

Insights and Experiences in Paris Proof Residential Renovations



Whitepaper

ASR Dutch Core Residential Fund

Index

1	Net zero by 2045	3
2	Our approach to net zero	4
3	Reducing energy consumption through asset-level action plans	6
4	Renovating dwellings to the Paris Proof standard	9
5	Practical insights from our expert	11
6	Next steps	12

1 Net zero by 2045

The global rise in CO₂ is one of the biggest challenges of our time. Climate change affects both cities and the countryside by changing our environment and has a major impact on society and nature. The built environment is a significant driver of climate change, accounting for 37% of global greenhouse gas (GHG) emissions.¹

The ASR Dutch Core Residential (‘the Fund’) acknowledges its responsibility for reducing its impact on nature and society. To this end, it signed the Paris Proof Commitment of the Green Building Council (DGBC) in 2020 and dedicated itself to achieving a net zero portfolio by 2045. In order to achieve this objective, the Fund drew up a Paris Proof roadmap using the CRREM pathways. These pathways were developed by the EU to help real estate investors to measure their exposure to emission-related risks. The Paris Proof roadmap is based on the current energy intensity figures and reduction measures are planned at the level of individual assets.

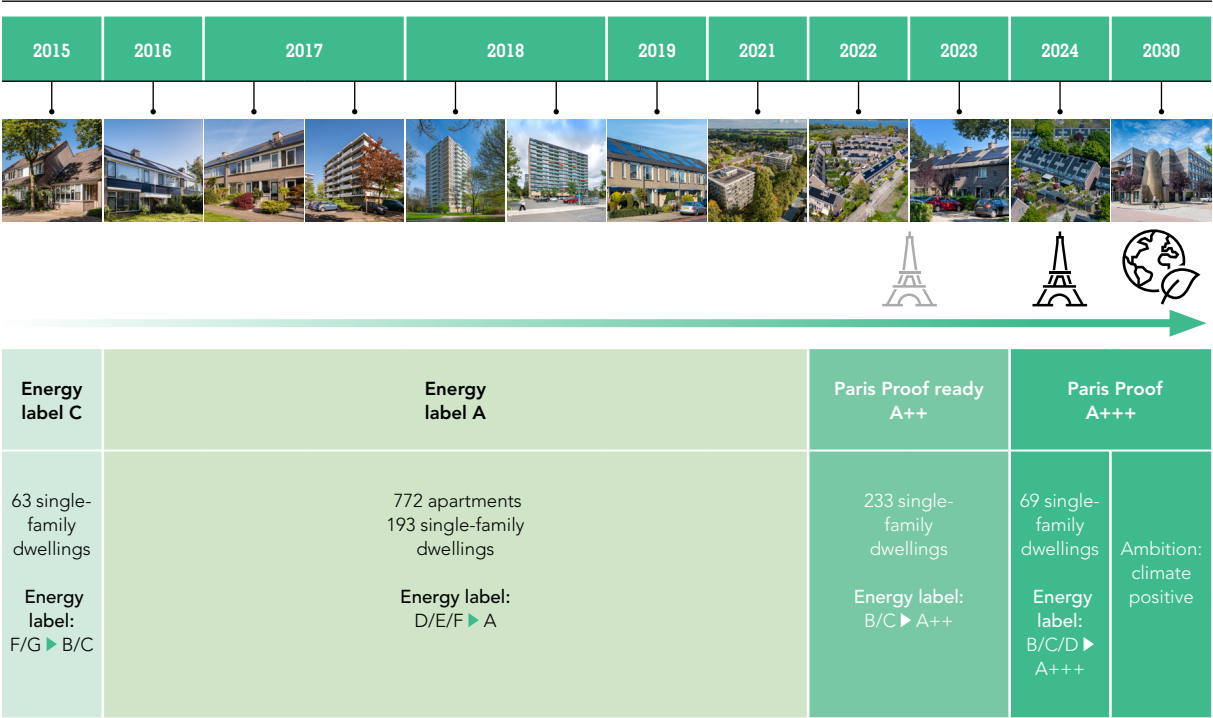
In the execution of these asset-level measures, the Fund can rely on its longtime experience with sustainable renovations. Since its inception, the Fund has been improving the energy efficiency of its assets

by renovating dwellings. As a result, the Fund has already improved the energy performance of more than 1,300 dwellings to at least energy label A. The Fund is a true frontrunner in this regard, being the first institutional investor to make rental dwellings built in the 1980s Paris Proof.

Beside showcasing the Fund’s ability to put words into action, this paper is meant to act as an inspiration and means of knowledge sharing.

The Paris Proof Commitment is not a *Tour de France* with an individual winner, but a team effort. We strongly believe that we will reach Paris Proof faster if we share best practices and lessons learned, rather than all of us having to reinvent the wheel. So practice what you preach and spread the word (and knowledge)!

Figure 1 Ambition level increases



1 <https://www.unep.org/resources/report/building-materials-and-climate-constructing-new-future>

2 Our approach to net zero

The Fund has been renovating dwellings to improve their energy efficiency since 2015 and it has dedicated itself to realising a net zero portfolio by 2045. As part of the Fund’s carbon reduction strategy, the Fund developed a Paris Proof roadmap for its real estate portfolio using the CRREM pathways. The Paris Proof roadmap is based on the current energy intensity figures and reduction measures are planned at the level of individual assets. The carbon reduction measures have been put into four main categories:

1

Reducing energy consumption through asset-level action plans

The carbon reduction strategy aims to reduce the energy usage of individual assets through asset-level action plans. This includes: (i) the identification and planning of carbon reduction measures aimed at becoming net zero by 2045, and (ii) a feasibility study of the proposed carbon reduction measures, including expected capital expenditures and return on investment.

2

Increasing on-site renewable energy generation

The Fund aims to implement renewable energy solutions wherever feasible. PV panels are the most suitable solution for the Fund’s portfolio. A significant portion of single-family houses in the portfolio have already had PV panels installed. The Fund eventually aims to install PV panels on all single-family houses and, if possible, on all apartment buildings. Panels can be installed on buildings where the Fund has full ownership and on buildings where the Fund has a share in the owner’s association.

3

Engaging with tenants: working towards mutual efforts and agreements in green leases

The Fund engages with its tenants on making their rental dwellings more sustainable. Tenants are encouraged to reduce their energy consumption, with the aim of bringing down and maintaining their energy intensity in line with the CRREM pathway, and to work towards reaching net zero by 2045.

Therefore, the Fund continuously works on a participation programme that involves various forms of tenant participation. Our activities range from playing an active role in sustainability projects and tenants’ associations, to focusing on sustainable living in the bi-monthly newsletters and events for tenants.

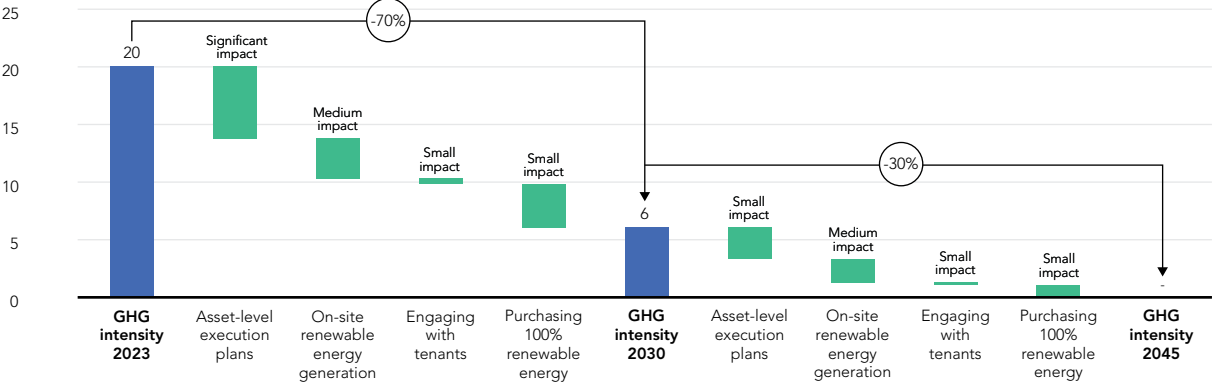
4

Purchasing 100% renewable energy

The Fund procures 100% Dutch renewable energy for the areas controlled by the landlord and encourages tenants to do the same.

The four main categories of carbon reduction measures and their related estimated impact on the Fund’s GHG intensity for 2030 and 2045 are summarised in the figure 2 below. We expect there to be a significant impact as a result of these asset-level action plans. The Fund’s approach on developing a feasible business case and monitoring performance is outlined in the next chapters.

Figure 2 Estimated impact of carbon reduction measures to reaching net zero by 2045



Theoretical framework: net zero by 2045

The ambition of the Fund is achieving a net zero portfolio by 2045. This ambition aligns with global climate goals, particularly the Paris Agreement¹, which aims to limit global warming to 1.5°C above pre-industrial levels.

Net zero (CO₂-neutral)

Net zero, or CO₂-neutrality, refers to the balance between the amount of greenhouse gases (GHG) emitted and the amount removed from the atmosphere². To achieve net zero, minimizing the energy consumption and GHG emissions is a priority. Next to minimizing emissions, maximizing the procurement of renewable energy is key to realise the net zero ambition.

CRREM pathways

The Carbon Risk Real Estate Monitor (CRREM) facilitates the identification and mitigation of carbon risks associated with real estate portfolios to mitigate climate change related transition risks and ensures compliance with future regulations. CRREM has developed CRREM pathways providing a roadmap for real estate portfolios to align with the Paris Agreement and guide the transition to CO₂-neutral portfolios. It offers an annual benchmark for energy intensity (kWh per sq.m. per year) and CO₂ intensity (kg CO₂ per sq.m. per year).

ASR Dutch Core Residential Fund

Achieving a CO₂-neutral and Paris Proof portfolio requires a comprehensive approach that integrates energy efficiency, emission reductions, and procurement of renewable energy. By adhering to Paris Proof targets and following the CRREM pathways, the Fund ensures a sustainable and resilient portfolio and its contribution to the global climate goals. The Fund uses the CRREM pathways as a benchmark for the 1.5 degrees Celsius global warming target for the Netherlands.

The net zero ambition of a.s.r. real estate includes the energy consumption of both the landlord and tenants in scope 1, 2 and 3 according to the GHG protocol³.

1 <https://unfccc.int/process-and-meetings/the-paris-agreement>

2 <https://www.un.org/en/climatechange/net-zero-coalition>

3 <https://ghgprotocol.org/>







3 Reducing energy consumption through asset-level action plans

Zooming in on the asset-level action plans, the Paris Proof roadmap and its related targets are based on archetypes that represent all residential property types in the portfolio. By categorising properties as archetypes, the Fund can tailor the carbon reduction strategy to the relevant building type. This ensures that the unique characteristics and requirements of each property are addressed effectively. Together with our data-driven approach, we draft a practical and efficient roadmap for all our properties to reduce carbon emissions and improve energy efficiency.

The archetypes used by the Fund were developed by our internal sustainability experts, in collaboration with a technical engineering firm, and were categorised as single-family houses and five different types of apartment buildings based on their heating system.

Each archetype has specific characteristics that influence the carbon reduction measures to be applied. For instance, single-family houses may focus on PV panels and installing individual all-electric heat pumps, while high-rise apartments may prioritise collective heating solutions. The six archetypes used by the Fund and their main characteristics are presented in figure 3.

Figure 3 Archetypes used in developing the Fund's Paris Proof roadmap

 <p>Single-family houses</p> <table> <tr> <td>No. of units</td> <td>1,544</td> </tr> <tr> <td>Construction year</td> <td>1973 - 2021</td> </tr> </table>	No. of units	1,544	Construction year	1973 - 2021	 <p>Apartments – district heating</p> <table> <tr> <td>No. of units</td> <td>782</td> </tr> <tr> <td>Construction year</td> <td>≥ 2008</td> </tr> </table>	No. of units	782	Construction year	≥ 2008
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 <p>Apartments – individual heating boiler</p> <table> <tr> <td>No. of units</td> <td>1,462</td> </tr> <tr> <td>Construction year</td> <td>≥ 2000</td> </tr> </table>	No. of units	1,462	Construction year	≥ 2000	 <p>Apartments – collective thermal energy storage</p> <table> <tr> <td>No. of units</td> <td>943</td> </tr> <tr> <td>Construction year</td> <td>≥ 2008</td> </tr> </table>	No. of units	943	Construction year	≥ 2008
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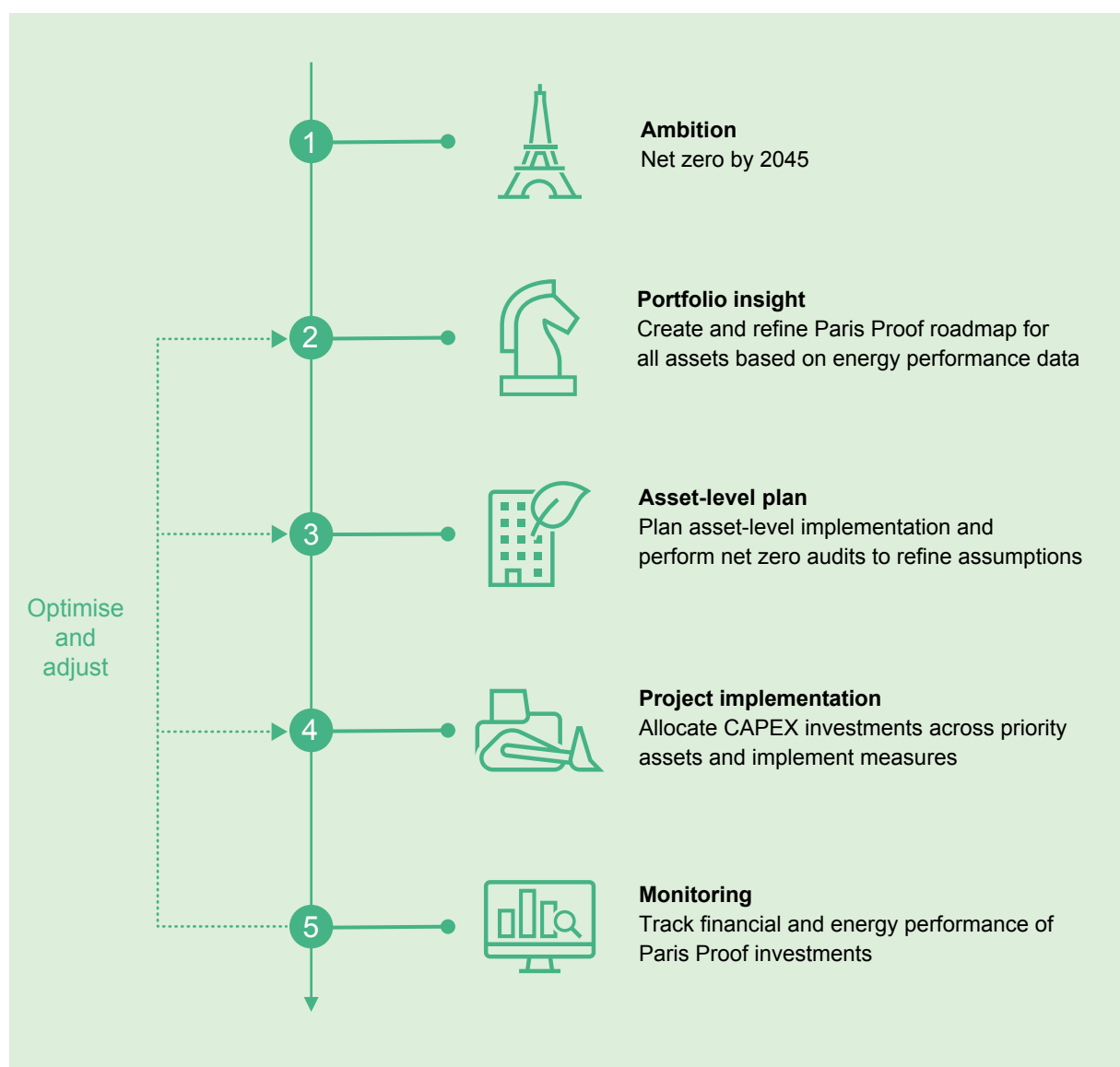
For each archetype the estimated (regular) CAPEX per unit as well as the estimated Paris Proof CAPEX at asset level and an estimated revaluation result are included. The archetypes are used to prioritise and set up initial feasibility studies.

These are subsequently transformed into property-specific business cases to develop tangible renovation plans at the building level. The financial and non-financial performance of business cases related to current and previously completed renovation projects are continuously monitored to gain insight in the investments, revenues and energy performance.

The Fund will continue to implement asset-level action plans and refine the Paris Proof roadmap with the lessons learned, resulting in a dynamic Paris Proof roadmap. By doing so, the Fund's Paris Proof roadmap is based on the latest financial and energy performance insights from actual renovation projects.

Figure 4 shows a schematic representation of our continuous process in implementing and improving asset-level action plans with the aim of reaching net zero by 2045.

Figure 4 Our approach to reaching net zero by 2045



Managing impacts, risks and opportunities related to climate change

a.s.r real estate is exempt from individual sustainability reporting by the Corporate Sustainability Reporting Directive (CSRD), but it is included in the CSRD sustainability statements of ASR Nederland N.V. on a consolidated basis. The ESRS standards and a.s.r. real estate’s contribution to the consolidated sustainability statement are used as a reporting framework for managing impacts, risks and opportunities related to climate change.

The Fund accepts its responsibility to invest in buildings that significantly reduce their impact on climate change, thereby contributing to the achievement of climate goals and ensuring long-term value for both investors and society. To achieve this, the Fund’s carbon reduction strategy is based on the actual and potential impacts, risks and opportunities related to climate change identified by the Fund and the potential adverse effects that climate change might have on the Fund.

Climate change presents both significant risks and opportunities for the Fund. The impacts of climate change, such as extreme weather events, heatwaves, droughts, and flooding, pose financial threats by potentially causing property damage, disrupting operations, increasing insurance and property costs, and decreasing property values. Regulatory changes, including carbon pricing and stricter obligations regarding energy performance and greenhouse gas emissions, can lead to increased operational costs and shifts in property demand, potentially rendering obsolete properties that do not meet future sustainability standards. However, these challenges also present opportunities. By investing in properties designed to meet Paris Proof sustainability standards and withstand climate risks, the Fund can ensure long-term value while reducing systemic climate risks. Additionally, the transition to a low-carbon economy allows the Fund to build a sustainable reputation, attract investors seeking sustainable investments, and comply with future regulatory requirements. The Fund’s proactive approach to climate adaptation, including the implementation of physical and non-physical adaptation solutions, further enhances the resilience of its portfolio.

An overview of the identified impacts, risks and opportunities are listed in the table below. Based on these insights, actions, metrics and targets are formulated to manage these impacts, risks and opportunities.

Figure 5 Impacts, risks and opportunities related to climate change

Positive impacts <ul style="list-style-type: none">• Energy efficiency improvements• Sustainable and biobased building materials• Renewable energy generation	Negative impacts <ul style="list-style-type: none">• Energy consumption of buildings• Embodied carbon
Opportunities <ul style="list-style-type: none">• Investment in resilient buildings• Sustainable building practices• Increased market demand	Financial risks <ul style="list-style-type: none">• Physical climate risks• Stranded assets• Reputational risks

4 Renovating dwellings to the Paris Proof standard

Until 2023, the ASR Dutch Core Residential Fund approached the sustainable renovation of dwellings in two steps: first renovating the shell of the dwelling (insulation) and then ten years later making technical adjustments (installation). With 2045 coming closer, it's time to speed up the process. In 2024, the Fund did a pilot with the sustainable renovation of a dwelling to the Paris Proof standard in just one step. The success of this pilot resulted in the renovation of all 69 dwellings in this neighbourhood – and all to the Paris Proof standard. This was the first time an institutional investor made rental dwellings built in the 1980s Paris Proof on this scale, and it serves as a blueprint for future sustainability projects.

Paris Proof pilot

In September 2024, the Paris Proof pilot house in Houten was completed. This dwelling was used to test measures to achieve the Paris Proof level of sustainability. Initial test results showed that the average CO₂ emissions of the dwellings in this neighbourhood, after implementing sustainability measures, were indeed below the Paris Proof target figures.

The dwelling used to have an average energy label D, and it has since been upgraded to an energy label A+++.

To achieve this, the dwelling was equipped with an all-electric heat pump, a heat recovery system, and PV panels. In addition, the dwelling was better insulated and fitted with new roof tiles, casement windows, doors, and glazing. For the tenant, this meant lower energy consumption and increased living comfort.

Building a business case

For more dwellings to be renovated to the Paris Proof standard, we required a feasible business case.

To provide insight into how such a business case can be built, the aforementioned project in Houten was used as an example.



This project consisted of 69 single-family houses located in the Northern part of Houten. The dwellings are within close proximity of amenities in a green and child-friendly environment. The promising rental potential of this asset, its location near Utrecht, and the affordability of these spacious single-family homes provided the impetus to further explore asset enhancement scenarios.

The following scenarios have been assessed:
Continued operation: 'As is'
Disposition: 'As is'
Paris Proof investments: 'Hybrid'
Paris Proof investments: 'All-electric'

Based on an in-depth analysis of the various scenarios, the Fund concluded that it preferred not to continue operations without sustainability measures or disposition (scenarios 1 & 2). As maintenance was necessary, this presented an opportune moment to incorporate sustainability measures. Hybrid sustainability measures (scenario 3) will need future adjustments to meet the CRREM energy and GHG intensity targets. The Fund's preferred solution is all-electric (scenario 4), which is in line with our ambition to achieve CRREM target figures when allocating funds for asset enhancement. Immediately making the step to the required CRREM target figures has the benefit of avoiding a second tenant participation process in

the future and many other operational, technical and financial inefficiencies during the asset's lifecycle.

- In order to build the business case, a financial analysis was conducted. The parameters used in this financial analysis can be divided into investment and revenues:
- The analysis began with the expected investment needed to realise the required level of sustainability.
 - The financial model then focused on the revenues, looking at operation and valuation.
 - The operations segment focused on rent (expected upside in contract and market rent after asset enhancement) and costs (expected savings on long-term maintenance planning).
 - For the valuation segment, the current appraisal value was compared to the expected appraisal value after asset enhancement (valuations are based on valuation reports from independent valuers).

- Next to the financial business case (on fund level), other parameters are assessed:
- Average energy cost savings (for tenants per month, therefore not part of the Fund's business case);
 - Energy label improvement;
 - Addition of PV panels and the expected level of on-site renewable energy generation.

The positive outcome of the financial analysis (a feasible business case) led to the tenant participation phase. The renovation work began after a successful tenant participation trajectory and the entire project (69 dwellings) was completed in April 2025.



5 Practical insights from our expert

‘To keep dwellings in our portfolio as investments, they must be sustainable and future-proof.’ Harm Tenback, technical asset manager sustainability at ASR Dutch Core Residential Fund, has made sustainability his mission. He speaks about the process of renovating dwellings to the Paris Proof standard and what this entails.

‘To keep dwellings in our portfolio as investments, they must be sustainable and future-proof. This requires making them more sustainable. Since its inception, the Fund has been renovating dwellings to be more sustainable and we have already improved over 1,300 dwellings. In 2020, the Fund dedicated itself to achieving a net zero portfolio by 2045. This is an ambitious goal, because it means dwellings have to reduce energy consumption and become CO₂ neutral.’

Continuous Dialogue

Various challenges arise when making dwellings more sustainable. ‘The first challenge is finding the balance between ambition and feasibility. We look for solutions that meet both our sustainability goals and the financial objectives. To renovate dwellings sustainably in a neighbourhood, we need the approval of at least 70% of the tenants. Another challenge is the lack of space in dwellings built in the 1990s and later.

These dwellings are smaller, relatively speaking, which means tenants must be willing to give up square metres of living space for pipes and installations such

as a heat pump and ventilation. Luckily, more and more people are willing to contribute to sustainability. Improving dwellings to the Paris Proof level of sustainability in one step requires a larger investment, and this investment needs to be profitable for our investors. This requires a continuous dialogue with valuers, who must value the property based on its expected future value.’

Positive About Sustainability

Tenants are increasingly positive about sustainability. ‘Tenants are increasingly more enthusiastic, although a financial incentive remains important. We try to ensure that the average rent increase equals the average energy savings. But sometimes, additional contributions are necessary.

We realise that we ask a lot from our tenants. Implementing sustainability measures requires major renovations in their homes. I make sure that we are mindful of the inconvenience caused by such large renovations. It is essential to have good communication and to minimise the inconvenience caused.’



6 Next steps

Following the successful completion of our first Paris Proof project, the Fund has developed a blueprint for similar future projects. By consistently raising the bar with each sustainable renovation initiative, the Fund has operationalised Paris Proof standards for single-family homes, which forms a cornerstone of our ESG strategy. This blueprint sets a minimum standard for future sustainable renovations and motivates us to keep up the good work.

Tailored solutions

Although we have developed a blueprint, tailored solutions remain the key to successfully renovating projects to the Paris Proof standard. Despite categorising single-family houses under one archetype¹, each asset (and therefore each renovation project) has unique characteristics. Projects vary in terms of type of dwellings, materials, insulation values, and installations.

For each renovation project, we seek an optimal package of measures that sufficiently reduces energy demand, enhances tenant comfort, ensures investment profitability, and balances required rent increases with achievable energy savings. For instance, the first project (Houten, Gilden) utilised radiators, while the second project (Houten, Velden) employed hot air heating. In both cases, new pipes were concealed within the existing structure, minimising the impact on living space. In the third project, due to space

constraints, pipes were installed via a lowered ceiling and coving, which was compensated for by adding an extra skylight in the attic to enhance usability. Each project involves consultation with tenants to optimise measures.

Prioritising projects

Next to a blueprint, having a timeline is essential to keep making progress. The Fund's Paris Proof roadmap makes assets with the highest energy demands a priority for earlier sustainability upgrades. As time passes, newer assets with lower current energy demands will also require upgrades to meet Paris Proof standards. Although these assets present less potential for energy savings, making it challenging to create profitable investment packages, the Fund will leverage its decade-long experience in sustainability measures to find solutions. We may partly omit adjustments to the building shell and focus on optimising the existing installations.



¹ With reference to figure 3

Seeking solutions for energy storage

But the road to Paris comes with more challenges, like uncertainties surrounding subsidies. To achieve Paris Proof standards, homes must be gas-free, with heating and hot water generated electrically. To avoid the reliance on external energy suppliers and ensure sustainable energy procurement, the Fund installs PV panels on all projects. These panels must generate sufficient electricity to cover heating, hot water, and ventilation needs.

Excess electricity can be returned to the energy supplier, with tenants receiving compensation, including government subsidies to promote PV panel adoption. If subsidies are discontinued, sustainable energy will still be generated, albeit less favourably for the tenant. We are actively engaging with market parties to explore solutions for energy storage, such as batteries or boilers, to maximise tenant usage.

Emerging technologies

Uncertainties along the road can also be a positive thing. Like emerging technologies that have yet to be

imagined, which could positively impact the progress, speed and feasibility of projects. That's why the Fund will continue to annually refine its Paris Proof roadmap with consumption data and evolving insights, from both lessons learned from completed projects and the latest technology or market insights.

Securing tenant approval

Having highly motivated and passionate professionals on board helps us to realise our ambitions and enthuse our tenants. As stated earlier, we currently need 70% tenant approval before we can start a renovation project. Thus far, the team has been very successful in gaining the required tenant approval. Hopefully, the ongoing governmental and legal discussion on lowering the required tenant approval will help to further speed up the process.

At this moment, tenant approval has already been secured for two upcoming Paris Proof renovation projects in 2025. The Fund anticipates that it will have approximately 180 dwellings renovated to the Paris Proof standard by the end of 2025.



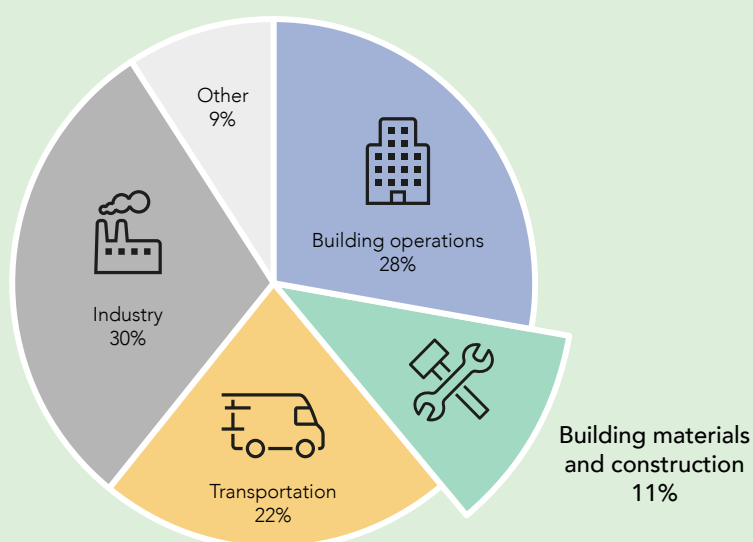
Embodied carbon

11% of the total GHG emissions in the Netherlands are embodied carbon emissions. Embodied carbon emissions are GHG emissions arising from the extraction, production, transportation and assembly of building materials. Sustainability upgrades involve replacing or adding materials, which contribute to CO₂ emissions from machinery, transport, and energy use. Beyond achieving operational Paris Proof standards, the Fund aims to minimise the CO₂ impact of the materials it adds or replaces.

In 2023, a.s.r. real estate conducted a study to identify and evaluate the existing standards for measuring and limiting embodied carbon. At present, the DGBC standard is the most suitable standard for real estate in the Netherlands. This standard uses the Global Warming Potential (GWP_a) indicator and sets target values for embodied carbon per asset type.

The Fund has integrated the GWP_a indicator in its programme of requirements for acquisitions and renovations. Our objective is to collect embodied carbon data and to challenge our partners to adopt an integrated approach that addresses both operational and embodied carbon emissions.

Figure 6 CO₂ emission per sector



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