

Amsterdam

1. Background

Amsterdam is the largest city in the Netherlands and is located in the western part of the country (the province of North Holland). In 2021, it had 873,338 inhabitants (CBS, 2022a). In 2021, Amsterdam had 449,989 housing units, of which owner-occupied homes made up about 29%, and rental properties made up 71%. Housing corporations owned 56% of residential rental properties, and private landlords owned the remaining 44% (CBS, 2022b). In terms of the age of the housing stock, 42% of the dwellings were built prior to 1945; 15% were built after 2005. Single-family homes made up 12% of the housing stock, while multi-family homes made up 88% (CBS, 2022c).

In 2021, 74% of homes in Amsterdam had an individual natural gas boiler; 16% of homes were heated through district heating; 6% – block heating; 1% – electricity (there is no data on the rest of the 3% of homes). The share of homes heated with the use of collective heating solutions is higher than the average share in the Netherlands (nationally district heating accounted for about 7% in 2021) (CBS, 2022d).

In 2020, the residential sector's heating accounted for 14% of all greenhouse gas emissions in Amsterdam. The municipality of Amsterdam set a goal of reaching a 55% CO₂ reduction by 2030 compared to 1990 and becoming natural gas-free by 2040, which is ten years sooner than the target set by the Netherlands as a whole (Amsterdam Municipality, 2020).

In 2017, Amsterdam finalised the City Deal 'Towards a city without natural gas' that set agreements between the municipality, housing corporations, network operators, and heating companies to work together on conducting research and piloting transitions to sustainable heating. The partners chose 50 'City Deal neighbourhoods' to start work on the transition to natural gas-free heating (Amsterdam Municipality, 2017).

2. Heat transition vision

2.1. Vision development and stakeholder engagement

Consultants from *Over Morgen* drafted Amsterdam's heat transition vision and coordinated stakeholder engagement in this process. The draft was sent to the City Council, and after a period of consultations the vision was adopted in September 2021.

Amsterdam residents were involved early in the process of the vision's development. In the first round of engagement, residents were invited through social media to participate in a survey in June 2019. The survey received 3,875 responses and showed that affordability was the biggest concern in the heat transition. The survey was followed by a meeting with 100 residents on June 26, 2019 to elaborate on the survey results. Amsterdam residents were also interviewed in the streets. In the second round, a meeting with 70 residents was held on January 14, 2020 with the goal of getting feedback on the potential impact of the heat transition on the residents of Amsterdam. In addition, ten residents provided more detailed

comments on the draft heat transition vision. Another social media survey was sent in January 2020 (received 3,395 responses) and asked Amsterdam residents about any preferred ways to be involved in heat transitions. Half of the respondents (51%) suggested that a small representative group of residents should participate in the planning and selection of solutions for heat decarbonisation (Amsterdam Municipality, 2020).

The draft heat transition vision was developed by the Over Morgen consultants with the input of a working group consisting of representatives of the gas and electricity network operator Liander, the Amsterdam federation of housing corporations, Ymere – the largest housing corporation in Amsterdam, energy and heat providers Vattenfall and Westpoort Warmte, the Amsterdam water company Waternet, and the Amsterdam association of tenants and homeowners !WOON. In addition, the consultants conducted separate rounds of interviews with the City Deal partners, housing corporations, large private landlords, and representatives of different municipality departments (Amsterdam Municipality, 2020).

Over Morgen consultants calculated the lowest social costs for each heating solution based on financial-technical modelling. The consultants compared the results of three models: their own heat transition model, the CEGOIA model developed by consultants at CE Delft, and the Start analysis developed by the Dutch Environmental Assessment Agency (*Planbureau voor de Leefomgeving*). The model-based results were revised based on information on local developments (e.g., information on planned new construction) and consultations with the stakeholders. In neighbourhoods where model results differed, the results of Over Morgen's model were prioritised because that model was the most up-to-date and most fully incorporated local analysis (Amsterdam Municipality, 2020).

Data sources included data from the Central Bureau of Statistics (neighbourhood metrics from the District and neighbourhood map, and data on gas consumption at the postcode level from the Network operators' open data), the Netherlands' Cadastre, Land Registry and Mapping Agency (data on terrain geometry for calculating building density, as well as data on building functions, year of construction, and ownership details), the Netherlands' Authority for Consumers and Markets (gas and heat tariffs), energy companies Essent, Eneco, and Vattenfall (electricity tariffs), the Netherlands' Tax and Customs Administration (energy taxes and price information on renewable energy storage), and Over Morgen consultancy's market knowledge on investment costs and operational costs (Amsterdam Municipality, 2020).

2.2. Approach to heat decarbonisation and natural gas phase-out

Amsterdam's heat transition vision presents a map specifying sustainable heating solutions and transition timeframes for each neighbourhood in the municipality, of which there are 481. The transition vision emphasises the gradual pace of heat decarbonisation. In some neighbourhoods, heat transitions will not start until after 2030. In other neighbourhoods, the goal is to complete the heat transition before 2030, including the 50 'City Deal' neighbourhoods, and those neighbourhoods where housing associations have renovation plans, where there are construction or renovation plans in the public areas (e.g., in the waste system, the water system, or the electricity system), or where residents put forward heat decarbonisation initiatives. The municipality coordinates the development of heat transition implementation plans and facilitates reaching agreements between the main stakeholders and

the residents on heat transition solutions in these neighbourhoods (Amsterdam Municipality, 2020).

To identify a preferred heating solution for each neighbourhood, the consultants in partnership with the stakeholders developed the criteria for navigating trade-offs between different heating solutions. The criteria included the following: lowest social costs; availability of and proximity to sustainable heat sources; sustainability of heat sources (allowing the highest CO₂ reductions and decreased reliance on fossil fuels); existing and planned infrastructure in the neighbourhood (e.g., the presence of heat network infrastructure); and least nuisance in the neighbourhoods and residents' homes.

Based on these criteria, the consultants produced a map of heating solutions for each neighbourhood that should be developed by 2040:

- The plan for about a half of Amsterdam's homes (54%) is to connect them to low- or medium-temperature (maximum 70°C) district heating, and to heat about 18% of all homes through local-source heat networks.
- The plan for newer neighbourhoods outside the ring road with lower building densities (14% of all homes) is to adopt all-electric heating solutions.
- Neighbourhoods in the historic centre and with lots of pre-war buildings are expected to remain on the gas network (14% of all homes) supplied with sustainable gas (biogas or green hydrogen) combined with reductions in heat demand through hybrid heating solutions and home insulation.

The heat transition vision emphasises that building owners are free to choose any sustainable heating solutions, but the municipality will steer them to adopt the preferred solution in their neighbourhood identified by the vision because deviating from that solution will likely increase overall social costs. For example, residents can get a larger subsidy if they opt in for the preferred heating (PAW, 2021). The vision also underscores that the outlined transition trajectory is not set in stone and will be regularly revised.

However, Amsterdam municipality employees emphasised the polarised nature of discussions with residents in the process of identifying the preferred heating solution. The strongest proponents and opponents voice their concerns, but a large moderate group seems to be poorly represented in the discussion and heard the least by the municipality. Another issue is residents' trust in the process of choosing the approach to decarbonising heating. To maintain trust, the municipality must be open about its intentions; it is either a neutral broker helping residents navigate different solutions, or it tries to convince residents to adopt a plan it believes would be more efficient (PAW, 2022a).

3. Heat transition pilots

3.1. Van der Pekbuurt, Amsterdam (grant from Programma Aardgasvrije Wijken (PAW), or the Natural Gas-Free Neighbourhoods Programme)

A PAW grant of €6,050,000 was awarded in 2018 (the first round of grants) to the municipality of Amsterdam for a pilot area in the Van der Pekbuurt neighbourhood located in Amsterdam-North. The pilot neighbourhood consists of terraced houses built in the 1920s for industrial and shipbuilding workers. The main partners in the pilot implementation are the housing corporation Ymere, the local tenants' association Van der Pek, and the Amsterdam

association of tenants and homeowners !WOON. Ymere owns the majority of the homes in the pilot area. The corporation combined the renovation of its housing units with heat decarbonisation. As part of the PAW pilot, it has focussed on implementing insulation measures and connecting homes to a heat network. Ymere has completed renovation work in the first three blocks of housing. By the end of 2022, the pilot had 350 natural gas-free-ready homes and 85 natural gas-free homes (PAW, n.d.-a).

The PAW pilot area is part of the larger Van der Pekbuurt neighbourhood (one of the City Deal neighbourhoods, in which work on heat transitions started in 2017). In 2017, the neighbourhood consisted of 2495 residences (2132 homes owned by housing corporations, 182 owner-occupied homes, and 181 private rental properties). Like in the pilot area, the housing corporation Ymere owns the majority of the homes in the neighbourhood (about 70%). The corporation's plan is to renovate its housing units in phases between 2018-2027. It is one of the main stakeholders in the planning and implementation of heat transitions because this process is closely connected to the plans for renovating housing units by the corporation (Amsterdam Municipality, n.d.-a).

The municipality of Amsterdam has led the process of finding a sustainable heating solution by devising a heat transition implementation plan for the Van der Pek neighbourhood as part of the municipal heat transition vision. A municipal employee emphasised uncertainty in this process, *'Local authorities get responsibility to organise things very quickly, very early in the process without a good national package of rules and regulations. So it was presented in the first phase, like we have to start with learning how to do it'*¹.

Financial-technical modelling results showed that a district heating solution should be prioritised over other solutions. Ymere's preferred natural gas-free heating solution is a high-temperature heat network. Renovation plans for the first several blocks of Ymere's homes included the decision to insulate the homes and connect them to a high-temperature heat network owned by a private company called Vattenfall and fed by a waste incinerator. However, this option has received pushback from the residents based on concerns over the sustainability of a high-temperature heat network, its affordability, and the potential for Vattenfall to abuse its monopoly as a heat provider. The municipality has been also concerned about creating lock-ins by connecting homes to high-temperature heat networks, but the current version of the Heat Act does not provide any instruments for the municipality to impose any sustainability requirements for the heat source on heat suppliers (PAW, 2020a).

Van der Pek residents felt that they were not heard in the process of choosing a heating solution for the neighbourhood. A municipal employee commented on this, *'There is a lot of mistrust... It's a future with a lot of uncertainties, so people are anxious. People have a lot of questions'*². As a response, the municipality organised an information meeting that was attended by an alderman and proposed conducting independent research into heating solutions together with the residents (PAW, 2020b). The municipality coordinated the process of including a committee of residents, both housing corporation tenants and private owners, in overseeing the analysis of different heating options in hopes of increasing support for the chosen solution. The study assessed different aspects (costs, sustainability,

¹ Interview with Amsterdam city official.

² Interview with Amsterdam city official.

availability, openness, and nuisance) of heating alternatives, including high-temperature district heating, individual heat pumps, local heat networks with underground heat storage and heat extraction from surface water (EnergyGO, 2020).

As a result of conducting the joint study, the distance between the municipality and residents got smaller (PAW, 2020b). However, the housing corporations chose not to get involved in supervising the study, which decreased the importance of the study given that the housing corporations are the major stakeholder in heat transitions (PAW, 2020a). A heat transition plan for the whole Van der Pek neighbourhood, including other Ymere's housing, the housing of three more housing corporations, and privately owned housing, has not been finalised as of this writing (January 2023) (Amsterdam Municipality, n.d.-b).

The municipality underscored the tension between early citizen engagement and its limited ability to answer some detailed questions regarding costs and other specifics of sustainable heating options. Another lesson is that municipal employees needed to spend a significant amount of time discussing with residents how to tailor sustainable heating solutions to the specifics of their homes. This required significant capacity on the part of the municipality and raised concerns over the scalability of heat transition techniques (PAW, 2020a). Another potential tension in the heat transition is between steering residents toward the most efficient solution based on financial-technical modelling and deciding on the solution based on residents' input.

3.2. Wilhelmina Gasthuis, Amsterdam (grant from PAW)

A PAW grant of €7,740,462 was awarded in 2020 (the second round of grants) to the municipality of Amsterdam for a pilot area in the Wilhelmina Gasthuis (WG) neighbourhood. WG is a former hospital converted into a residential area and located in Amsterdam-West. The pilot focusses on insulation measures, the creation of a medium-temperature heat network (70°C) based on aquathermal energy from surface canal water, seasonal storage, and the use of collective heat pumps. The pilot neighbourhood consists of stacked construction built between 1890 and 2000. There are 786 residences in the pilot area, including 187 owner-occupied homes and 599 rental properties (PAW, n.d.-b).

The main partners in the pilot implementation are the local energy cooperative KetelhuisWG, the housing corporation Stadsgenoot and two smaller landlords, the Amsterdam association of tenants and homeowners !WOON, the gas and electricity network operator Liander, the Amsterdam water company Waternet, and local tenant and homeowner associations (PAW, n.d.-b). The WG living lab represents a bottom-up initiative of the residents, while the Van der Pekbuurt pilot is an initiative led by the municipality and the housing corporation Ymere (PAW, 2020a).

In 2018, a group of residents put forward an initiative to develop locally-sourced sustainable heating in the WG neighbourhood. More residents became interested in the idea, which led to the establishment of an energy cooperative KetelhuisWG. The residents commissioned research into potential solutions for sustainable heating for 2,500 homes in the area using local heat sources. The chosen solution was to create a local-source heat network for heating and tap water using aquathermal energy from the Jacob van Lennep canal in combination with seasonal underground storage and collective heat pumps. For more information about the proposed heating technology, see Amsterdam Municipality (n.d.-c).

The municipality fulfils several functions in supporting the residents' initiative: it monitors and assesses the technical and financial feasibility of the project, as well as transfers the PAW funds to the co-operative. The funding transfer takes place in phases, which can sometimes be disruptive to the project workflow, but helps maintain accountability of the funds. The municipality indicates that the national government funding increases the legitimacy of the project (e.g., the national support contributed to the decision of the housing corporation Stadgenoot to join the initiative) (PAW, 2021).

KetelhuisWG started signing preliminary contracts with residents in May 2022 (KetelhuisWG, 2022). The construction will start when there are enough committed residents. There are some conditions in the pre-contract allowing both the co-operative and residents not to sign the main contract. For example, the co-operative can refrain from signing if the project financing does not work, or the residents can refrain if the 'pay no more than now' principle is not fulfilled (PAW, 2022b).

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