



# POSITIVE ENERGY NEIGHBOURHOODS: Overcoming financial and market barriers

**October 2023**

Authors: Victoria Taranu, Jessica Glicker, Emily Bankert, Zsolt Toth (BPIE), Dominic Stephen, Thomas Gelauff (BAX & COMPANY)  
Reviewers: Mariangiola Fabbri, Scott Magalich (BPIE), Maarten De Groote (VITO), Annika Urbas (TREA), Kaspar Alev (TARTU)



This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No. 101037080.

## ■ Summary and key messages:

- Positive energy neighbourhoods (PENs) contribute meaningfully to a climate neutral building stock while offering multiple benefits for the community and society, such as improved comfort and public health, social inclusion, climate resilience and value retention. Additionally, PENs can help alleviate energy poverty and contribute to energy security.
- Current economic developments, such as inflation and higher borrowing costs, pose a threat to renovations in the EU and pioneer projects like PENs, making it harder to reach the goals set by the Renovation Wave.
- Pilot PEN projects rely heavily on public funding. Mainstreaming PENs will require more substantial contributions from private finance. The public sector should encourage and engage in dialogue with the construction and financial communities to improve collaboration and recognise the multiple benefits of PENs for homeowners, communities and society.
- A key barrier is that the construction and financial sectors are currently working in silos, using different methods to assess investment risk and sustainability performance. A common approach is needed for measuring, tracking and reporting projects' environmental, social and governance (ESG) impacts, at both the building and the neighbourhood level. Extending the EU sustainable finance taxonomy to include both environmental and social criteria could help fully capture ESG benefits and foster investment in PENs.
- Overall, more guidance and policy support are needed to lever access to public and private funding for PENs. Many terms related to PENs have not yet been universally defined, making it difficult to identify benchmarks, set KPIs and outline industry best practices.

**Positive energy neighbourhoods (PENs)** represent the pinnacle of energy transition in urban environments. PENs contribute to the decarbonisation of the building stock, while providing additional benefits for residents at both the building and the neighbourhood level, enhancing wellbeing and social cohesion. Besides deep renovation of individual buildings, PENs can provide a range of shared spaces, services and facilities, such as shared heat pumps, solar PV panels, electric vehicle charging stations, electric vehicles, bicycles, and common spaces with greenery, water and biodiversity. Neighbourhood approaches provide additional benefits to demand-side flexibility compared to single apartments or buildings through the aggregation of energy assets and stacking of revenue streams, generating greater energy savings and economic benefits for homeowners. **PENs go beyond simply combining individual positive energy buildings. By integrating buildings and neighbourhood infrastructure, they create a dynamic interacting with energy, mobility and industry.** This approach aligns seamlessly with the Renovation Wave's call for an integrated, participatory and neighbourhood-centred approach.

Renovations are a key requirement for successful decarbonisation of the European buildings sector.<sup>1</sup> As recognised in the Renovation Wave,<sup>2</sup> deep renovations currently only occur in 0.2% of the building stock per year. The advantages of neighbourhood approaches to renovations as compared to individual buildings are acknowledged in the 2023 Energy Performance of Buildings Directive (EPBD) recast proposal of the European Parliament.<sup>3</sup>

“Integrated **district or neighbourhood approaches** allow for overall renovation concepts for buildings that are spatially related such as housing blocks. Such approaches to renovations offer multiple solutions at a larger scale. Integrated renovation plans can adopt a more holistic approach, which addresses the broader community ecosystem, such as transport needs and appropriate sustainable energy sources, including on-site and nearby renewables or district heating and cooling. Such plans allow for increased **cost effectiveness** of the works required, enhance connections between modes of transport and take account of existing infrastructure for the purpose of system optimisation as well as the preservation of cultural heritage. Therefore, this Directive should promote the wider use of integrated, participative and district-related approaches, which allow for synergies and potential energy savings that would remain untapped if the focus were exclusively on individual buildings. Integrated renovation plans can also lead to **benefits such as improved air quality, a reduction in district emissions, and a large-scale alleviation of energy poverty.** Districts should be established by local authorities, in accordance with **local needs.**”

Art 35a, amendments adopted by the European Parliament on 14 March 2023 on the EPBD recast proposal version.

**Current economic trends pose a threat to the success of renovations in the EU and pioneer projects such as PENs, making it harder to reach the targets of the Renovation Wave.** According to Eurostat data, construction costs increased by 30% between 2016 and 2022.<sup>4</sup> In particular, high inflation and higher borrowing costs risk jeopardising renovation projects. Increases in the overall cost of living have impacted homeowners' ability to finance additional household works.

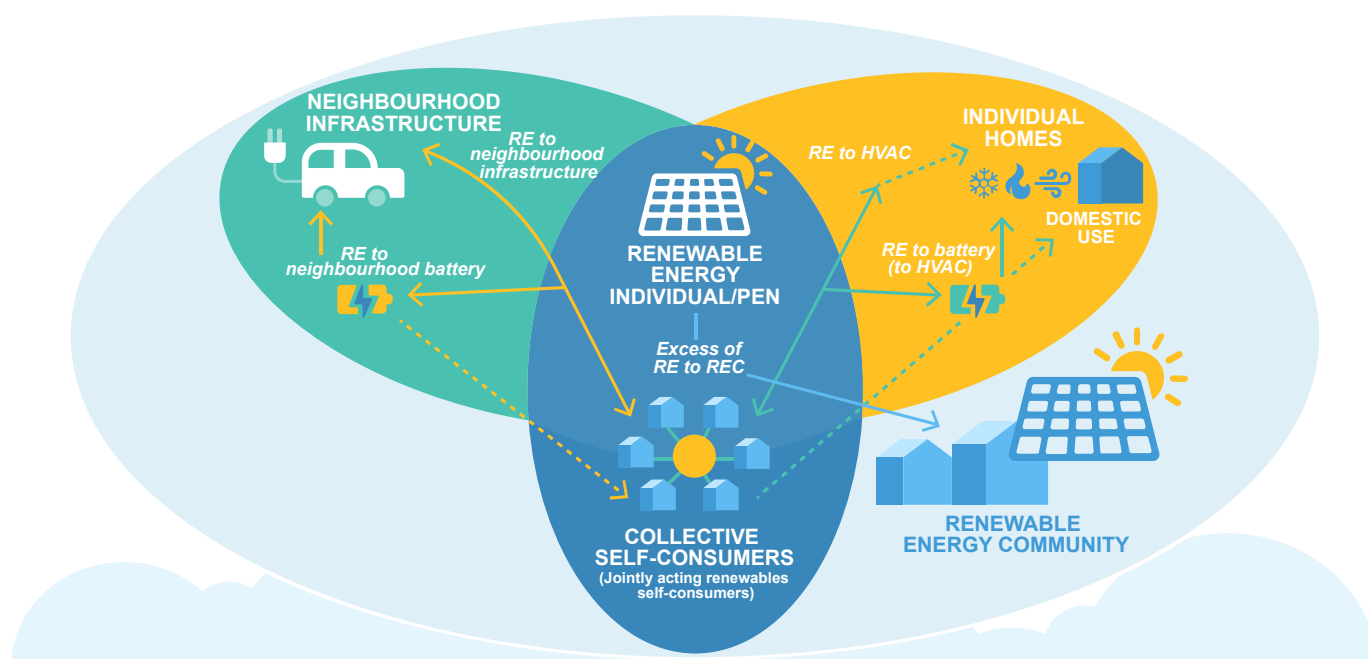
<sup>1</sup> [https://www.european-calculator.eu/wp-content/uploads/2020/04/EUCalc\\_PB\\_no3\\_Buildings.pdf](https://www.european-calculator.eu/wp-content/uploads/2020/04/EUCalc_PB_no3_Buildings.pdf)

<sup>2</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1603122220757&uri=CELEX:52020DC0662>

<sup>3</sup> [https://www.europarl.europa.eu/doceo/document/TA-9-2023-0068\\_EN.html](https://www.europarl.europa.eu/doceo/document/TA-9-2023-0068_EN.html)

<sup>4</sup> [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Construction\\_producer\\_price\\_and\\_construction\\_cost\\_indices\\_overview](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Construction_producer_price_and_construction_cost_indices_overview)

Pilot PEN projects rely heavily on public funding. **Scaling up PENs will require a more substantial contribution from private finance. The public sector should encourage and engage in dialogue with the construction and financial communities to improve collaboration and recognise the multiple benefits of PENs for homeowners, communities and society.** Identifying and assessing the multiple positive impacts of neighbourhood approaches will increase their **attractiveness to responsible investors and developers seeking to realise their fiduciary duty to understand and actively manage environmental, social and governance (ESG) and climate-related risks.** Policymakers and market actors should commit to tracking social and environmental impacts, exchanging best practices to build capacity, and promoting PENs as investments that maximise benefits in all ESG dimensions.



The collective production and self-consumption of energy within a PEN and the sharing the excess of energy within a renewable energy community.

## Financial and market impacts of the energy crisis on building renovations: the example of Tartu, oPEN Lab

The Russian invasion of Ukraine in early 2022 shook the European energy landscape and has caused a cascade of economic, financial, social and environmental repercussions. The urgency of the clean energy transition has gained traction, building on the Renovation Wave strategy from 2020<sup>5</sup> and the EU's continued intention to prioritise the building sector<sup>6</sup> to achieve climate neutrality by 2050. This objective is reflected in the recast of the Energy Efficiency Directive and the ongoing recast of the Energy Performance of Buildings Directive<sup>7</sup>. However, the construction sector is particularly affected by inflation, increased interest rates, price fluctuations, supply chain disruptions and financial market uncertainty.

<sup>5</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52020DC0662>

<sup>6</sup> <https://www.europarl.europa.eu/news/en/press-room/20230310IPR77228/meps-back-plans-for-a-climate-neutral-building-sector-by-2050>

<sup>7</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52021PC0802>

The Estonian Tartu oPEN Lab project is a prime example of how high inflation and interest rates have crippled renovation projects. Higher borrowing costs and inflation make it less attractive for property owners to take out loans to invest in renovations and put at risk the implementation of large-scale renovation projects such as PENs. OECD figures for the Eurozone show the highest inflation rates in the Baltic countries, with consumer prices for energy growing most rapidly in Latvia and for food in Lithuania and Estonia along with Slovakia (as of March 2023).<sup>8</sup>



## Tartu oPEN Lab demo project

**oPEN lab** is a 22 million project, funded by the EU's Horizon 2020 European Green Deal, to demonstrate PENs in three European cities. One of these is Tartu in south-east Estonia, 186km from the capital Tallinn. The Tartu municipality aims to demonstrate a PEN model interconnecting three high-rise apartment blocks with 288 dwellings, refurbished with novel industrialised workflows into a local multi-vector energy system with enhanced flexibility through large-scale storage. This PEN will be the first of its kind in Estonia and the Baltic region.

During the inception phase of the oPEN Lab project in early 2020, estimated renovation costs were 400-600/m<sup>2</sup>. In 2023, this estimate has increased to 750-1000/m<sup>2</sup>. At the same time, interest rates went from 2.2% (fixed bank rate to apartment associations) plus 0% (Euribor 6 months) in March 2022, to 2.2% plus 3.97% in July 2023. The rise of interest rates and the unpredictable evolution of renovation loan conditions reduced homeowners' willingness to invest in renovation. Dropouts were not only observed in oPEN Lab Tartu but also in partner cities such as Võru.

To support the building renovations planned under oPEN Lab, the Estonian government was able to supply 50% of project costs – and part of the public subsidies went towards the use of industrial prefabrication components in the project. Combined with oPEN Lab funding, this meant only 45% of the renovation costs would need to be covered by the apartment owners. However, the overall costs remain so high that the majority of owners originally signed up to the project have since withdrawn their interest or ability to participate. Estonia is among the European countries struggling the most with inflation, which reached a high of 24.8% in August 2022. This eased somewhat to 15.3% in March 2023, though food inflation remained at 24.7%. This has raised the cost of living for the average Estonian, which contributes to homeowners' reluctance to take private loans for renovations.

<sup>8</sup> <https://data.oecd.org/price/inflation-cpi.htm>

## ■ Levering access to private funding for positive energy neighbourhoods

**Pilot PEN projects such as oPEN Lab demos are important to test new technologies to realise a positive energy balance, as well as to foster social and organisational innovation.** The successful completion of pilot PEN projects in a community is a good way of creating investor trust and reducing the risk of future investments, which lowers the weighted average cost of capital for subsequent projects in that community. Often, municipalities promote PEN or renewable energy community projects, either in social housing or the private residential sector, as part of their strategy to decarbonise the building stock. Scaling up PEN in the private residential sector will require increased reliance on private finance.

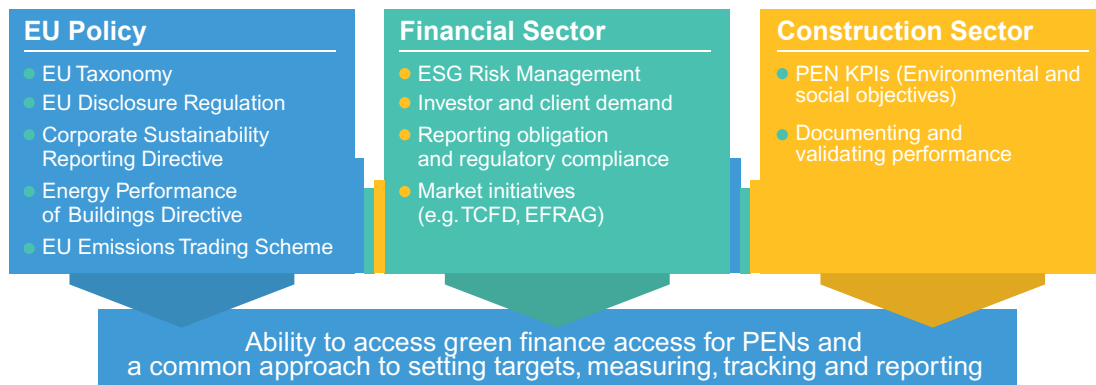
**Overall, more guidance and policy support are needed to lever access to public and private funding for large projects such as PENs. Many terms related to PENs have not yet been universally defined, making it difficult to identify benchmarks, set KPIs and outline industry best practices.** Standards of assessment and compliance are still missing, as is a definition of the most critical impact areas that could affect the project's long-term sustainability and success. There is currently no definition of materiality that would facilitate the incorporation of non-energy benefits in financial decision-making. There is little acknowledgement of the ESG aspects of PEN projects, due to limited knowledge of the concept in the financial sector, perceived high risks, and the technical and governance complexity of projects.

In private residential buildings, homeowners are expected to have to access individual loans to cover part of the investment cost. Developers must access commercial loans. Demonstrating clear ESG benefits of such projects could enable them to access loans at preferential rates. The total investment cost of a PEN, based on pilot projects, ranges from €9 million to €60 million, which may be too large for soft loans and too small for big investment funds. Due diligence to assess their risk and creditworthiness can be time-consuming and expensive for lenders (an estimated €100,000-200,000). Private stakeholders have different solvency credentials and can access loans with various conditions, but also have different interests and roles in PEN projects. This means stakeholder coordination and social and organisational innovation are key to unlocking private finance to successfully initiate and finalise projects.

### Challenges to accessing private financing

**A key barrier to accessing finance is that the construction, energy and financial sectors are currently working in silos, using different approaches to assess investment risk and sustainability performance.** Energy and renovation value chain integration is more of an exception than the norm. Clear and transparent measurement of impacts beyond energy savings and carbon emission reductions is necessary for PENs to attract responsible investors and ESG financing. In this sense, the first step is to make energy efficiency and associated benefits visible and measurable through consistent metrics that meet the needs of the financial sector. Energy performance certificates (EPCs), despite their inconsistencies, are the most readily available information tools at individual building level, but an energy performance assessment and monitoring scheme for neighbourhoods is still missing. Equally, EPCs focus mostly on energy performance aspects, while social and health indicators are outside of their scope for now. Standardised assessment frameworks, reporting templates and compliance checks at both the building and the neighbourhood level, used by both the construction and financial sectors, would be an important step towards demonstrating the sustainability benefits of PEN projects compared to business-as-usual.

## BREAK DOWN SILOS FOR ACCESS TO FINANCING



Investors and financial institutions can use the EU taxonomy for sustainable activities<sup>9</sup> to channel capital towards assets that meet its criteria to reduce risks and contribute to positive societal outcomes. Although the current EU taxonomy doesn't overtly cover neighbourhood developments, linkages can be made between the taxonomy's climate objectives and the related environmental and social benefits. **Wider benefits of PENs are currently outside the scope of the taxonomy screening criteria.** Extending the taxonomy to include both environmental and social criteria is therefore essential to fully capture ESG benefits and foster investment in PENs. Some PEN aspects, such as **participatory processes, climate change mitigation and contributions to the circular economy, are well aligned with ESG frameworks and the EU taxonomy requirements, making PENs a prime example of sustainable and ethical real estate projects and investment classes.** In addition, prioritising the renovation of existing buildings over new developments in ESG frameworks and in the EU taxonomy would recognise the environmental and social benefits of retrofitting (e.g. resource efficiency, social equity, preservation of cultural heritage), and could lead to increased financing options for renovations.

Investments in shared assets specific to PENs, while costly, can generate significant additional cash flows by selling aggregated excess energy and flexibility services to the market. However, **regulatory and market barriers currently limit the ability of PENs and energy communities to sell flexibility services to the market.** Cleanwatts in Portugal for example stated that: "Battery revenue from flexibility markets is not yet permitted by regulation in Portugal". This potentially costs energy communities hundreds of thousands of euros in annual income, undermining their business case to secure financing to scale up further. Until regulation is developed that enables clean technologies like battery storage to fully deliver their potential value, PENs and renewable energy communities will remain largely dependent on public grants and subsidies for financing, limiting their ability to generate local economic, environmental, and social impacts.

*"Until they can reach economies-of-scale, a subsidy-free business case for local energy systems relies on near-perfect technical conditions. While the recent energy crisis has improved the business case for local energy development, it's the upfront costs that are often the key challenge for energy communities."*

**(Scene Connect, UK)**

<sup>9</sup> [https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities\\_en](https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities_en)

## Stacking finance

Following the approach of conventional finance, PENs should generally seek to stack multiple sources of public and private financing to diversify finance risks and loan conditions. A wide range of financing instruments, both innovative and established, is available, as shown in table 1.

Non-repayable public funding	Debt financing instruments	Equity financing
<ul style="list-style-type: none"> <li>• Grants, subsidies, EU Funds</li> <li>• Tax-related financing instruments</li> <li>• Energy efficiency obligations</li> <li>• Energy efficiency feed-in tariffs</li> <li>• One-stop-shops</li> </ul>	<ul style="list-style-type: none"> <li>• Soft loans, leasing</li> <li>• Commercial loans</li> <li>• Energy performance contracting</li> <li>• Revolving funds</li> <li>• Energy service agreements</li> <li>• Funds based on achieved energy savings</li> <li>• Crowdfunding*</li> <li>• Energy efficient mortgages*</li> <li>• Property assessment clean energy*</li> <li>• On-bill finance*</li> </ul>	<ul style="list-style-type: none"> <li>• Energy performance contracting</li> <li>• Energy service agreements</li> <li>• Crowdfunding*</li> </ul>

\*More innovative financing instruments

**Table 1** Financing options for renovation projects at both individual building and neighbourhood levels, based on Bertoldi et al., 2020;<sup>10</sup> Papapostolou et al., 2023<sup>11</sup>

Typically, commercial banks provide the bulk of project financing for renovation and renewable energy projects and often require upwards of 20-30% in equity from the project owner before financing through an interest-bearing loan. This debt finance then usually represents around 50-70% of the total project cost. PENs could fill the remaining 10-20% gap in finance through a combination of community shares (crowdfunding), public grants and subsidies, or subordinated debt.

The Amsterdam Cooperative 'De Warren' financed its highly energy-efficient affordable housing project by securing €300,000 in community shares before applying for a loan of €8 million at a 3% interest rate from the German ethical bank GLS. The remaining costs were covered by provincial and municipal loans at higher interest, with government subsidies to fill the finance gap.

<sup>10</sup> Bertoldi, P., Economidou, M., Palermo, V., Boza-Kiss, B. and Todeschi, V. (2020). How to finance energy renovation of residential buildings: Review of current and emerging financing instruments in the EU. *Wiley Interdisciplinary Reviews: Energy and Environment*, 10(1). <https://doi.org/10.1002/wene.384>

<sup>11</sup> Papapostolou, A., Touloumis, K. and Kapsalis, P. (2023). Report on Building Renovation Financing Typologies. [www.energate-project.eu](http://www.energate-project.eu)



## ■ Financing through servitisation

**Servitisation** – where companies sell the services their products provide – is becoming an increasingly popular way to increase the uptake of smart and efficient clean energy solutions. This service model reduces entry barriers for building owners or communities by transferring the upfront investment burden to the service provider, who may have better access to credit. By reframing traditionally high-CAPEX projects to an ongoing energy-as-a-service model, servitisation allows more communities to participate in the energy transition, removing the initial cash burden and providing a better risk profile. A commitment to high-quality energy services is written into an energy performance contract between the service provider and the user, guaranteeing cost savings and technical performance for the user, income for the provider, and a reliable loan repayment for the bank. Banks also increasingly prefer this approach: “Banks do not like to own assets and are increasingly moving towards a service model. Banks would not sign a contract with end customers but rather with solution providers” (BASE).

Servitisation also offers users the possibility of accessing energy benefits without having the energy asset (and debt) on their balance sheet, protecting their credit and enabling them to access favourable finance elsewhere. This approach reduces the high initial investment costs of a PEN by covering investments in particular technologies and services such as PV installations, energy storage, smart systems and energy optimisation software. Several types of service models are used in the sector, often taking the form of either an operational lease (similar to renting of equipment) or a financial lease (treated as a loan with an ownership transfer at the end of the lease period). These have distinct economic, ownership, legal and fiscal conditions. A limitation of servitisation is that PENs require very high investment costs, while energy service company (ESCO) models are usually designed for more specific technologies such as PV or storage, with lower investment costs.

While servitisation can be one promising avenue towards mobilising private investment in PENs, **selling excess energy and flexibility services to the market provides only a limited input to a cost-benefit analysis, which does not capture the multiple benefits of PENs.** Most banks simply require a demonstration of the project’s debt-equity ratio, and debt-service coverage ratio, which demonstrates the financial health of the project by assessing the relationship between free cash flow and income used to pay off debt. Such an approach does not provide a comprehensive assessment of the overall risk exposure of their investments. Looking beyond short-term financial stability by considering transitional risks and societal benefits is essential for financial institutions to make more informed and responsible investment decisions. Assessing the long-term sustainability of a project not only helps manage risks, but also to seize opportunities of value preservation or creation, meet regulatory requirements, and align with stakeholder expectations in an increasingly complex and interconnected financial landscape.

Among the **multiple benefits for homeowners** are security against energy price fluctuations, increased property value, comfort and health benefits, as well as a sense of community through asset sharing. **Multiple benefits for society** include reduced investment in energy grid upgrades since the renewable energy is produced and consumed locally, less expenditure on public health due to improved indoor environmental quality and reduced greenhouse gas emissions.

*“Energy generation is the easy part. Today’s more complex investments now require more knowledge. Is the energy transition fair? That’s the hard part.”*

**Triodos Bank N.V.**

Addressing climate change urgently requires the public sector, building and financial sector value chains to unite around a common methodology, as fragmented approaches hinder progress and create inconsistencies. Such a collaboration not only accelerates progress but also ensures fairness among different players and contributes to the societal benefit of transforming the existing stock to prevent asset stranding and stagnation in real estate markets, ultimately addressing urban development challenges and reshaping our cities.

**Public authorities, the construction sector and the finance sector must cooperate and align to jointly find solutions for emerging sustainable finance and to unlock opportunities to scale up investment in viable PEN business models that generate inclusive and sustainable benefits for all stakeholders. As a matter of priority, policymakers, built environment and private sector finance stakeholders should collectively define a clear ESG policy framework connecting PENs and sustainable finance, including common metrics and measurable objectives, target values, processes and data evidence, followed by supporting tools and guidelines. Neighbourhood approaches have a unique opportunity to integrate wider environmental and social objectives that are well aligned with all three ESG dimensions and sustainable finance taxonomy requirements.**



**oPEN Lab** is a project funded under the European Union’s Horizon 2020 Research and Innovation Programme under grant agreement No. 101037080. Under the coordination of **VITO**, 32 partners from 7 countries are collaborating to revitalise urban areas across Europe to lead the transition to Positive Energy Neighbourhoods. Over the duration of 4.5 years, oPEN Lab will focus on identifying and demonstrating replicable, commercially viable solution packages enabling to achieve positive energy buildings and neighbourhoods. Activities will take place in the three oPEN Living Labs: Pamplona, Tartu, and Genk.

## oPEN Lab Partners



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