

As was highlighted in Chapter 1, large city networks collect a variety of metrics on the cities which belong to them. However, while those data exist, they are not open to the public in a fashion which is useful to a statistician. Furthermore, I was unable to find published data for more than half of the cities which were reported to have submitted a monitoring report to the CoM as of April 2017. Given the overall lack of transparency and monitoring in climate projects, this additional finding begs the further questioning of published statistics that are not independently verifiable. This is not a conclusion which I had hoped to find nor is it one that is easily remedied as it was found that the reason most of those data are not available is due to privacy agreements between parties (Climategroundswell 2017).

8 Recommendations for Civil Servants

This section will be dedicated to my own evaluation of my study to make recommendations to civil servants and other municipal actors to speed climate action within their own municipalities. My recommendations are based on the entirety of the study but are derived mainly from the process of researching and interviewing civil servants at participating municipalities. The actions I will recommend are to be completed in the short term; my hope is that with such ideas firmly established that further climate action will be more easily facilitated both within and between Dutch municipalities.

8.1 Municipal Power: Taking Actions

Throughout my interviews, I was repeatedly told that local governments do not have the power to legislate or enforce climate action. However, there were a significant number of actions written in climate documents which showed governing by authority was used consistently. This section lists a short list of recommendations where I saw municipal governments having the authority and the ability to act which could lead to achieving their climate targets.

The firmest recommendation I can make is to focus immediately on the enforcement of the Environmental Protection Act. This is *the* instance where municipalities were granted power to require large energy consumers to make significant changes to their practices and enforcement, in my experience, is lacking. The weakness in the legislation is that it deferred the responsibility of execution – funding, staff, training, and enforcement are all the responsibility of local governments. However, this means that the local government has control over the process of how stakeholders are engaged, what actions are prioritized, and how renovations are suggested. When considering this process, reach out to civil servants in Eindhoven, Den Bosch, or Almere as they all have programs at different states of implementation which could help with planning and implementing a system.

It follows directly from this enforcement that local governments must know who the large energy consumers are within municipal boundaries and, more importantly, which renovations could be required. Energy scans are one method building such a knowledge base – another would be to train inspectors on climate & sustainability, so, when they inspect a location, they can first sense problems/possible refurbishments and then assess what sorts of renovations are necessary. Placing the responsibility under the office of enforcement would also send the message that this is not just a climate issue but a focus which is now critical to the municipality as a whole. To build support for this initiative, connect with local companies which may be able to offer renovations to large energy consumers and learn at what scale would be necessary for rate reductions. If this can be done, then the large consumers when they make their required renovations can be lauded in the press for their commitment to climate action as well as building the local economy.

The final piece of municipal power which I saw to be underutilized but potentially effective was in raising awareness of climate actions using waste management as a medium. In Almere, as I was leaving the municipality, I was shown their trashcans. Each one has multiple holes for disposal depending on what is being thrown away. I was told that schools within the municipality also have the same trashcans. Habits are difficult to change, and people can be incredibly lazy when looking to throw something away. So, by making it simple and available to act responsibly, people may begin to do so. In addition, by implementing this system in schools, children learn this process as

"normal" and, I was told, began to bring it home as well. Thus, such a simple practice can begin to subtly change the habits not only those interested in climate action, but the municipality at large.

8.2 Municipal Planning: Planning Actions

As is shown in Table 12, only 9 out of 13 municipalities have written a short-term sustainability strategy and not 1 of the 13 municipalities about which a case study was written had a short-term Action Plan and zero even had a long-term strategy, let alone an action plan. But what to do about it? Action Plans can be costly to write, difficult to implement given the tumultuous political landscape, and, potentially, yield no concrete results despite the effort put into writing the plan. However, short-term thinking will not lead to achieving long-term goals. Furthermore, in an analysis of city action plans, it was found that the climate plans weakest points are, universally, actionable components and the documents on the whole are inadequate to achieve their emissions targets (Krause 2011).

Given these difficulties, action planning must be adapted to better fit municipal capacity as well as becoming more action-oriented. First, climate goals should be made concrete and should be explicitly quantified: "Energy Neutral" isn't specific and, while it sounds nice, seems to not lead to action or to inspire others interest in climate projects. If other departments are unwilling to act, then make sure to have a study showing the future investment which will be required as was done in Almere. This way, when politicians balk at current costs, you can easily justify the investment. Numbers, figures, effects are required; make the ideas stick by showing the effects from different perspectives: economic, health, urban planning.

Here, local governments could benefit from sharing knowledge and learning from other, similar municipalities. Repetition of another's idea can save time, money, and effort. Furthermore, given that many of the low-hanging fruit in climate mitigation (renovation, heating, transport) are relatively similar, it is foolish to approach problems in isolation. Several local governments within this study had commissioned a study on heating for their own municipality without discussing it with each other. While, yes, the results may need to be tailored to an individual municipality, it is possible that a consultancy when approached by a coalition of local governments interested in similar work may have different offerings as a result of the large influx of business. Several times in my study, I was told that a Dutch "good practice" must include an innovative aspect. Insisting on being the "First" or requiring innovation for innovations sake is foolish when considering climate actions and policies. There is a famous Dutch saying which I feel applies to this situation, "beter goed gepikt dan slecht zelf bedacht" roughly translating to "it is better to seal something good then to invent something bad."

Furthermore, long-term planning does not need to include every aspect of the municipal structure. However, there are a few key areas where a long-term plan is required – for example heating – where the local government must invest in one scheme and will be locked in to that plan. Without government commitment, energy or emissions savings are not available and citizens are not likely to buy into the new system. So, civil servants must identify areas where a long-term target is required and plan towards that goal. It was typical for consultancies to be brought in to perform such studies, but you have the power to require them to write not only the report but implementation plans for their recommendations. Too many times did I hear that a report was commissioned, read, and set aside. In this way, a commissioned report can become not only a

theoretical exercise but also an actionable plan. Furthermore, the implementation of these plans can be reviewed annually to ensure that short-term targets are building towards the long-term goals. Finally, by locking in large concrete goals, this will insulate those programs from political whims because the implementation will require buy in from all actors within the municipal limits: government, companies, industry, and private citizens.

8.3 Other Actions

The above sections were focused on where civil servants and local governments, in my opinion, could have a direct impact on planning for and implementing emissions reductions. This following section, however, will center around the no-regrets options which civil servants can take to begin to boost the capacity within the municipality for climate actions. In trying to answer the question, "what can I do now to impact climate action?" these were those actions which require little time but do require organizational and managerial skills.

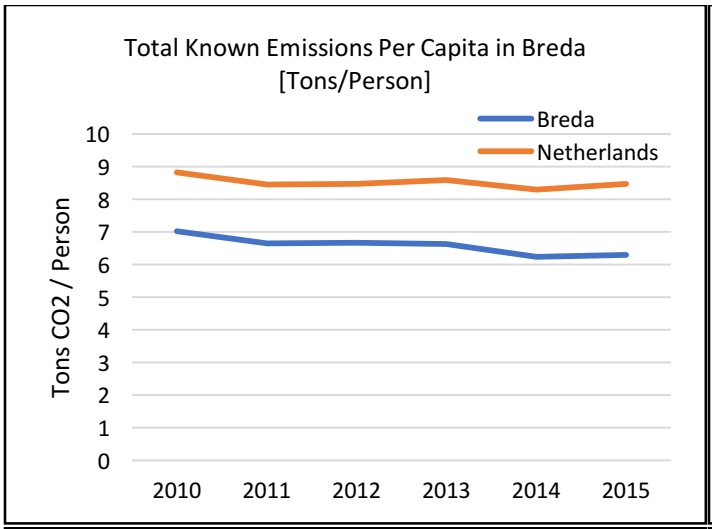
Monitoring is the unifying theme, but not monitoring of emissions but of people. When speaking with civil servants in Arnhem, Eindhoven, Groningen, and Haarlemmermeer, they all mentioned strategies for cataloging connections with private citizens, companies, institutions, and energy cooperatives interested assisting or implementing climate actions. This seems to me to be a given, but I interviewed several civil servants who didn't collect callers' information when they asked the municipality for information about sustainability/climate actions. So, as a first step, do that. When someone calls interested in climate actions, make sure you get their contact information and, if possible, address as well. This can be especially helpful when a project impacts a certain neighborhood and you have a connection to someone in that location who might champion the idea to their neighbors.

Beyond taking callers' information, speak with your colleagues across all departments and ask them to please refer calls to you when someone asks them about sustainability or climate. And, even better, work with them to build suggestions so that civil servant can participate in the process directly; the lease effort, however, if merely transferring you (a climate actor) the call. As this list grows, include all actors you have known who have either undertaken or been a part of the implementation process of a climate action. What this will provide you with is a network with the local government as a node from which you can connect parties interested in similar projects. A key benefit to this is that it can build trust between citizens and the local government. It was further found that building networks, managing expectations, and facilitation of learning are of critical importance to the success of local energy initiatives (Hoppe, Graf et al. 2015) as well as a flexible and opportunistic response when local energy initiatives or other locally interested parties contact the municipal government for assistance. Such aid can create lasting effects, building relationships and capacity in local climate action (Warbroek and Hoppe 2017). It is important to note that as a climate actor you don't need to know everything, but you are incredibly useful if you can connect an interested party to someone who knows what they are interested in

Such a program can grow into a consortia of companies (see Section 5.2.1.4), or citizens' led energy cooperatives as happened in Eindhoven. If you have private citizens interested in participating in the process, consider starting an energy ambassador project (see Section 5.2.2.1). All of these outcomes begin with the development of a personal network of parties interested in taking and participating in climate action. However, as this grows, be mindful that these people

are interested and invested in climate actions and hope to be included in the process when the municipal government acts itself. As was found in Arnhem, trust is very important and when that trust is violated, even unintentionally, it can force civil servants do damage control regardless of the actual circumstances.

Appendix A: Quantitative Analysis Charts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[Tons/Person]
Breda
Netherlands
Tons CO2 / Person
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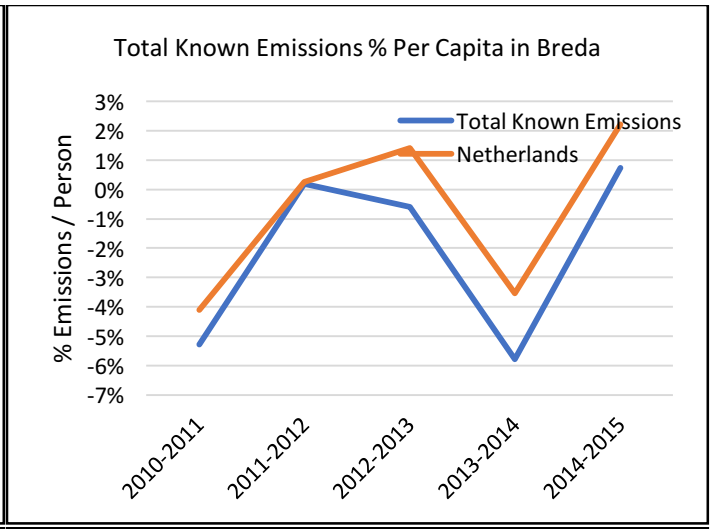
Total Known Emissions % Per Capita in Breda
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% Emissions / Person
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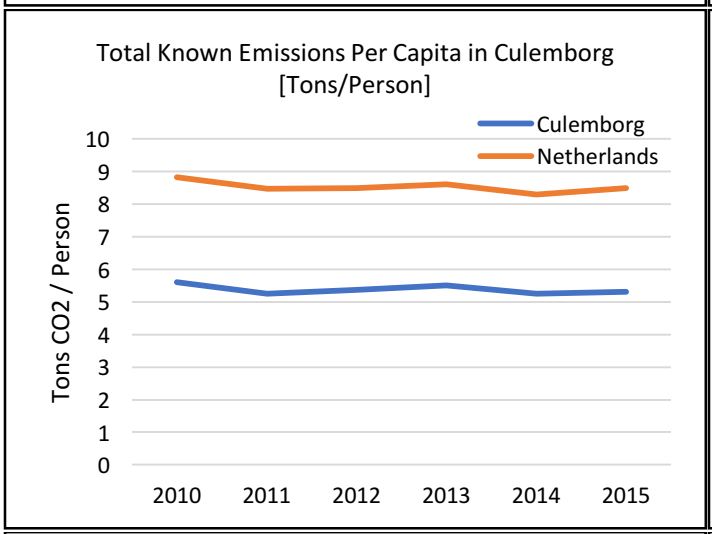
2014-2015


Total Known Emissions Per Capita in Culemborg
[Tons/Person]
Culemborg
Netherlands
Tons CO2 / Person
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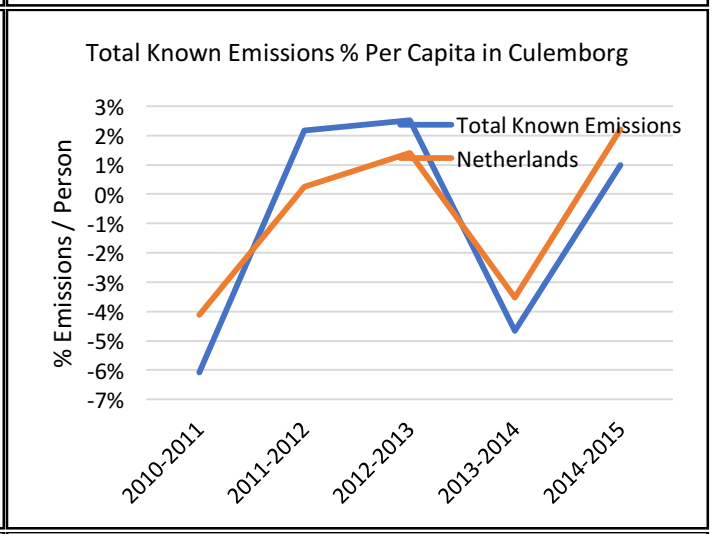
Total Known Emissions % Per Capita in Culemborg
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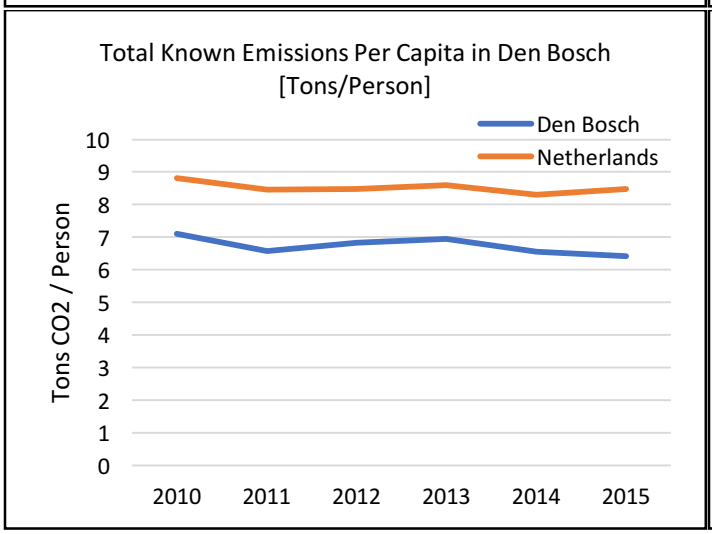
Total Known Emissions Per Capita in Den Bosch
[Tons/Person]
Den Bosch
Netherlands
Tons CO2 / Person
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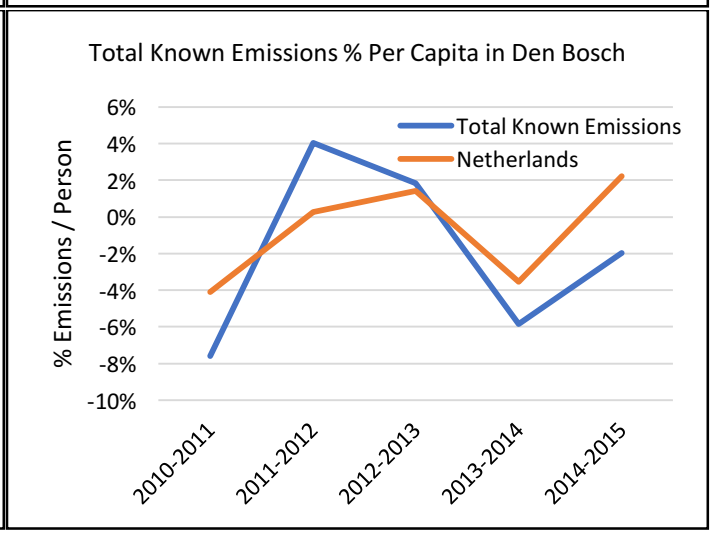
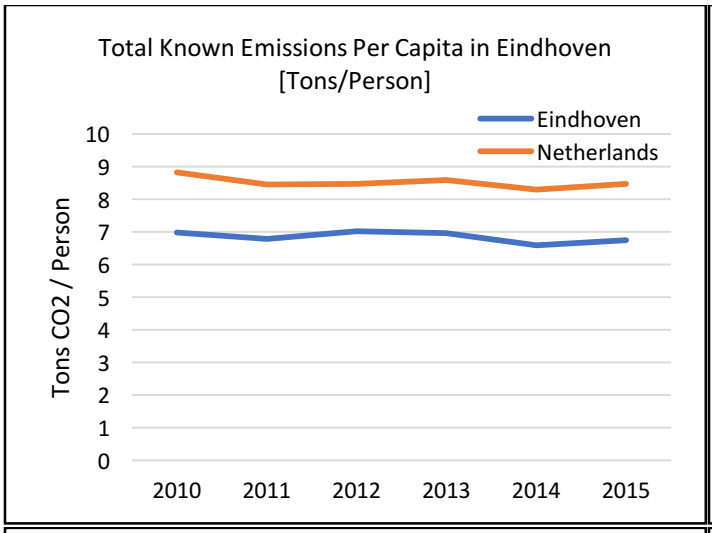
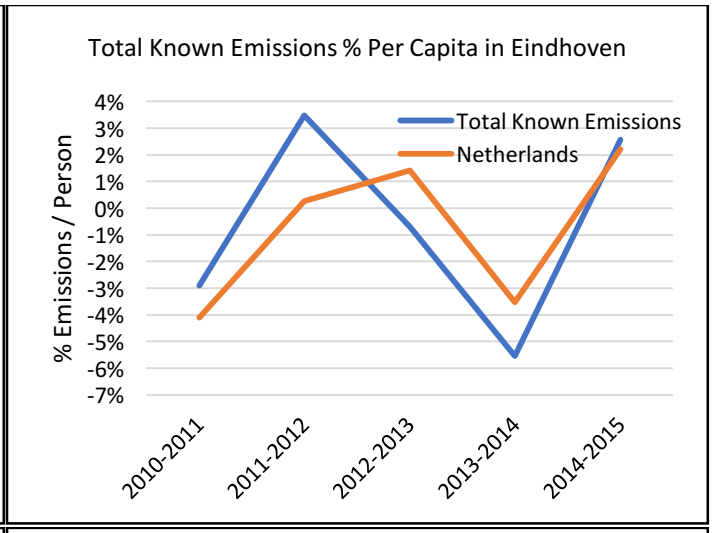
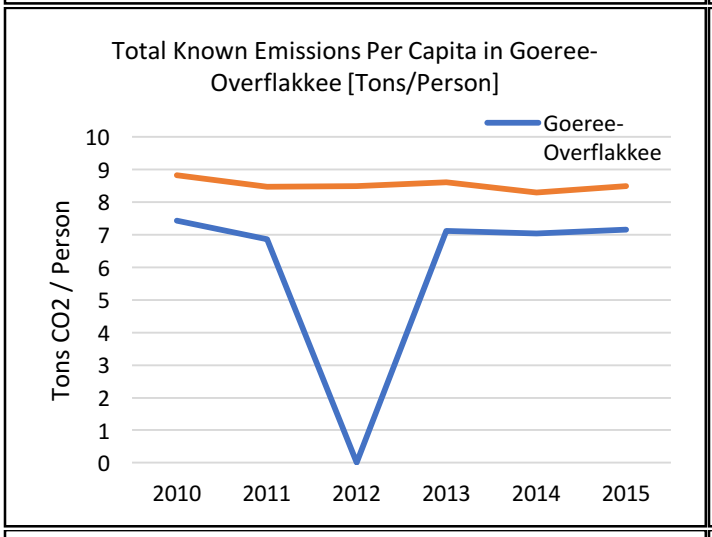
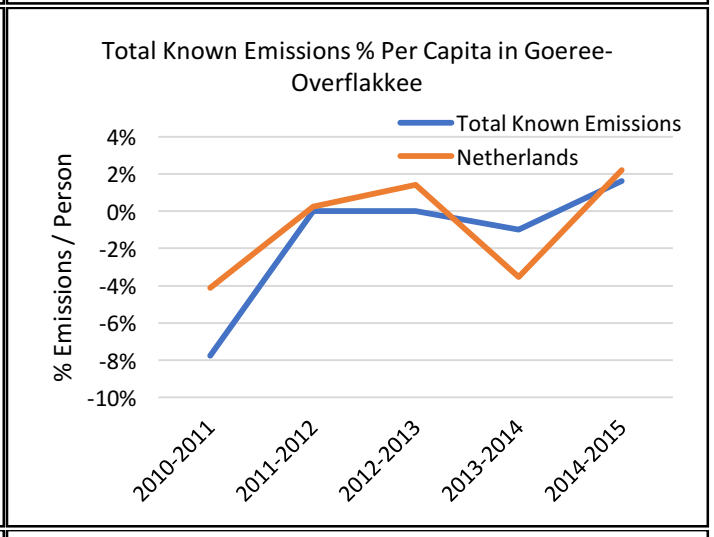
2013
2014
2015

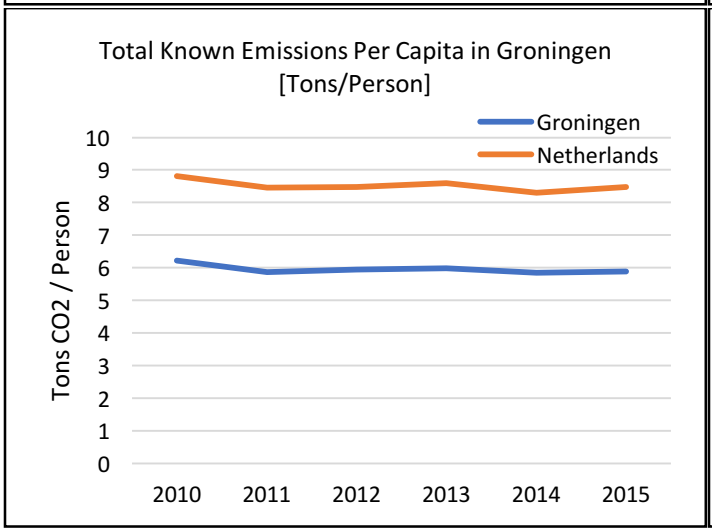

Total Known Emissions % Per Capita in Den Bosch
Total Known Emissions
Netherlands
% Emissions / Person
6%
4%
2%
0%
-2%
-4%
-6%
-8%
-10%
2010-2011
2011-2012
2012-2013
2013-2014
2014-2015

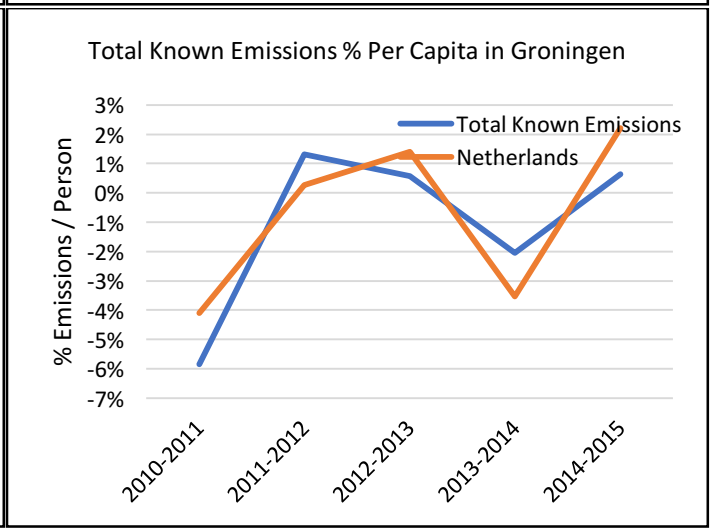

Total Known Emissions Per Capita in Eindhoven [Tons/Person]
Eindhoven
Netherlands
Tons CO2 / Person
0
1
2
3
4
5
6
7
8
9
10
2010
2011
2012
2013
2014
2015

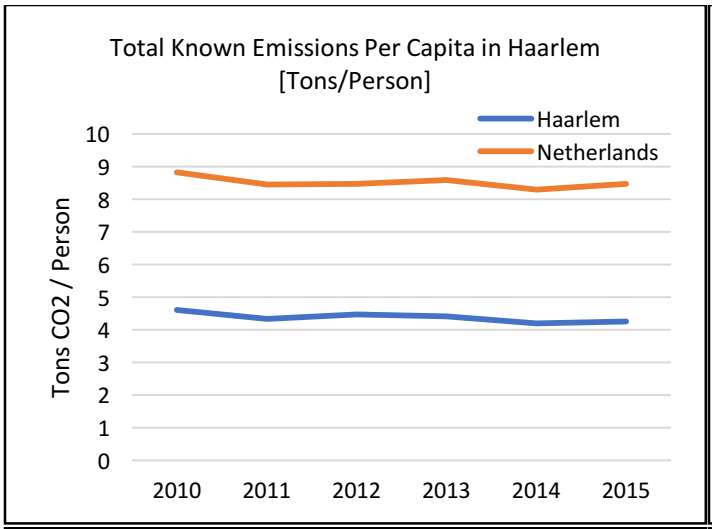

Total Known Emissions % Per Capita in Eindhoven
Total Known Emissions
Netherlands
% Emissions / Person
4%
3%
2%
1%
0%
-1%
-2%
-3%
-4%
-5%
-6%
-7%
2010-2011
2011-2012
2012-2013
2013-2014
2014-2015

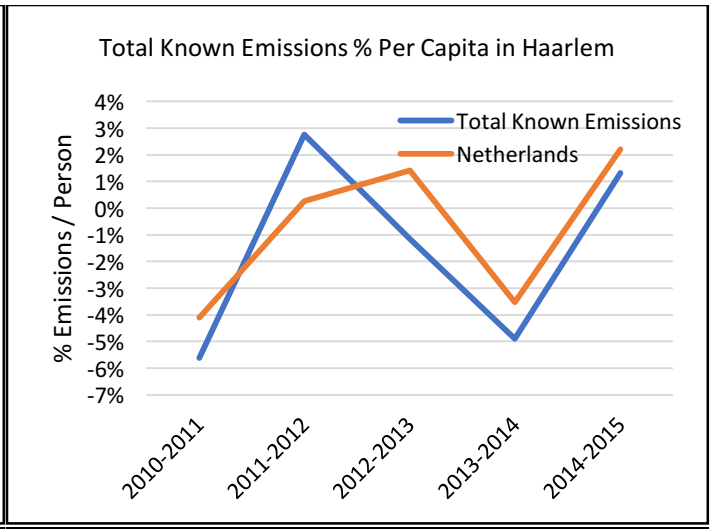

Total Known Emissions Per Capita in Goeree-Overflakkee [Tons/Person]
Goeree-Overflakkee
Tons CO2 / Person
0
1
2
3
4
5
6
7
8
9
10
2010
2011
2012
2013
2014
2015

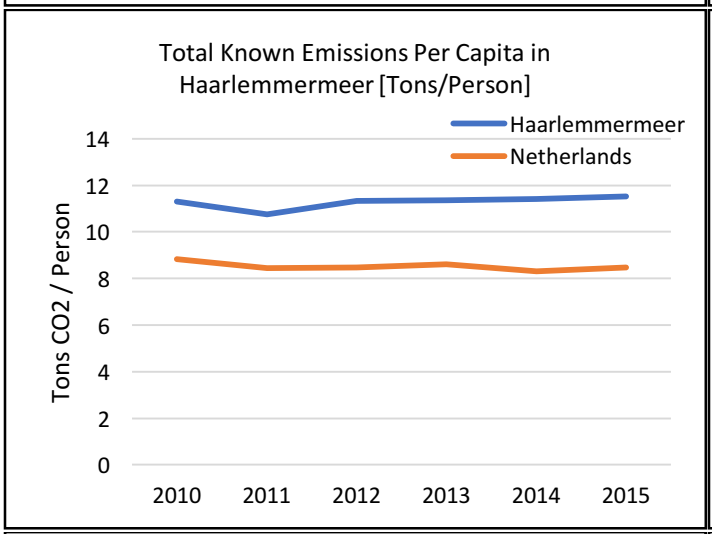

Total Known Emissions % Per Capita in Goeree-Overflakkee
Total Known Emissions
Netherlands
% Emissions / Person
4%
2%
0%
-2%
-4%
-6%
-8%
-10%
2010-2011
2011-2012
2012-2013
2013-2014
2014-2015

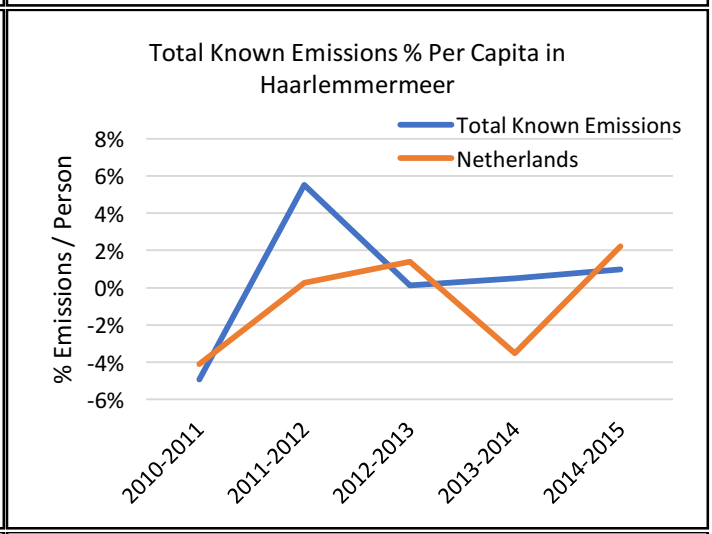

Total Known Emissions Per Capita in Groningen [Tons/Person]
Groningen
Netherlands
Tons CO2 / Person
0
1
2
3
4
5
6
7
8
9
10
2010
2011
2012
2013
2014
2015

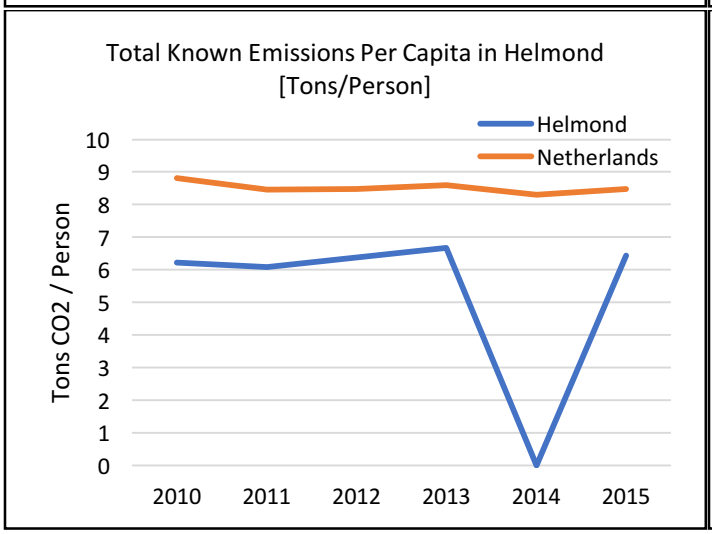

Total Known Emissions % Per Capita in Groningen
Total Known Emissions
Netherlands
% Emissions / Person
3%
2%
1%
0%
-1%
-2%
-3%
-4%
-5%
-6%
-7%
2010-2011
2011-2012
2012-2013
2013-2014
2014-2015

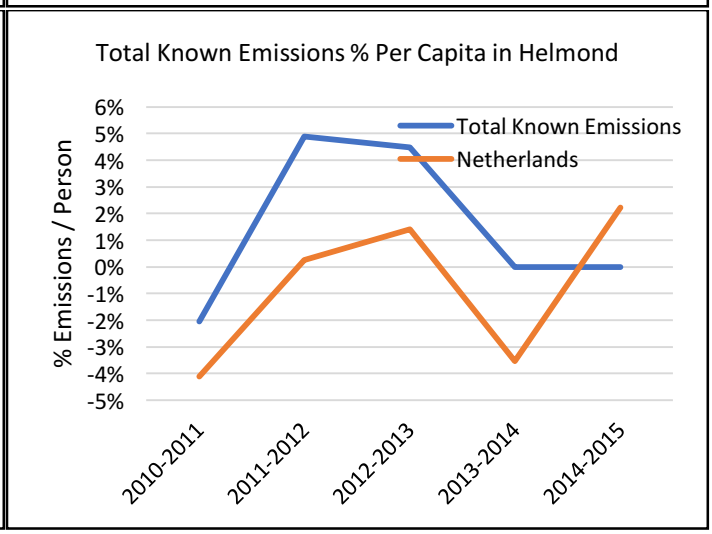

Total Known Emissions Per Capita in Haarlem [Tons/Person]
Haarlem
Netherlands
Tons CO2 / Person
10
9
8
7
6
5
4
3
2
1
0
2010
2011
2012
2013
2014
2015

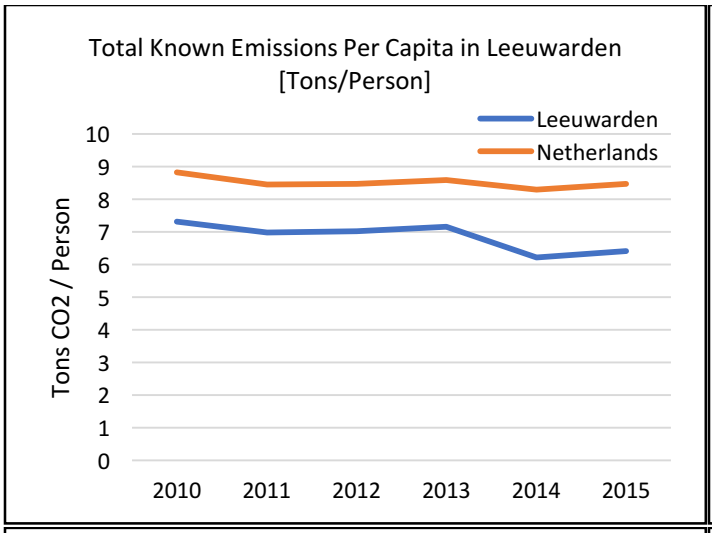

Total Known Emissions % Per Capita in Haarlem
Total Known Emissions
Netherlands
% Emissions / Person
4%
3%
2%
1%
0%
-1%
-2%
-3%
-4%
-5%
-6%
-7%
2010-2011
2011-2012
2012-2013
2013-2014
2014-2015

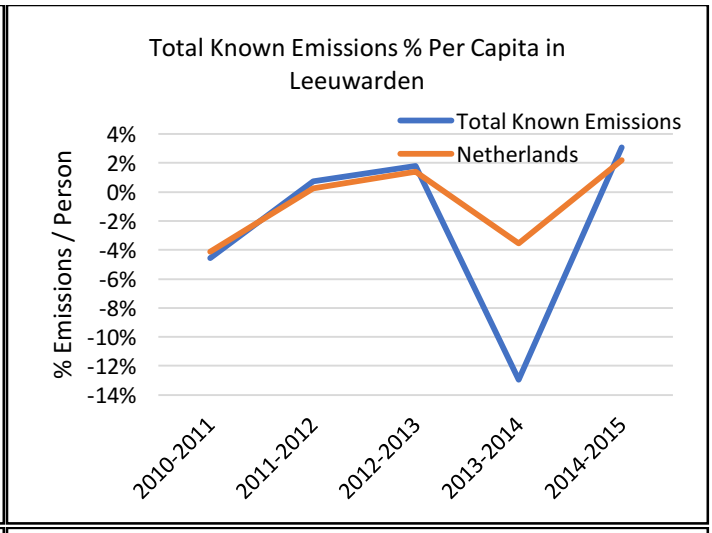

Total Known Emissions Per Capita in Haarlemmermeer [Tons/Person]
Haarlemmermeer
Netherlands
Tons CO2 / Person
14
12
10
8
6
4
2
0
2010
2011
2012
2013
2014
2015

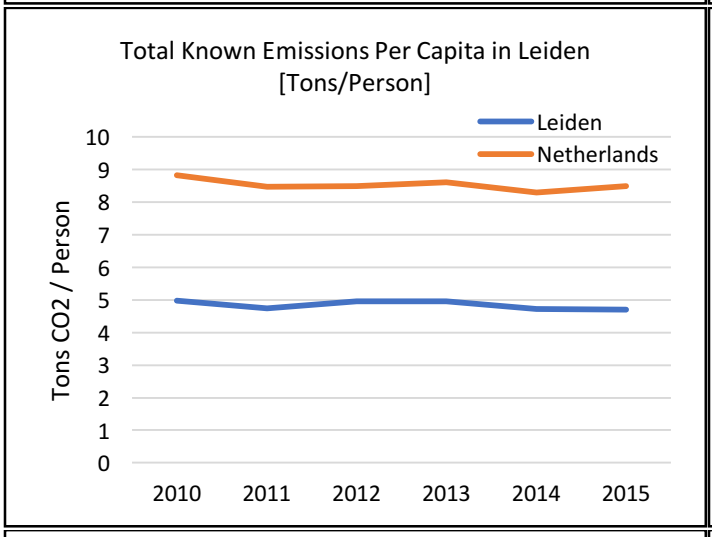

Total Known Emissions % Per Capita in Haarlemmermeer
Total Known Emissions
Netherlands
% Emissions / Person
8%
6%
4%
2%
0%
-2%
-4%
-6%
2010-2011
2011-2012
2012-2013
2013-2014
2014-2015

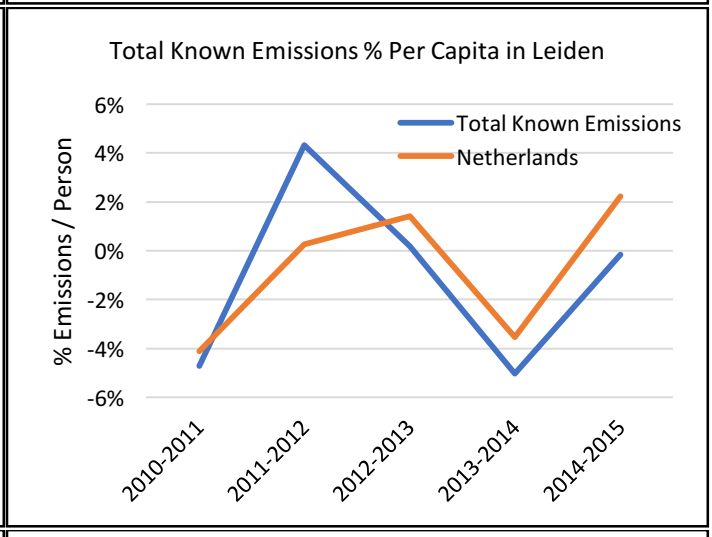

Total Known Emissions Per Capita in Helmond [Tons/Person]
Helmond
Netherlands
Tons CO2 / Person
10
9
8
7
6
5
4
3
2
1
0
2010
2011
2012
2013
2014
2015

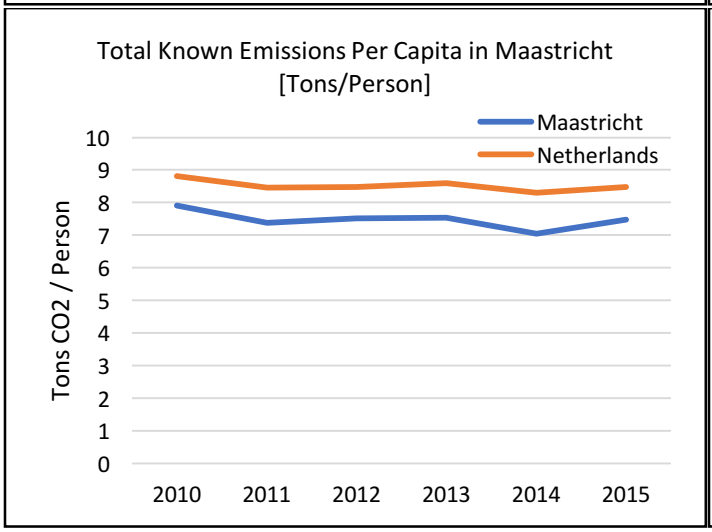

Total Known Emissions % Per Capita in Helmond
Total Known Emissions
Netherlands
% Emissions / Person
6%
5%
4%
3%
2%
1%
0%
-1%
-2%
-3%
-4%
-5%
2010-2011
2011-2012
2012-2013
2013-2014
2014-2015

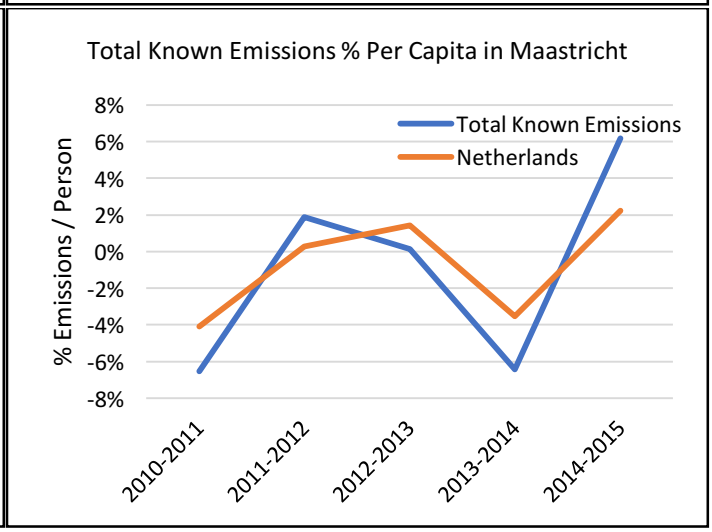

Total Known Emissions Per Capita in Leeuwarden [Tons/Person]
Leeuwarden
Netherlands
Tons CO2 / Person
0
1
2
3
4
5
6
7
8
9
10
2010
2011
2012
2013
2014
2015

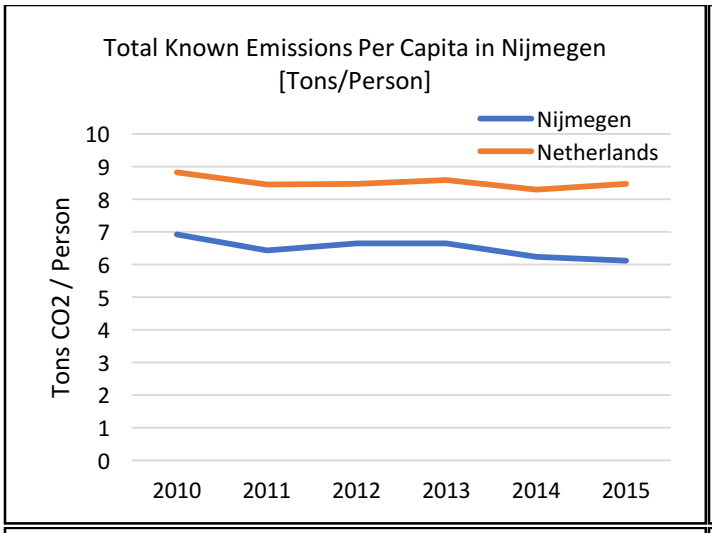

Total Known Emissions % Per Capita in Leeuwarden
Total Known Emissions
Netherlands
% Emissions / Person
4%
2%
0%
-2%
-4%
-6%
-8%
-10%
-12%
-14%
2010-2011
2011-2012
2012-2013
2013-2014
2014-2015

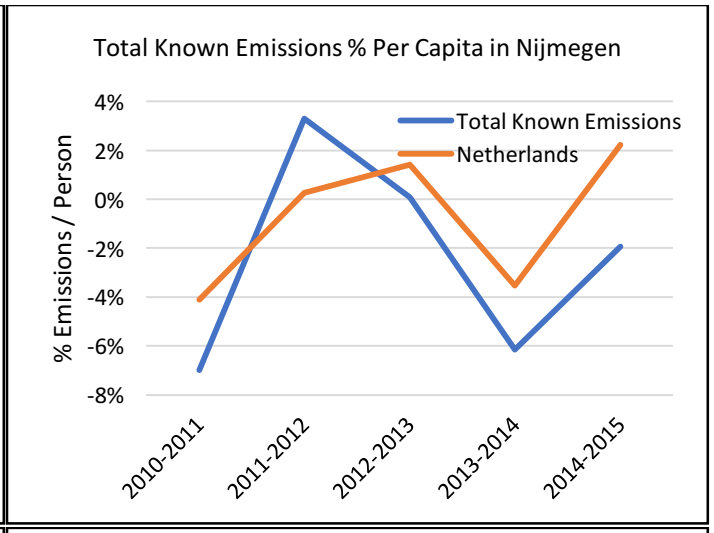

Total Known Emissions Per Capita in Leiden [Tons/Person]
Leiden
Netherlands
Tons CO2 / Person
0
1
2
3
4
5
6
7
8
9
10
2010
2011
2012
2013
2014
2015

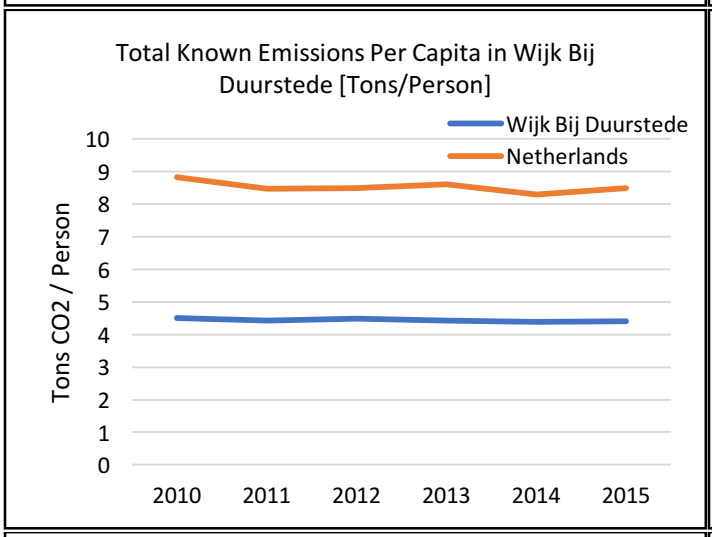

Total Known Emissions % Per Capita in Leiden
Total Known Emissions
Netherlands
% Emissions / Person
6%
4%
2%
0%
-2%
-4%
-6%
2010-2011
2011-2012
2012-2013
2013-2014
2014-2015

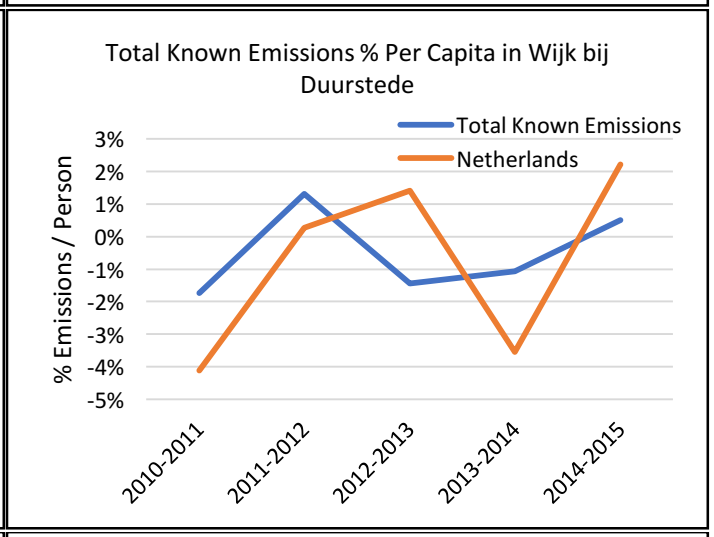

Total Known Emissions Per Capita in Maastricht [Tons/Person]
Maastricht
Netherlands
Tons CO2 / Person
0
1
2
3
4
5
6
7
8
9
10
2010
2011
2012
2013
2014
2015

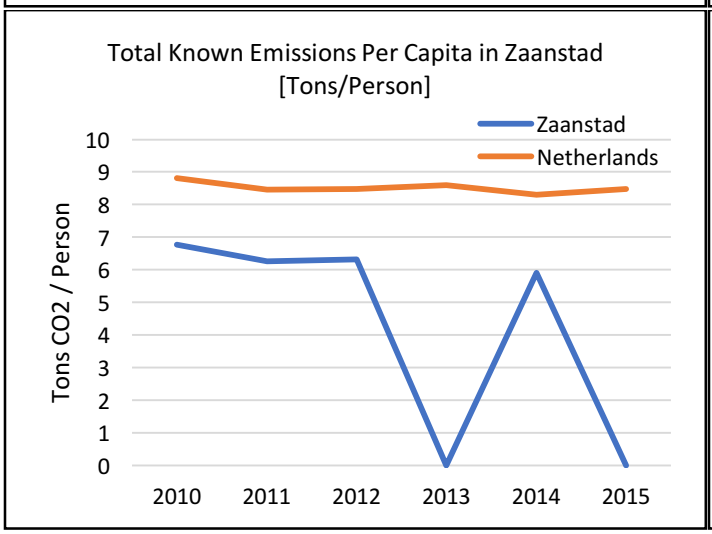

Total Known Emissions % Per Capita in Maastricht
Total Known Emissions
Netherlands
% Emissions / Person
8%
6%
4%
2%
0%
-2%
-4%
-6%
-8%
2010-2011
2011-2012
2012-2013
2013-2014
2014-2015

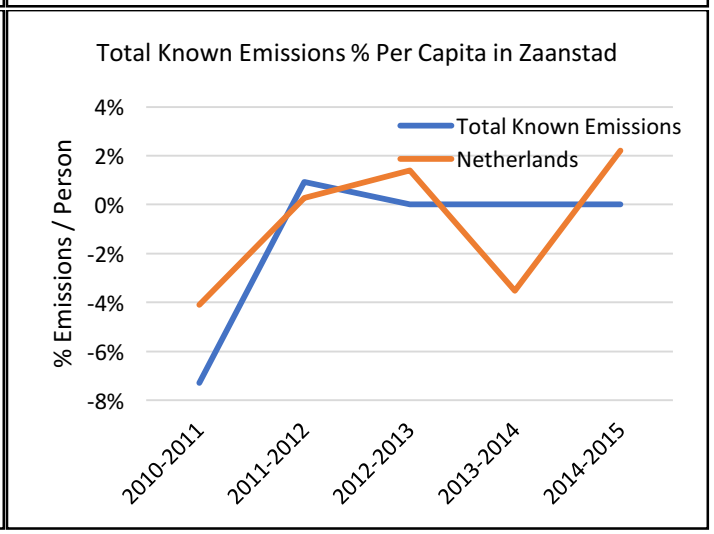

Total Known Emissions Per Capita in Nijmegen [Tons/Person]
Nijmegen
Netherlands
Tons CO2 / Person
10
9
8
7
6
5
4
3
2
1
0
2010
2011
2012
2013
2014
2015

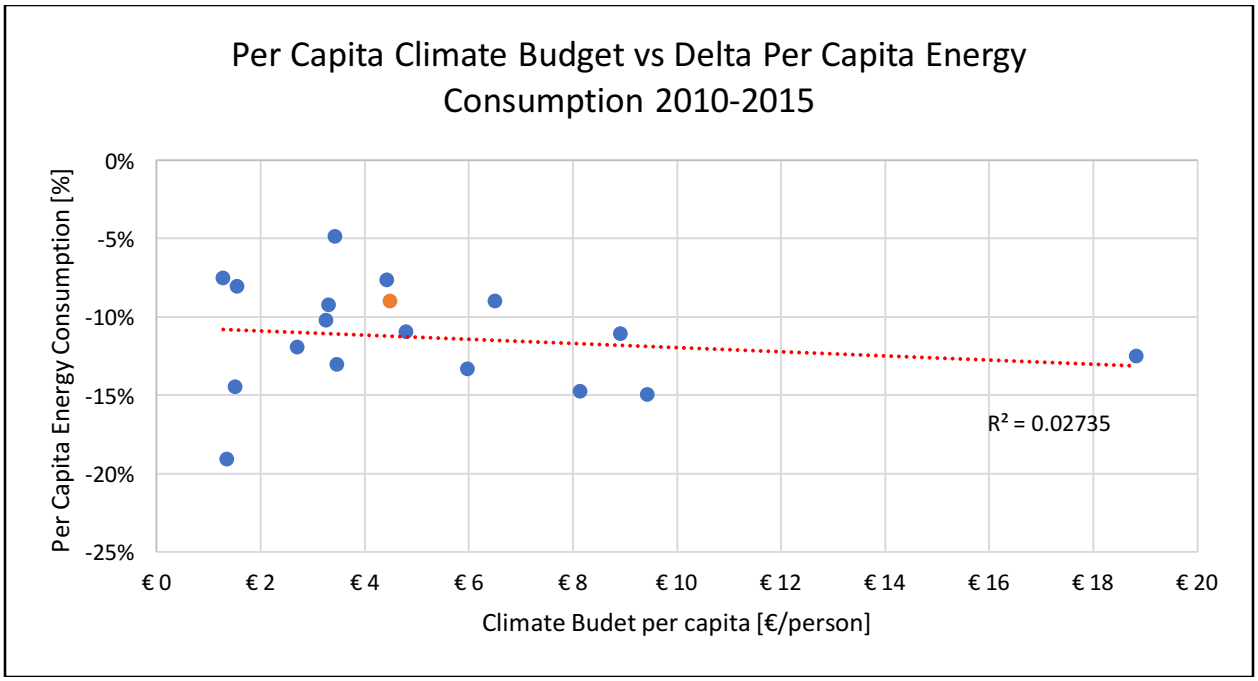

Total Known Emissions % Per Capita in Nijmegen
Total Known Emissions
Netherlands
% Emissions / Person
4%
2%
0%
-2%
-4%
-6%
-8%
2010-2011
2011-2012
2012-2013
2013-2014
2014-2015

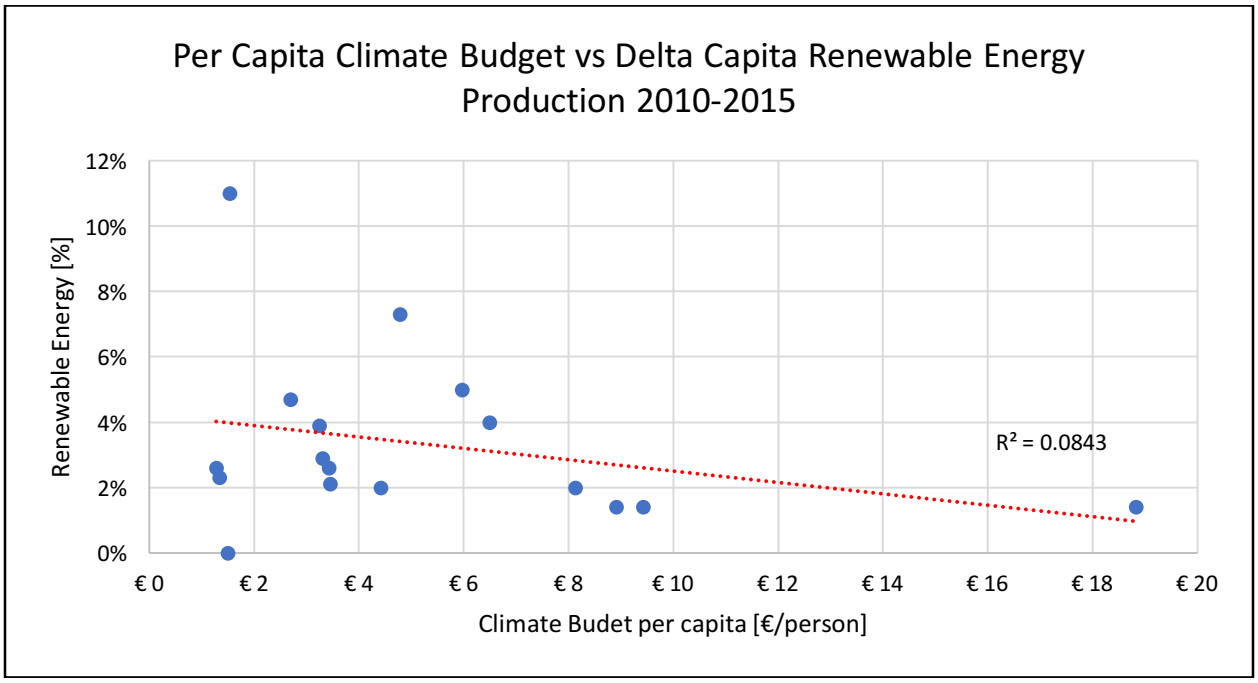

Total Known Emissions Per Capita in Wijk Bij Duurstede [Tons/Person]
Wijk Bij Duurstede
Netherlands
Tons CO2 / Person
10
9
8
7
6
5
4
3
2
1
0
2010
2011
2012
2013
2014
2015

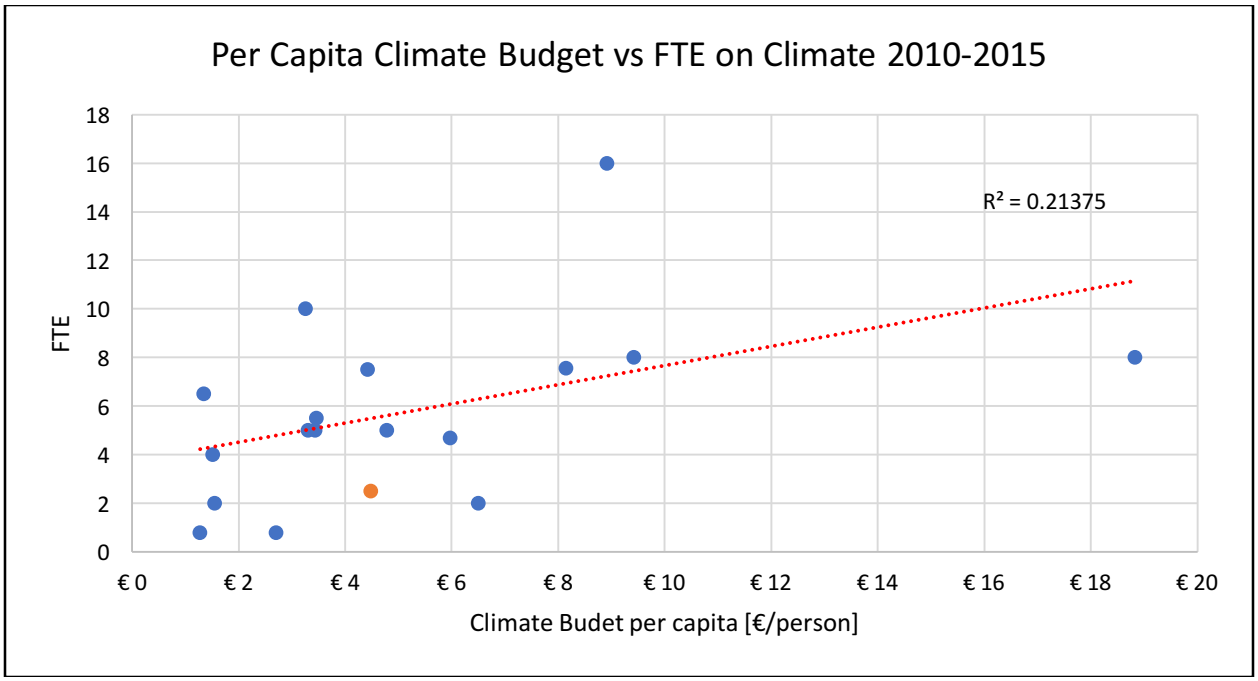

Total Known Emissions % Per Capita in Wijk bij Duurstede
Total Known Emissions
Netherlands
% Emissions / Person
3%
2%
1%
0%
-1%
-2%
-3%
-4%
-5%
2010-2011
2011-2012
2012-2013
2013-2014
2014-2015

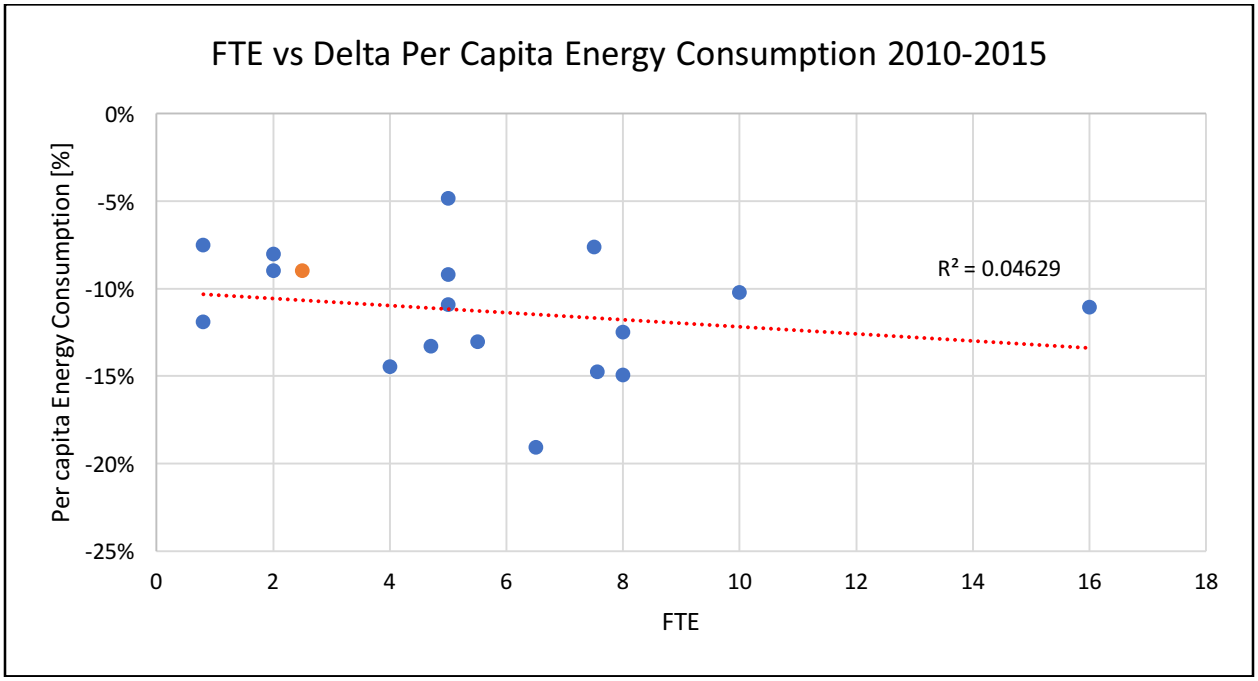

Total Known Emissions Per Capita in Zaanstad [Tons/Person]
Zaanstad
Netherlands
Tons CO2 / Person
10
9
8
7
6
5
4
3
2
1
0
2010
2011
2012
2013
2014
2015

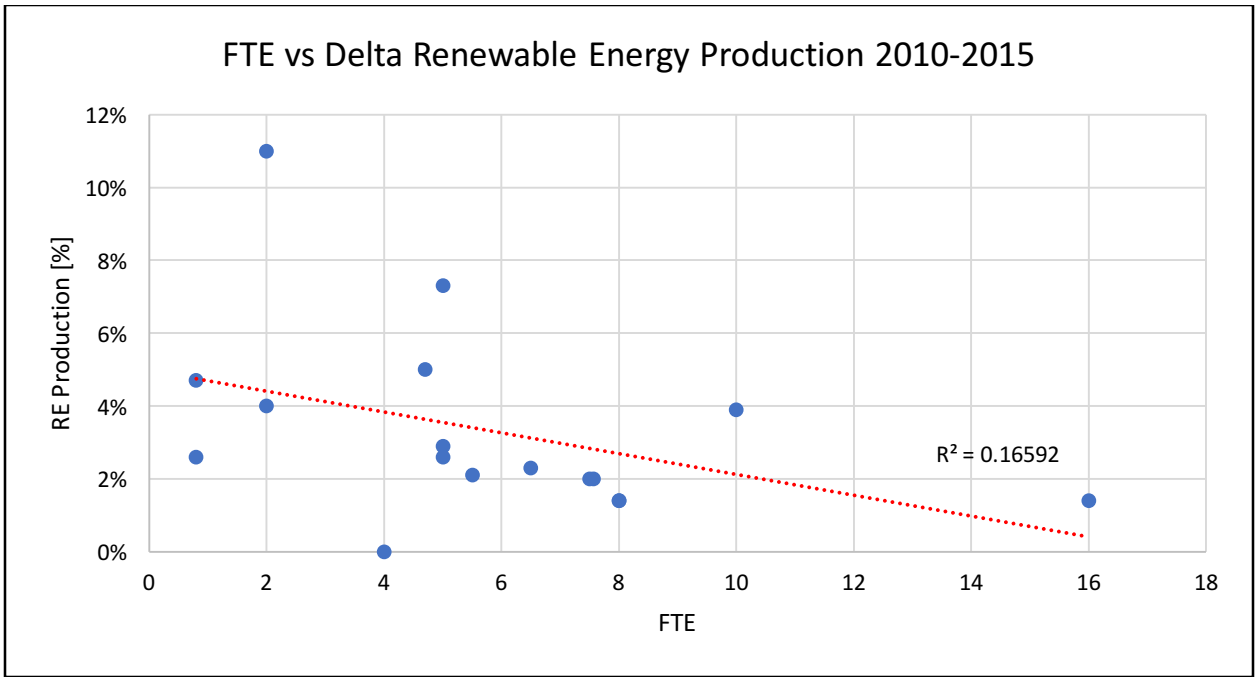

Total Known Emissions % Per Capita in Zaanstad
Total Known Emissions
Netherlands
% Emissions / Person
4%
2%
0%
-2%
-4%
-6%
-8%
2010-2011
2011-2012
2012-2013
2013-2014
2014-2015

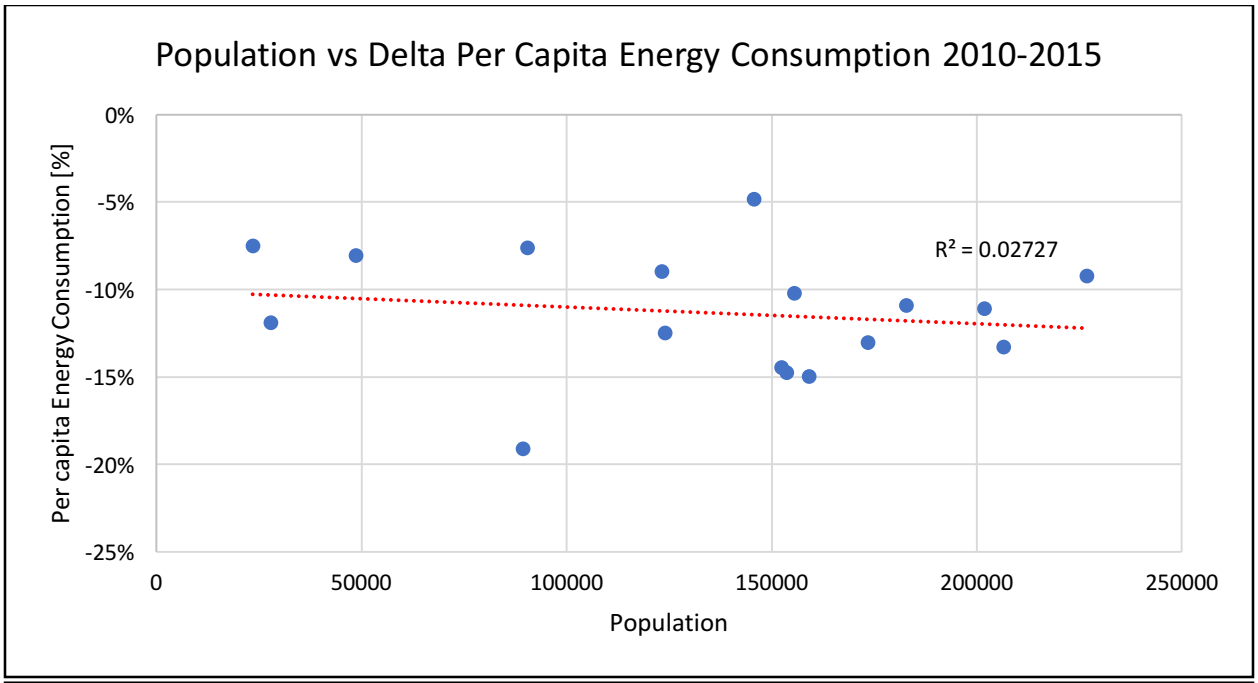

Per Capita Climate Budget vs Delta Per Capita Energy Consumption 2010-2015
Per Capita Energy Consumption [%]
0%
-5%
-10%
-15%
-20%
-25%
€ 0
€ 2
€ 4
€ 6
€ 8
€ 10
€ 12
€ 14
€ 16
€ 18
€ 20
Climate Budet per capita [€/person]
R² = 0.02735

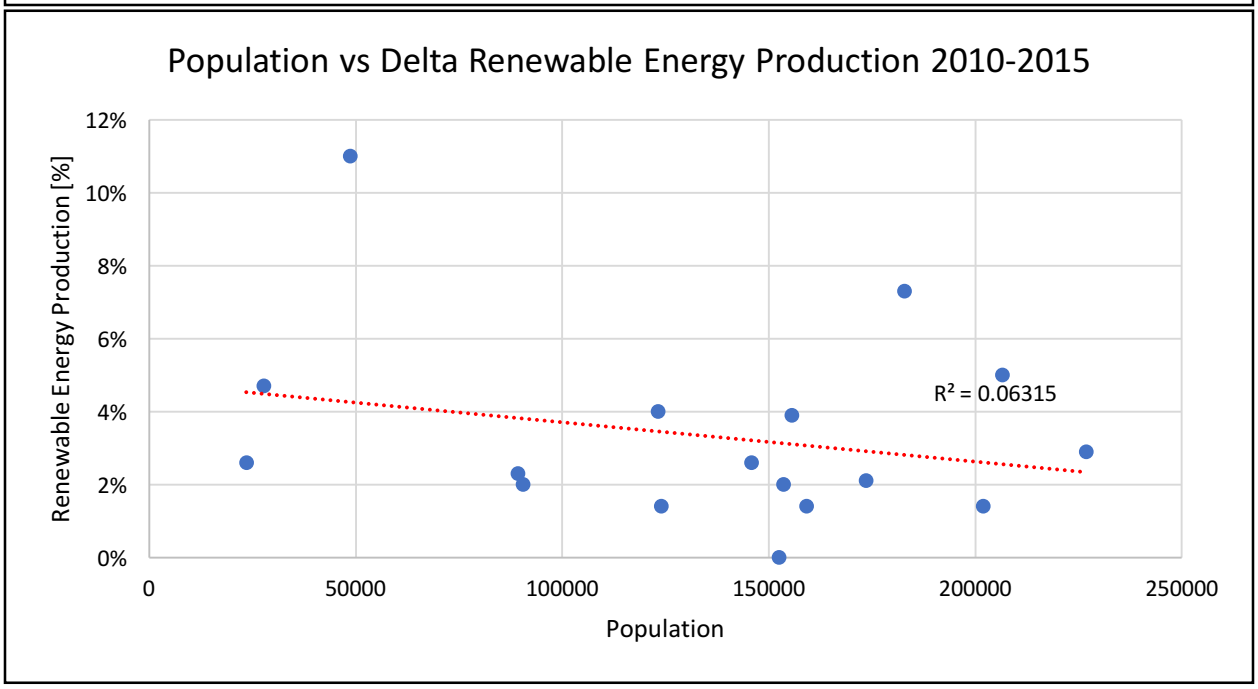

Per Capita Climate Budget vs Delta Capita Renewable Energy Production 2010-2015
Renewable Energy [%]
12%
10%
8%
6%
4%
2%
0%
€ 0
€ 2
€ 4
€ 6
€ 8
€ 10
€ 12
€ 14
€ 16
€ 18
€ 20
Climate Budet per capita [€/person]
R² = 0.0843

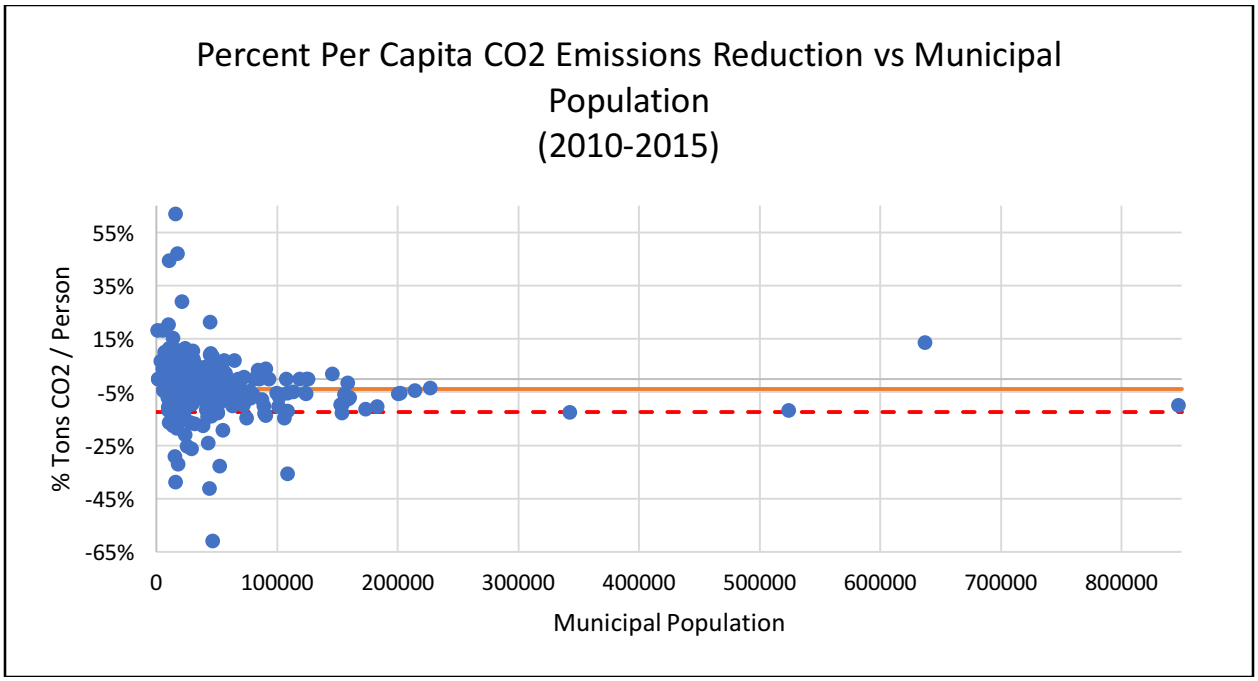

Per Capita Climate Budget vs FTE on Climate 2010-2015
FTE
Climate Budet per capita [€/person]
R² = 0.21375
0
2
4
6
8
10
12
14
16
18
€ 0
€ 2
€ 4
€ 6
€ 8
€ 10
€ 12
€ 14
€ 16
€ 18
€ 20

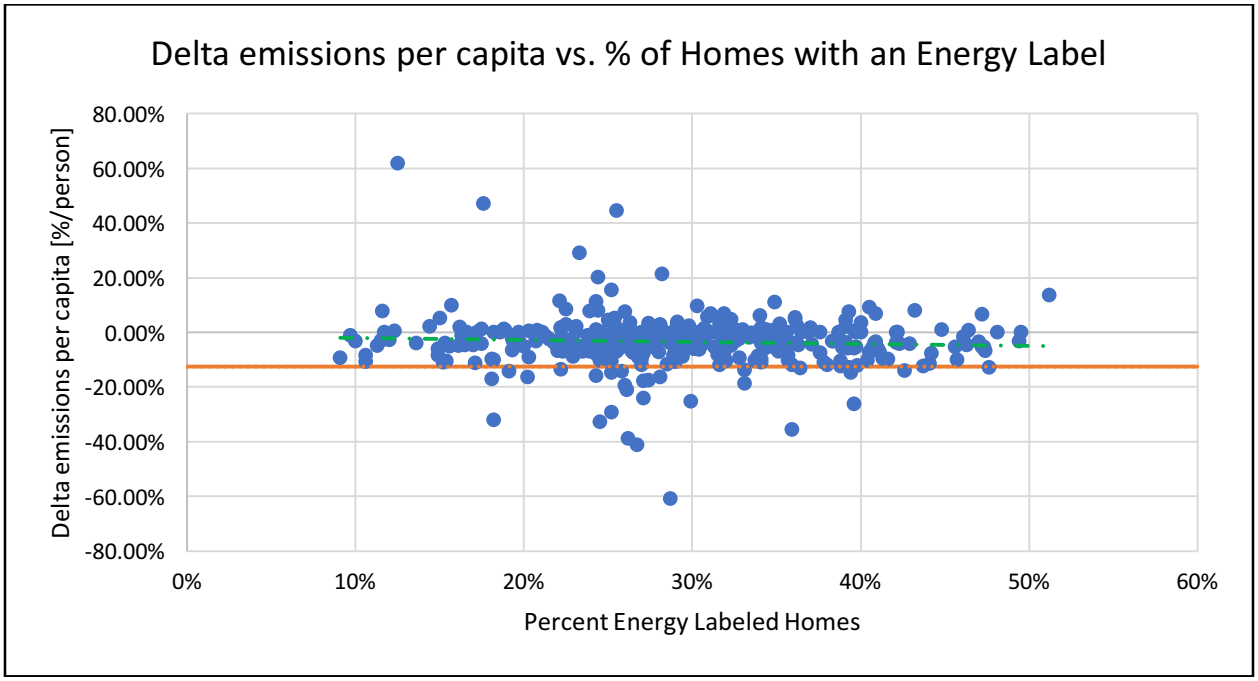

FTE vs Delta Per Capita Energy Consumption 2010-2015
Per capita Energy Consumption [%]
FTE
R² = 0.04629
0%
-5%
-10%
-15%
-20%
-25%
0
2
4
6
8
10
12
14
16
18

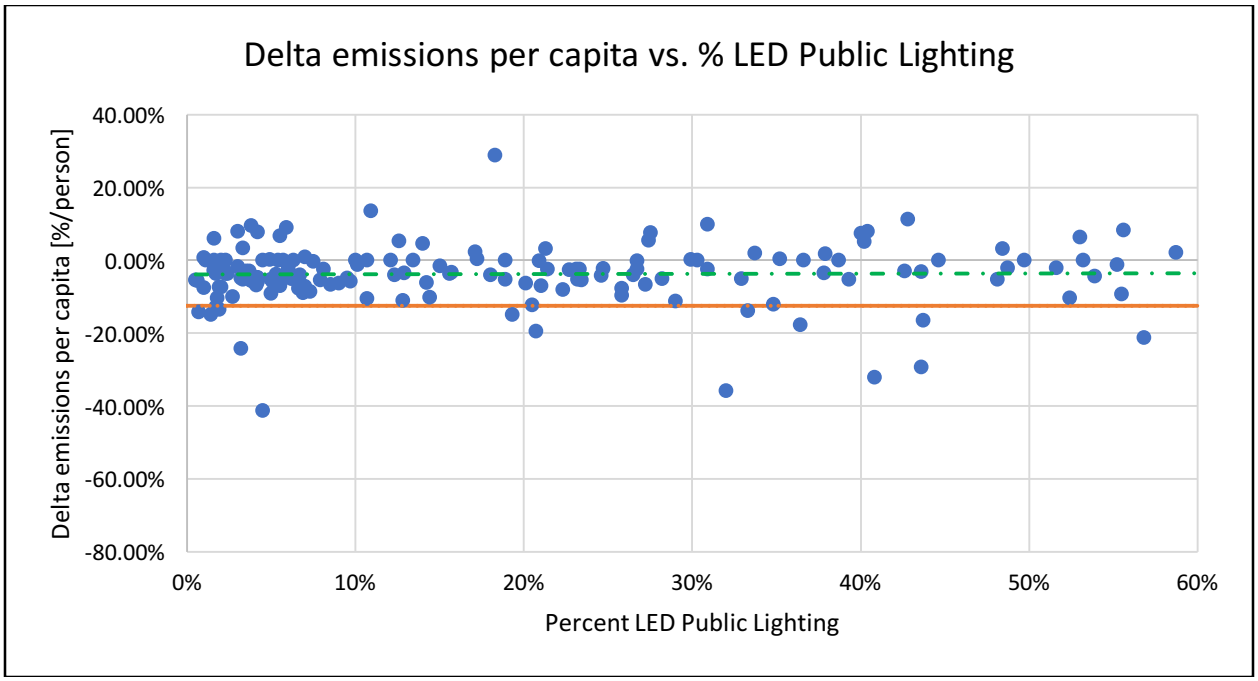

FTE vs Delta Renewable Energy Production 2010-2015
RE Production [%]
12%
10%
8%
6%
4%
2%
0%
0
2
4
6
8
10
12
14
16
18
FTE
R² = 0.16592

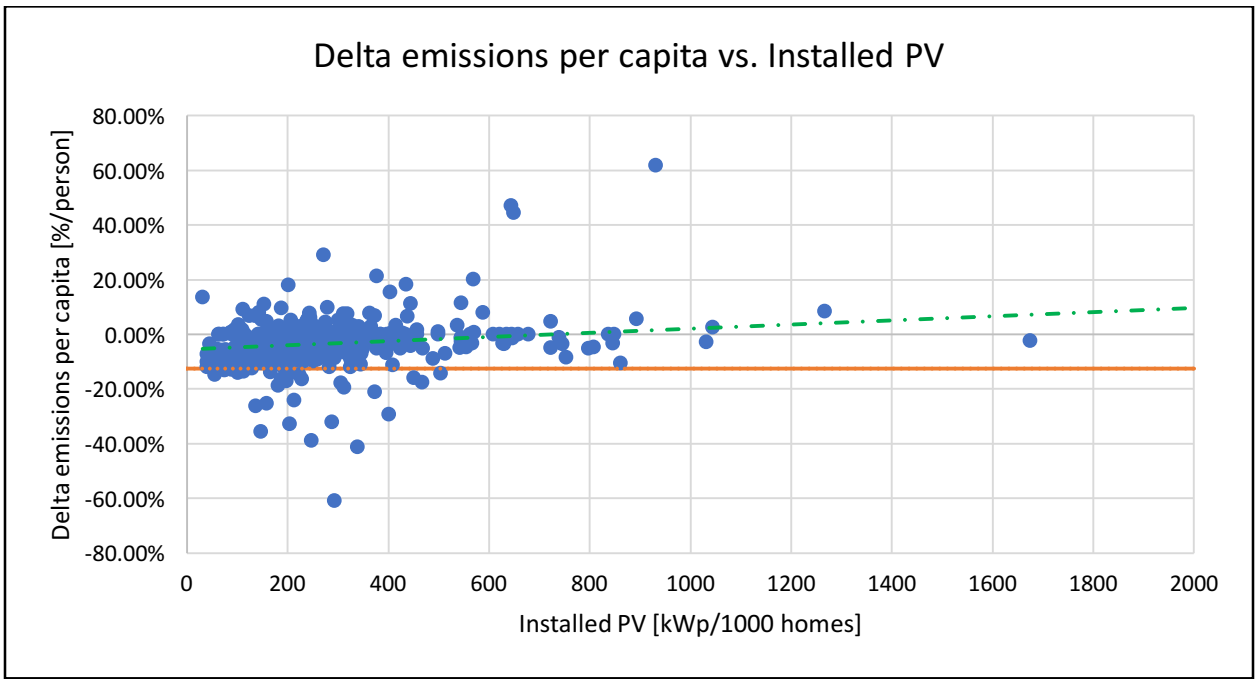

Population vs Delta Per Capita Energy Consumption 2010-2015
Per capita Energy Consumption [%]
0%
-5%
-10%
-15%
-20%
-25%
0
50000
100000
150000
200000
250000
Population
R² = 0.02727


Population vs Delta Renewable Energy Production 2010-2015
Renewable Energy Production [%]
12%
10%
8%
6%
4%
2%
0%
0
50000
100000
150000
200000
250000
Population
R² = 0.06315


Percent Per Capita CO2 Emissions Reduction vs Municipal Population
(2010-2015)
% Tons CO2 / Person
55%
35%
15%
-5%
-25%
-45%
-65%
0
100000
200000
300000
400000
500000
600000
700000
800000
Municipal Population

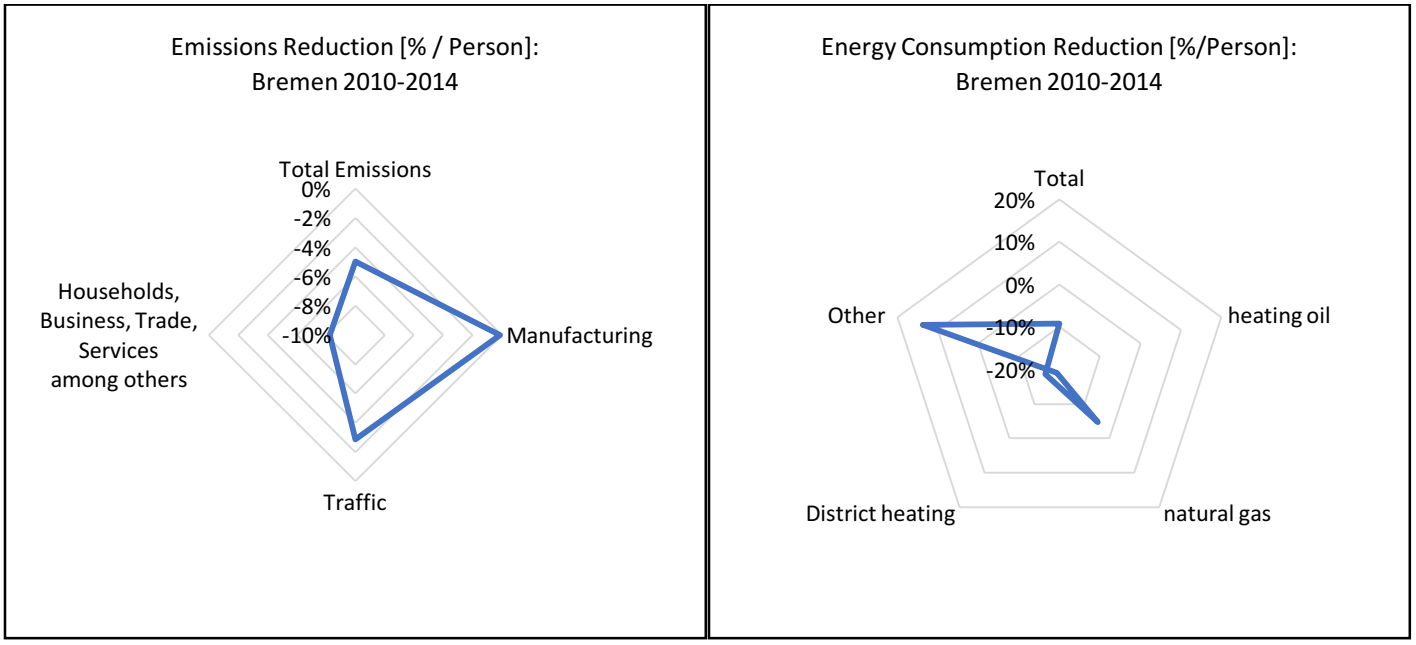

Delta emissions per capita vs. % of Homes with an Energy Label
Delta emissions per capita [%/person]
80.00%
60.00%
40.00%
20.00%
0.00%
-20.00%
-40.00%
-60.00%
-80.00%
0%
10%
20%
30%
40%
50%
60%
Percent Energy Labeled Homes


Delta emissions per capita vs. % LED Public Lighting
Delta emissions per capita [%/person]
40.00%
20.00%
0.00%
-20.00%
-40.00%
-60.00%
-80.00%
0%
10%
20%
30%
40%
50%
60%
Percent LED Public Lighting


Delta emissions per capita vs. Installed PV
Delta emissions per capita [%/person]
80.00%
60.00%
40.00%
20.00%
0.00%
-20.00%
-40.00%
-60.00%
-80.00%
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Installed PV [kWp/1000 homes]

Appendix B: Bremen Case Study

Area [km^2]	419.2	FTE	2.5
Population [2015]	557464[1]	Climate Budget	€ 2,500,000
Population Density [People/km^2]	1330	Climate Budget per Capita	€ 4.48
Population Growth [2011-2015]	14757[1]	Total Environmental Budget [2016]	n/a
Duurzaamheidsmeter	n/a	Total Budget [2016]	n/a



Status of the municipality 2010-2014: Percent per capita

Emissions:	Energy Consumption:	Renewable Energy:
-5%	-9%	n/a

Status of the municipality 2010-2014: Difference in Annual Statistics

Emissions [Tons]	Energy Consumption [TJ]	Renewable Energy [TJ]
-151000	-7027	n/a

*All data excluding the Steel Industry

Goals:
2020: 40% emissions reduction
2050: 80-95% emissions reduction

Klimaatverbond membership: No
Covenant of Mayors membership: Yes, as per 15th December, 2019

Point of Contact: Klimaschutzmanager

B.1.1 Municipal Status

While Bremen did achieve a modest reduction in emissions between 2010-2014, a 5% drop over the period does not put the city on track to achieve either its 2020 or 2050 goals. In addition, while there was a net decrease in emissions, the annual rate of reduction fluctuated widely between years. This was mainly a result of emissions in Households, Business, Trade, and Services. It should be noted, that the energy consumption recorded per capita in Bremen jumps annually. With a standard deviation of emissions of over 10% with a total emissions reduction per captia of 9% suggests that these numbers are likely not the result of policy, but, rather, other external factors which are not yet accounted for. Further investigation is required in order to understand why and how the energy consumption varies so significantly.

Although Bremen has a climate strategy, written in 2009, and a variety of other documents detailing their progress over the following years, no detailed action plan has been written for the short or long term. However, the process has been started to write a plan to 2030, and the aim is to have finished the tendering process by January 2018. Since the city has not achieved reductions to suit its climate targets, a study was commissioned and is being completed to understand what caused the discrepancy between the reference and target scenarios. Ideally, this study will inform not only future plans within Bremen but also be circulated to other cities to avoid duplication of mistakes. Unfortunately, due to the pressure to achieve climate targets, the currently elected officials are discouraging the spread of current reporting data, which shows the lack of progress within the city. While this does not stop the information spread, it does make future actions and planning difficult.

Climate action in the city is currently focused on both the municipally owned buildings, public spaces, and transportation, as well as facilitating other entities to take climate actions. Renovations to municipal building sock has been legislated to be doe towards the passive house standard. While on the surface this legislation seems positive, it, apparently, has led to a reduced rate of renovation. Such renovations require a far greater budget which has not been allotted, more energy from building contractors which they are uneasy to dedicate, and the outcome of such renovations, in the eyes of some practitioners, are inconclusive. This problem is further exacerbated by the relatively low energy prices over the past few years, making efficiency measures less attractive to managers and building developers.

For those assets not under direct control of the local government, other avenues must be found to spur action. In Bremen, this has meant, in general, the dissemination of critical information to other parties. In an interview, I was told that it was crucial to keep documents simple and easily accessible to outside entities. While he has met some resistance internally, due to the loss of "control" over those data, this practice gives others in the city the tools which they require to act. In addition, the city government can apply for and promote funding programs from outside: from the state or federal levels. However, he did note that while there were a number of initiatives targeting municipal-level action, applications for grants and subsidies require time, effort, and expertise which can be in short supply. In some cases, even if there is available national or EU funding, the city does not have the capacity to write and submit project applications to channel those funds into the city.

In Bremen, there are a few significant barriers which have been experienced in the past few years. First, in action planning, the assumed rate of economic grow was far below that of current expansion; production, consumption, and exports are all increasing, resulting in higher than predicted emissions. This, coupled with the low energy costs leaves the local government with few options to encourage climate action – the incentives are simply too weak to force changes in habit. Furthermore, while methane has become a major energy carrier and is a cleaner alternative to other sources, demand continues to increase. So, while there may be some modest gains due to the switch in feedstock, this has only a limited ability as a placeholder to positively impact the city's climate targets.

B.1.2 Good Practice

1. Subsidy: Renovations for private homes
Budget: € 800,000 – € 1,000,000
€ 2000 - € 4000 / applicant
FTE: 1.5

This successful subsidy program has existed in Bremen for over 20 years. Many renovation programs and building companies will only look into one aspect of the building to renovate as opposed to developing an entire package addressing the waste of the entire building. This program focuses on the entire external structure of locations with 1-10 units, heating and insulation. Such a subsidy helps convince homeowners to invest me in their renovations which currently cost between € 20000 - € 40000. Since envelope options currently have a payback time of around 20 years, and the current owners may not live there for so long, this subsidy has helped maintain a steady rate of energy renovations within the city. Currently, they aim to speed this process and increase the number of applicants.

The program began with a study evaluating the effects of additional investment in energy efficient renovations for housing. Following those results, the energy agency of the city began a program to inform people of the subsidy. A series of information meetings were held, a website was built, and, most importantly, the craftsman in the city were informed of the available funds. The builders then informed clients when discussing their plans that such funds were available. This was a mutually beneficial practice as it increased efficiency for the municipality, and it was good for business, encouraging homeowners to invest more in their renovations.

However, while the subsidy has existed for over 20 years, the rate of renovation has not increased dramatically. The city officials feel that this is due to the low energy cost and few other incentives to invest in greater renovation measures. In addition, the construction industry in Bremen does not have the capacity to increase the annual number of renovations. Not only are the companies backlogged with job offers, but they also in some cases lack the skills and knowledge required to add new materials and technologies to their portfolios. While this indicates a need for further vocational training options in the city, there are currently no measures addressing this demand.

2. Sustaining an Energy Agency

The creation of an energy agency, privately funded for 20 years, was one stipulation in the contract when privatizing the energy utility in Bremen. This agency was mandated to advertise mitigation measures within Bremen, and run information campaigns. The office was successful in creating round tables with small businesses, running a contest for energy efficiency, and assisting in the creation of a 250 company consortia committed to achieving efficiency goals. However, the office's future was uncertain as the 20-year mandatory funding expired, and the municipality had to choose what to do with regards to the program. The municipality decided to provide funds equaling to around half of their previous budget. However, the office has, so far, been quite successful raising external funding from state and national agencies to maintain their activities.

Key points:

1. Dedicated offices outside of the municipal structure can have immense impact within a city
2. Assisting dedicated actors with some funding and resources can preserve capacity

Documents:

1. https://www.citypopulation.de/php/germany-bremen.php?cityid=04011000
2. Emissions/Consumption data from : Entwicklung der CO_2-Emissionen im Land Bremen

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