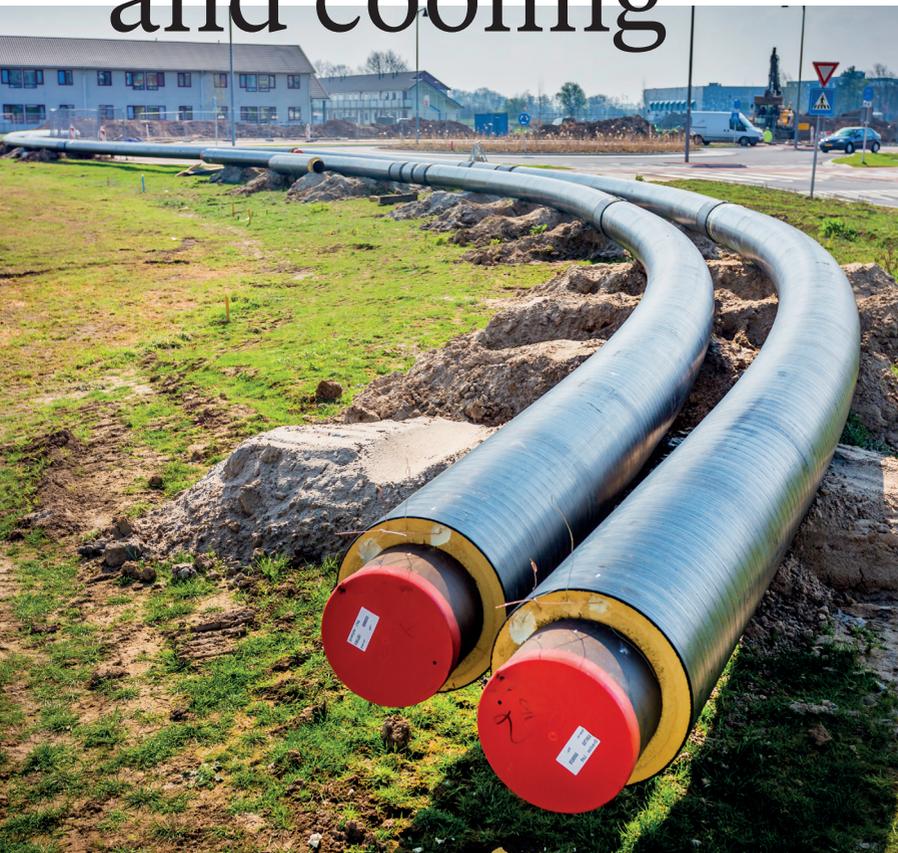


SUSTAINABLE HEATING and cooling



**OVER
MORGEN**

an Arcadis Company

SUSTAINABLE HEATING and cooling

A sustainable transition to natural gas-free cities

In an effort to meet climate targets and phase out natural gas, governments are placing the heat transition high on their agenda, at the national and European level. In the Netherlands, home- and property owners will be required to make their property natural gas-free by 2050, and municipalities are expected to take a leading role in the process. This brings a large number of questions and issues, such as: which alternative renewable heating or cooling sources are available now, and in the future? Which sustainable solution is most suitable for specific users and regions? How can the transition be carried out in a way that guarantees safety, reliability and affordability? How can it be accomplished in a smart way, and where to begin?

What we bring to the table

We at Over Morgen know from experience that the main step from vision to reality in the transition to natural gas free (or other fossil fuels) cities is the actual project execution. With our inspiring, integrated approach, we are able to tackle different issues across

neighbourhoods and coordinate all parties involved. We assist municipalities in drafting policies and roadmaps for sustainable heating, advise them on the most promising heating infrastructure and develop tailor-made strategies for social housing corporations. We employ state-of-the-art data tools and make sure citizens are involved at all stages. Our excellence lies in the smart combination of data analysis, technical and financial know-how, process knowledge and stakeholder involvement. Over Morgen plays a key role in turning policies into successful projects with tangible results.

Our projects

At Over Morgen, we accompany projects throughout their lifecycle, from idea to implementation. Have a look at the project section to discover how we helped the cities of Amsterdam and The Hague kick-start their transition to sustainable heating, and how stakeholders, residents and citizens have been involved in the various stages. Our projects aim at bringing profound economic, social and environmental impacts, resulting ultimately in a better quality of life. A heat transition by everyone, for everyone.



The right policy mix for CO²-free neighbourhoods

Communication is key

Understanding how the heat transition should be deployed is complex: it requires profound knowledge of the needs, preferences and demands of all stakeholders (the residents, municipalities and businesses), paired with an in-depth understanding of the technical-financial aspects, project management and participation strategies to promote sound policymaking and enable viable business models. Our role at Over Morgen is to guide stakeholders and municipalities through the process and allow them to take the right steps at the right time.

A step-by-step guide

First, we identify all relevant stakeholders and set up working groups, which will be active participants throughout the process. Then, we make use of our data tools to identify all available opportunities and the best strategies for a successful transition. We look at public data, such as the status of existing buildings, the availability of district heating networks and the location of heat sources to identify the

With the phasing out of natural gas extraction and the climate agreement, the heat transition is gathering momentum. In the Netherlands, the built environment will have to become CO²-free by 2050. It is predicted that this transition will affect almost seven million properties. The central government expects all municipalities to play a leading role and present their own roadmap for sustainable heating, a document that details all the choices to be made and the timeline for the municipality's transition to alternative heating solutions. But what does a natural gas-free municipality look like? Where to begin? And especially: how can we implement this project together with the stakeholders?

most promising options. Through a process of participation that includes municipalities, residents and businesses, all stakeholders state their requirements, which will then set the basis for future planning.

Based on this analysis, we define the most suitable neighbourhoods and locations to kick-start the transition and help the municipality draft the roadmap for sustainable heating. We discuss the short-term steps and actions that need to be taken in order to put ideas into practice. The chosen solutions are always tailored to every neighbourhood,

to achieve affordability and low societal costs. The municipalities are now able to take a leading role in the process and put the heat transition on the fast track.

This step-by-step guide allows municipalities to get the works started while remaining flexible. With our substantive consultancy, data analysis and process guidance, we aim at paving the way for more and more CO²-free neighbourhoods to come.

A joint process

Over Morgen plays a connecting role by establishing channels of cooperation between all stakeholders. It is crucial that all stakeholders agree with the chosen strategies and support them. We help municipalities identify the main stakeholders, understand the complexity of the task at hand and set up strategies to communicate effectively with citizens and residents. The heat transition is a joint process: together, we can make it fun.

Have a look at the project section to see how we helped the City of Amsterdam kick-start the process of becoming natural gas-free by 2040.



Sustainable heating infrastructure

The heat transition is a process that involves many technical, financial and logistical challenges; once the roadmap for sustainable heating has paved the way, concrete plans need to be implemented at neighbourhood level. A fundamental part of the process is the choice of the most appropriate heating infrastructure.

Making the right choice

The analysis of the local situation is always the starting point to determine which infrastructure will be best suited to every location. By making use of our data tools, we are able to determine which type of infrastructure is most convenient for specific neighbourhoods, buildings or building clusters. We base our analysis on several criteria, such as the type and age of the buildings or the proximity of renewable heat sources like geothermal energy or residual heat. For a certain neighbourhood, a heat pump may be the most attractive option, while for other neighbourhoods the most cost-effective alternative could be a district heating network. Often, the final solution will be a mix of different technologies.



Technical and financial aspects

Over Morgen assists municipalities throughout the process with technical-financial expertise and process management skills. We start with an interactive approach, by getting together with the stakeholders to work out the feasibility of technical solutions. Together, we establish the requirements for the new heating system and discuss its technology, the required investments and options for financing. We help stakeholders organise the whole heat chain, from source and production to distribution and delivery to the end user; we make sure that the technical requirements are well embedded in the project execution plans and assist the stakeholders in the drafting of the



financial plan. Over Morgen also provides consultancy on the business case for the required installations and exploitation of the heat sources.

Participation is key

Implementing a brand new heating infrastructure across municipalities is a complex task that required great effort and cooperation from all parties involved. We at Over Morgen believe that the heat transition can be successful only if everyone has a clear understanding

of the undertaking and has the ability to have their say. We make sure that the whole process is carried out with full consideration for public space and housing as well as the neighbourhood's identity, its residents and stakeholders.

Have a look at the project section to see how we helped the city of The Hague take a major sustainability step with new district heating infrastructure.



Sustainable real estate strategy for housing corporations

living environment, lower maintenance costs and CO² emissions. At Over Morgen, we help social housing corporations find the most sustainable solutions.

Data driven advice

We lay the groundwork by means of smart data visualisations. With our Real Estate Atlas, it is possible to map all relevant information for the whole housing portfolio, such as the type of buildings, their energy consumption or the proximity of district heating networks in the surroundings. The map layers are then combined to point out the most favourable locations from where to start the process.

It is particularly important to define an adequate pace for the transition. Residents of social housing are a particularly delicate group, and we must be sure to do the right thing at the right time to avoid unnecessary discomfort. Once the best alternative heating option has been chosen, the social housing corporation can start combining all necessary installation works with the pre-scheduled general maintenance. For example, routine maintenance works

A step-by-step transition towards a CO²-neutral housing stock: this is the essence of a sustainable real estate strategy. In the Netherlands, nearly 30% of dwellings are owned by social housing corporations. In some cities, they make up to 70% of all real estate. This is why these corporations play a major role in the transition to future-proof, CO²-neutral neighbourhoods.

Social housing corporations have their own distinct company processes. The main challenge for them lies in making the right decisions within the pre-established project budget, in order to achieve higher levels of comfort, lower energy bills, improved appearance, better



on the façade constitute an excellent opportunity to start insulating and to install double glazing.

A realistic, flexible transition

With our technical-financial expertise, we help social housing corporations make an effective and flexible planning of investments and costs. We make sure that all chosen processes are tailored to their own internal structure and organisation. By using our data tools, social housing corporations have an extensive overview of their entire portfolio and remain in the driver's seat throughout the transition, while at the same time allowing for flexibility in the implementation of the individual steps.

A sustainable heat strategy gets better with time; it is important to have an encompassing view and oversee the whole spectrum. We at Over Morgen do just that: we understand the interests of all stakeholders and bring them together. With our expertise in heating infrastructure, business case and finance, process management and data, we help our customers make sure that every goal is met.

Have a look at our project section to discover future-proof social housing in The Hague.

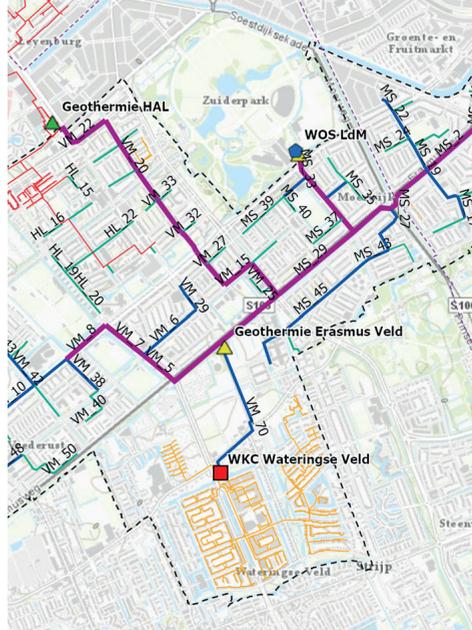
Data at the heat transition's service

Data alone may not make the world go round, but they are certainly a great ally when it comes to giving reliable, pragmatic advice. At Over Morgen, we have developed a set of tools to make the heat transition easier. We use **data driven, geo-spatial models** to map and analyse the current state of the built environment and to determine the most feasible and cost-effective alternative heating options.

The tools presented below allow municipalities and other stakeholders to take a proactive approach and plan the heating infrastructure for whole neighbourhoods or building clusters in advance. With detailed information about existing buildings and viable heat sources, they are able to define the most logical short-term and long-term steps to be taken with an impressive degree of precision.

Heat Transition Atlas

The Heat Transition Atlas provides insight into the built environment of specific municipalities or groups of municipalities. By combining the



District Heating Design The Hague South West

different map layers, it is possible to obtain information on various factors which are particularly relevant when drafting a decarbonisation strategy. You can start by visualising information on the status of existing buildings and their insulation, such as the type of building or the year of construction. By adding another layer, the atlas shows the most promising locations for district heating networks. Include the viable heat sources in the map and you just have to connect the dots: identify the most convenient alternative heating solution for every neighbourhood and start a cost calculation.

The same approach can be used to define which neighbourhoods are most suited for district heating or all-electric. By combining the geo-spatial data with

socio-economic indicators and technical-financial information, it is possible to get a clear insight on the best, most cost-effective CO²-free heating solutions for the whole of the Netherlands.

Real Estate Atlas

The interactive Real Estate Atlas is a data driven tool that shows the most promising locations from where to start making the built environment more sustainable. The goal of this tool is to make an abstract task like the heat transition more tangible. Thanks to data provided by the housing corporations themselves, it provides insight into their current real estate portfolio, the state of the property, and the pace that is needed to achieve CO²-neutrality by 2050. The atlas is a wonderful tool to help real estate corporations define a

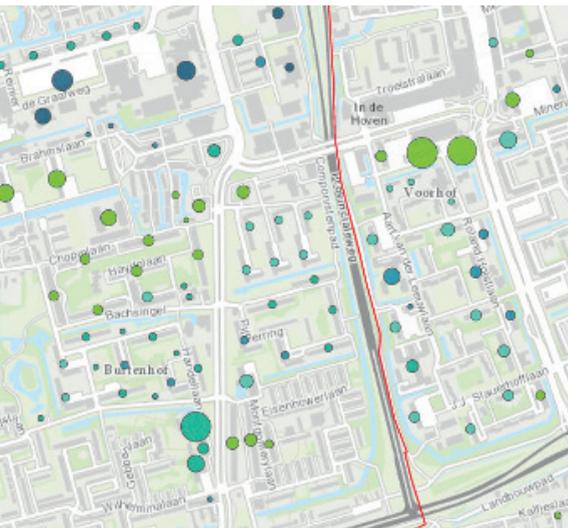
sustainability vision, set the course for the whole organisation and visualise practical methods for achieving their goals.

By combining the various map layers, it is possible to analyse the area one neighbourhood at a time and spot the districts that offer the most promising chances. The atlas is interactive: it allows to visualise the whole portfolio and zoom in on individual buildings or clusters. It shows, for example, whether a specific roof has been insulated, or what the energy costs are for a specific dwelling.

With the help of this tool, we can prepare a technical analysis, an overview of the necessary investment costs for all the promising areas and deliver a practical action plan. The tool is particularly indicated for housing corporations that want to gain insight into their own portfolio in a quick and reliable way.

Business Case Model

Over Morgen provides consultancy on the business case for various projects, to determine their feasibility and affordability. For this purpose, we have developed a Business Case Model; it combines all relevant technical-financial parameters for a specific project and allows to make projections on the necessary investment costs. Our business case models are transparent and transferrable to our clients.



Wijkverhaal Heijenoord/Lombok/Klingelbeek

Uitleg

Een foto van de wijk

Het energieverhaal

Projectoverzicht

Atlas

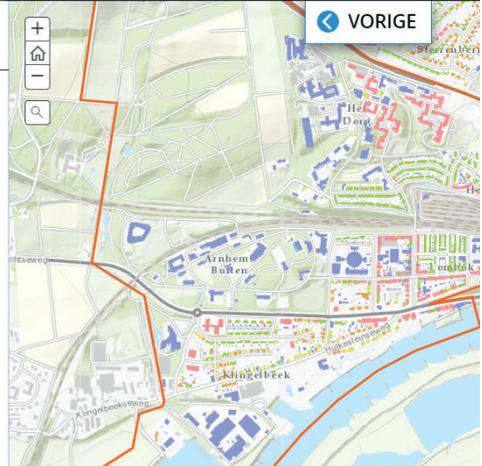
Heijenoord, Lombok en Klingelbeek

Klingelbeek, Heijenoord en Lombok?

Veel gebouwen in de wijken komen uit een **bouwperiode** van voor de oorlog. De komst van de spoorverbinding naar Arnhem verstoort de plannen om van dit gebied een villawijk te maken. Het spoor betekende bedrijvigheid. En bedrijvigheid betekende behoefte aan woningen voor arbeiders. De arbeiderswoningen **rond de Nassastraat** zijn daar het gevolg van. Veel van deze woningen zijn inmiddels **monumenten** en zijn in het bezit van een **woningcorporatie**.

Verder zijn er voornamelijk veel koopwoningen (53% in Klingelbeek en 57% in Heijenoord/Lombok) en huur in de vrije sector. In het gebied zijn 2.870 woningen te vinden. De **woningtypen** zijn best verschillend. Van rijwoningen tot villa's en appartementen. De aanwezigheid van Het Dorp maakt het gebied qua type woningen anders dan andere Arnhemse wijken.

Naast **Het Dorp** zijn ook **de Koepelgevangenis**, het voormalig



Story Maps

Story Maps are online picture stories with interactive maps, designed to represent the various steps of the heat transition in a dynamic, impactful way. Municipalities and stakeholders are very aware of the power of this particular strategy and want the communication around the heat transition to be as clear and effective as possible. With vast expertise in the creation of story maps and everything that revolves around the heat transition, Over Morgen helps municipalities collect all the necessary information and lay out the stories in an efficient, impactful way. At Over Morgen, we believe in combining

expertise in technology and data with practical, substantive knowledge of the field. We want to share the lessons that we learned: our tools help make complex issues understandable and find easily workable solutions. Policymakers and stakeholders can now focus on making the decisions that matter.

Curious to find out how our Real Estate Atlas has been employed in one of the most ground-breaking infrastructure projects in the Netherlands? Read more in the project section.



Participation

identify target groups and connect them to the stakeholders.

Together, we set the conditions for the participation process and determine its reach. Afterwards, we define a strategy and a concrete action plan. Sometimes, participation means providing citizens with the information they need; other times, they will be directly involved in the decision-making process. We motivate and guide citizens to participate in every stage of the heat transition and keep them informed about all the necessary requirements. We organise meetings with the residents in order to obtain a clear understanding of the questions that are raised in their community and address them by means of information sessions, interviews or questionnaires.

The heat transition is a complex process that requires effort and cooperation from all citizens: they will have to change the way they cook, or maybe install solar panels on their roofs. We at Over Morgen believe that participation is an indispensable tool to make the heat transition beneficial for everyone. Participation, however, does not come in a one-size-fits-all model, but has to be tailored to each and every situation.

Know your audience

Every constructive relationship begins with getting to know each other; a good starting point for participation consists in identifying the target groups and understanding them in order to find the best approach to inform and empower them throughout the process. For us at Over Morgen, participation is not an isolated task; it is the best way to guarantee the success of the heat transition. We make smart use of data to

Participation benefits all

We at Over Morgen know from experience that a successful participation process has a direct impact on policymaking; by empowering citizens and getting them involved, stakeholders and municipalities are guaranteed to achieve the best results. We know how to bring people together. And together, we can make it work.

Have a look at how real “Amsterdammers” have helped make their own city future-proof. More in the project section.

AMSTERDAM BECOMES NATURAL gas-free by 2040

Amsterdam has set itself an ambitious goal – to get rid of natural gas by 2040, which is a decade earlier than the rest of the country. Over Morgen has offered its contribution to this by helping the municipality draft their own roadmap for sustainable heating.

Amsterdam is a big city with many old buildings; housing corporations and energy suppliers are very influential players, and the citizens are well informed. Key to our approach was the close cooperation between all stakeholders; together, we looked at different relevant criteria, such as the lowest societal cost, the proximity of the heat sources, and ways for minimising the inconvenience to residents.

With our data models, we divided the built environment into different categories according to building type and made a projected cost

analysis. Afterwards, we looked at the option carrying the lowest societal costs.

For each heating option, we looked at the short-term energy efficiency and CO² reduction values, but also at the possibilities for improving the sustainability of the installation.

We chose to start with the neighbourhoods which offered the most promising short-term results, and from there we played out the entire scenario for Amsterdam from now to 2040.

Curious about how our step-by-step transition plans can be applied in your city? Feel free to contact our advisor.

THE VOICE OF THE Amsterdammers

While helping the municipality of Amsterdam plan the heat transition, we have also worked on communication strategies, campaigns and participation programmes. The municipality of Amsterdam requested explicitly that the voice of the 'Amsterdammers' would be heard in the drafting of the roadmap for sustainable heating. This created a unique opportunity for a fresh participation approach.

Amsterdammers have given a significant contribution to the heat transition in two key moments: we collected input from residents by means of several activities. We have organised an online survey with roughly 4000 respondents, interviews on the streets, a whole evening dedicated to sharing thoughts and a session with social housing representatives and other relevant stakeholders. Through these steps, we have been able to set the groundwork for the roadmap for sustainable heating.

The results of this first round were collected in a memorandum and used to define the criteria and requirements for the choices to be made. The second round took place after the analysis of the previously obtained data. This was

characterised by two major challenges: making the roadmap more easily understandable, and collecting input for the subsequent steps. Roughly 70 residents have cooperated on a first draft of the transition map, indicating all alternative heating options and the timeline per neighbourhood, and on the overview of the heating solutions. With a smaller group, we have also discussed the roadmap in its entirety.

In Amsterdam, where real estate corporations make up for a large portion of the built environment, they are a target group whose voice cannot be ignored. Their contribution has significantly improved the clarity of the roadmap and the map material.

On September 30, 2020, the City officially adopted the roadmap. The 'Amsterdammers' are proud to have offered their contribution to keeping their city as healthy, liveable, and forward-thinking as we all know it.

Curious about how our step-by-step transition plans can be applied in your city? Feel free to contact our advisor.

PROVIDING RESIDENTIAL HEAT FROM The Rotterdam Port to The Hague

Municipalities and corporations in the area around The Hague, see district heating as a great opportunity to kick-start the heat transition with low societal cost. The stakeholders have asked Over Morgen to draft a complete business case for the project.

The most promising source to get the transition started is the residual heat from the port of Rotterdam. Gasunie is currently developing a major heat transmission grid, the so-called “Pipeline through the Middle”. This is a district heating infrastructure from the port of Rotterdam to The Hague. A large portion of this heat will be made available for the development of new district heating networks in the current built environment.

We started by sharing the basic operating principles, such as the viable neighbourhoods, the inlet temperature of the heating grid, the time and speed required to connect dwellings to the heating network, the projected energy fees for renters and owners of the properties, the demarcation lines between the heat supplier and the property owners and the heat

supplier’s technical requirements.

The most promising neighbourhoods were appointed by means of the Real Estate Atlas (check our website for more information).

Based on these starting points, we calculated the necessary contributions for cost recovery. This is the amount that needs to be paid to the heat supplier at the moment of connection to the grid, in order to allow for a financially sound operation. We included recommendations on the subsequent steps to follow in order to obtain a more secure, reliable case on the feasibility of district heating networks. With the detailed and comprehensive dashboard, the client can carry out all necessary sensitivity studies independently.

The Pipeline through the Middle will have a capacity of 250 MW, with which it will fulfil part of the current heat demand. The supply of residual heat in the port of Rotterdam is more than sufficient to also fulfil a future increase in heat demand. The resulting reduction of CO² emissions will contribute significantly to achieving the climate objectives.

SUSTAINABLE REAL ESTATE STRATEGY in The Hague

Haag Wonen is one of the three largest housing corporations in The Hague. They have recently joined in on the country's effort to become more sustainable. Haag Wonen's goal is to make 1.000 houses per year sustainable and ready to be connected to the district heating grid. Moreover, the corporation wants to help limit the tenants' energy costs, and asked Over Morgen to assist them in this ambitious challenge.

Haag Wonen wants to operate with agility and reduce the discomfort for the residents to the minimum. We have developed an approach that enables them to combine the necessary interventions with pre-scheduled maintenance works. By combining insulation works on the roof, for example, with regular roofing maintenance, it is possible to work more efficiently and minimise the inconvenience for tenants.

Haag Wonen needed a solid basis to calculate the amount of work to be done, the necessary investments and to determine their budget. Based on an analysis carried out with our data tools, it was possible to define all the necessary measures for insulation and provide a

comprehensive insight into the whole housing portfolio and the task at hand, including the best strategies to approach the project, the costs and the necessary planning in a short time.

Based on system data, we have established a strategy per complex, based on relevant factors such as location, size of the complex, type of heating infrastructure, year of construction and insulation value of the paintwork. This way, every complex gets a strategy for tailored improvements, such as paintwork insulation, the sustainability of heat generation, and installation of solar panels.

The end result is a pragmatic, realistic strategy per complex, with concrete measures and a detailed description of all practical interventions per building complex, including price indication and moment of execution. Haag Wonen can now do the right thing, at the right time

REAL ESTATE ATLAS for sustainable housing in The Hague

The Dutch government has declared its goal to make the built environment natural gas-free and CO²-neutral by 2050. Social housing corporations are committed to doing their part and are well aware of the importance of their role. In order to obtain a better insight into the feasibility and affordability of the heat transition and the most viable locations from where to start, umbrella organisation Sociale Verhuurders Haaglanden (SVH) has asked Over Morgen to create a Real Estate Atlas for the 150.000 dwellings in the area around The Hague.

We developed the Real Estate Atlas to be able to map the current state of the social housing portfolio in detail. The atlas indicates the best locations from where to start and which measures are necessary to reach the goal of a CO²-neutral housing stock by 2050. It also gives a good indication of the necessary investment costs for the whole portfolio as well as per location, building complex, and even per building element (flooring, façade, glass, roof, ventilation system).

We started by collecting the housing corporations' requirements and expectations, as well as their individual

data; then, we loaded the real estate data and other relevant indicators into our atlas, such as the existing district heating networks and the actual gas consumption. Our models display this information visually in dashboards, maps and graphs. The final results were then presented to different corporations.

The Real Estate Atlas was also used to provide insight into available chances and opportunities for the creation of a district heating network from Delft to The Hague, with deep geothermal energy and residual heat from the port of Rotterdam as a sustainable source. Moreover, it can calculate the impact of all different measures on the actual CO²-emissions.

The Real Estate Atlas incorporates all necessary data in one model and provides a precise, comprehensive overview that allows to make deliberate decisions; it has proven to be a useful instruments for housing corporations to take their first active steps towards a successful heat transition.



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Our smart and sustainable mobility solutions are designed to create healthy cities and liveable streets”

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