AmsTErdam BiLbao cItizen drivEn smaRt cities

Deliverable 3.4: Highlights and results Track 3: New Financing Instruments

WP3, Task 3.3

Date of document

24/12/2024

Deliverable Version:	D3.4, V1.0
Dissemination Level:	Public
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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.864374

List of beneficiaries

No	Name	Short name	Country
1	GEMEENTE AMSTERDAM	AMST	Netherlands
2	AYUNTAMIENTO DE BILBAO	City of Bilbao	Spain
3	FUNDACION TECNALIA RESEARCH & INNOVATION	Tecnalia	Spain
4	NEDERLANDSE ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK TNO	TNO	Netherlands
5	FUNDACION CARTIF	CARTIF	Spain
6	STICHTING WAAG SOCIETY	Waag Society	Netherlands
7	STICHTING HOGESCHOOL VAN AMSTERDAM	AUAS	Netherlands
8	PAUL SCHERRER INSTITUT	PSI	Switzerland
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26	DNV NETHERLANDS B.V.	DNV	Netherlands
27	GROENE ENERGIE ADMINISTRATIE BV	Greenchoice	Netherlands
28	ZABALA INNOVATION CONSULTING. S.A.	ZABALA	Spain
29	FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V.	Fraunhofer	Germany

Document history

Project Acronym	ATELIER	
Project Title	AmsTErdam and BiLbao cItizen drivEn smaRt cities	
Project Coordinator	Atelier.eu@amsterdam.nl City of Amsterdam	
Project Duration	01/11/2019 – 30/04/2026 (72 Months)	
Deliverable No.	D3.4 Highlights and results Track 3: New Financing Instruments	
Diss. Level	Public (PU)	
Deliverable Lead	TNO	
Status		Working
		Verified by other WPs
	x	Final version
Due date	31/12/2024	
Submission date	24/01/2025	
Work Package	WP3 PED Innovation Atelier	
Work Package Lead	TNO	
Contributing beneficiary(ies)	AMST, City of Bilbao, Tecnalia, CARTIF, Waag Society, AUAS, PSI, SEZ, UDEUSTO, CEPV , IBE, TELUR, EVE, Spectral, Republica, AMS Institute, WATNL	
DoA	Subtask 3.2.3 Innovation track 3: New Financial Instruments. Innovation track 3 customizes new business models and financial schemes to support the implementation of smart urban solutions. The track organizes at least 4 workshops with the innovation ecosystem during the four years of its existence.	

Date	Version	Author	Comment
14/12/24	0.1	Jurgen van der Heijden, Shanita Rambharos (TNO)	Full draft of deliverable, ready for review
24/12/24	0.2	Omar Shafqat (AUAS)	Review
22/01/25	1.0	Jurgen van der Heijden, Shanita Rambharos (TNO)	Final deliverable, ready for submission

Disclaimer

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Abbreviations and Acronyms

Acronym	Description
PED	Positive Energy District
RES	Renewable Energy Resources
ICT	Information Communication and Technology
WP	Work Package
LH	Lighthouse
ESCO	Energy Service Company
LHC	Light house city
FC	Fellow city
CCC	Climate City ContractEPS
EPC	Energy Performance Contract
SPV	Special Purpose Vehicle
PV	Photo Voltaic
EV	Electric Vehicle
EIB	European Investment Bank
EBRD	European Bank for Reconstruction and Development
ESG	Environmental, Social en Governance
ABS	Asset-Backed Security
MBS	Mortgage-Backed Security
ECSP	European Crowdfunding Service Providers
CAPEX	Capital Expenditures
OPEX	Operating Expenditures
WCW	Wet collectieve warmte (Collective Heat Supply Act)
ICCCPR	International Covenant on Civil and Political Rights
ECHR	European Convention on Human Rights
EMD	Electricity Market Design
EED	Energy Efficiency Directive
RED	Renewable Energy Directive
NECP	National Energy and Climate Plans
NPE	National Program for the Energy system
PPA	Power Purchase Agreement
MoU	Memorandum of Understanding
P2P	Peer to peer
KPI	Key Performance Indicator
RLI	Dutch Council for the Living Environment
WMO	Social Support Act

0. Executive Summary

The role of the active user has gained a fixed place in the energy sector. The European Union emphasized this with Directives that have led to legislation in the member states since 2020: Internal Electricity Market Directive (EU) 2019/944, IEMD; Renewable Energy Directive (EU) 2018/2001, RED II. The active energy user is now an indispensable part of government policies, laws, and investment strategies. One of the primary reasons for this shift is technology; for example, solar panels represent investments accessible to individual active users. These users take on roles traditionally held by companies and governments, thus transforming the energy sector. While the sector is governed by both market forces and government, it now includes a new player that behaves differently than market parties and governmental agencies.

The emergence of the active user and their community is reshaping the energy sector, which in turn affects its economics, law, policy, governance, and finance. Decentralization of production is one of the major consequences, thus making the Positive Energy District (PED) important. The main thesis here is that decentralization makes the energy sector multi-carrier-sector-vector-benefit: at the level of a PED a range of renewable carriers are produced, converted, stored, shared and traded with both economical and social benefits. This multiplicity of benefits demands blended finance and therefore methodologies and instruments to provide blended finance to PEDS.

Deusto, Civiesco and TNO produced results that are usable for active users within PEDs. All results were presented to active users and debated in an iteration of workshops meant to learn from these users and experts. Partners from Bilbao and Amsterdam, the lighthouse cities, and from fellow cities were involved in the workshops. These workshops, as well as parts of this report, are dedicated to implementation. The overall objective of this report is to further the PED as a place where active users can actually realize their ambition to amplify clean energy transition. The focus is on finance since money is pivotal for both the PED and the active user.

1. Introduction

ATELIER focuses on developing and implementing Positive Energy Districts (PEDs) as a contribution to achieve a carbon neutral transition in European cities. Conceptually PEDs correspond to an urban area or group of connected buildings designed to produce more energy than it consumes on an annual basis. This energy surplus is mostly generated by combining a maximization of energy efficiency, local generation from renewable energy sources (RES) and use of energy flexibility to match supply and demand adequately. In the Atelier project two demonstrators (Amsterdam and Bilbao) of PEDs have been designed, implemented and tested. Six fellow cities (Bratislava, Budapest, Copenhagen, Krakow, Matosinhos and Riga) have studied the replication potential of the PEDs.

To support a successful development and implementation of the positive energy districts, the Atelier project developed the framework of the Innovation Atelier. The Innovation Atelier support the deployment of PEDs by enabling an innovative collaboration process with the local innovation ecosystem to foster co-creation of new solutions and building up the capacity to learn and innovate across the city and with other cities. Throughout the project the Innovation Ateliers had an eminent role to play in the innovation and knowledge creation for tailoring local implementation of smart (energy) solutions in the cities' PED development.

Design of the innovation ateliers

Depending on the cities local ecosystem, partners representing the quadruple helix have been identified and agreed to participate in the activities of the cities' PED Innovation Ateliers. The required innovation and knowledge creation is to a great extent being organized in four "Innovation tracks", each track delivering specific domain expertise and know-how to the innovation ecosystem gathered in the PED Innovation Ateliers. The PED Innovation Atelier in Amsterdam and Bilbao have appointed a local track coordinator as a first point of contact within their network, supporting the identification of specific knowledge needs, questions, opportunities or threats within the domain of that Innovation Track. Bringing these requests further, assessing of what is needed, selecting a team of partner organisations, and preparing the programme for a dedicated knowledge session or workshop is coordinated by the local innovation Track lead. International collaboration and alignment of activities within the scope of each Innovation Tracks is coordinated by an ATELIER partner.

In the preparation of the ATELIER project proposal, the four topics of Innovation Tracks had been pre-determined, based on the critical added value of these domains for realizing the PED ambitions in cities. The co-creation of innovations extends, thus, beyond the technical domain and is integrated with innovations of institutions, financial instruments, data and policy. The 4 Innovation tracks holding the co-creation of innovations for supporting the PEDs, reflect the following domains:

Innovation Track #1 > Integrated Smart Energy Systems and Electro-mobility

This track addresses innovations regarding the design and optimization of dedicated measures for reaching energy efficiency goals that are 'beyond existing codes' for buildings, implementation of positive energy systems, deployment of E-mobility solutions and integrated operations and management.

Innovation Track #2 > Governance, Integrated Planning and Law

In track 2 questions related to governance, integrated planning and law are explored.

Innovation Track #3 > New Financial Instruments

Track 3 explores how innovative business models can support different innovations and the concept of PED as a whole. The track also looks into different innovative financing structures.

Innovation Track #4 > Data, Privacy and Data Platforms

Data use and data platforms activities aim to allow collection of local user-data, apply queries and ICT applications for smart energy management, balancing local supply & demand; and ultimately enable automated demand response programs to further increase energy efficiency and impact of PEDs.

In each of the Innovation tracks various methods and instruments have been developed and demonstrated in the cities Innovation Ateliers to identify and discuss specific smart (energy) solutions, by developing and reviewing new institutional arrangements, new forms of cooperation and governance, new business models, new financing schemes and funding opportunities that support the technical solutions.[1]

Coordination of knowledge sessions, workshops and deep dives to answer the specific knowledge needs or questions, has been delt with in accordance with the core team of the LH Innovation Ateliers. Drafting the final programme for a knowledge sessions or deep-dive included also defining the target audience, invites for external practitioners, experts in the field or specialists for contributions or presenting a key element of know-how in the quest. All sessions have been documented for recording the lessons learned, and value for other cities or PED projects to learn from.

1.1. Purpose and Target Group

The objective of this report is to provide an overview of the sessions organised under track 3 on how innovative business models can support different innovations and the concept of PED as a whole. Focus of this Report is the particular methods of research and co-creation being applied in the context of Innovation Track 3 on New Financial Instruments in the Lighthouse cities Amsterdam and Bilbao, and further being discussed in cross city learning programmes during a number of Fellow City events. The report holds a number of lessons learned and recommendations for further deployment of the findings.

The outcomes and reflections from these sessions are aimed to benefit a wide range of stakeholders, extending beyond the immediate partners and participants of the Amsterdam and Bilbao Innovation Ateliers. The target groups include cities planning PED projects, those implementing smart urban solutions, and municipalities preparing to establish their own local Innovation Ateliers. Through cross-city events and strategic sharing of learnings, the project ensures that its insights reach a broader network of urban stakeholders, particularly those engaged in EU initiatives like Scalable Cities. This approach enables knowledge transfer and

[1] EC, ATELIER project Deliverable 3.1: The PED Innovation Atelier Organisation Document, 2020.

provides valuable perspectives to cities seeking to advance their urban innovation strategies, thereby maximizing the impact and replicability of the projects' findings.

1.2. Contributions of Partners

The following 1 depicts the main contributions from project partners in the development of this deliverable.

Partner short name	Contributions
Deusto	Overall content in sections 3.1 and 4.1
Civiesco	Overall content in sections 3.2 and 4.2
TNO	Overall content in sections 3.3 and 4.3

Table 1. Contributions of Partners

Contributions Deusto:

- Workshop, December 10, 2020
- Workshop, July 6, 2021
- Workshop, November 25, 2022
- Workshop, September 28, 2023

Contribution Civiesco

- Technical report, December 31, 2023

Contributions TNO:

- Workshop with fellow cities, March 14, 2023, Bratislava
- Two workshops with fellow cities, June 15, 2023, Riga
- Workshop with Skanske PED-Riga, June 16, 2023, Riga
- Workshop with fellow cities, April 17, Krakow
- Workshop with Amsterdam partners, December 21, 2024
    - Preparatory workshops
        - October 14, 2024, Rotterdam
        - November 6, 2024, Utrecht
        - November 18, 2024, Hilversum

2. Objectives and Expected Impact

2.1. Objectives

The primary objective of this innovation track is to develop and investigate effective business models for smart urban solutions, with a focus on enhancing the finance-ability of implemented actions and engaging citizens in green investment. To achieve this, the project will demonstrate new business models featuring innovative revenue streams, value capture methods, and financing mechanisms. These models will be applied to district heating/cooling networks, comparing a concession approach in Bilbao with an open-source thermal network in Amsterdam, and to grid flexibility, contrasting demand response agreements between DSOs and users with a virtual power plant managed by an energy cooperative. Additionally, the track aims to create dedicated business models to sustain PED Innovation Ateliers beyond the project's lifetime. By profiling executive business models for energy prosumer communities, the initiative seeks to stimulate citizen engagement and green investment. All knowledge generated on these business models and innovative financial constructs will be packaged for widespread dissemination and replication, fostering sustainable urban development and energy transitions.

2.2. Expected Impact

This initiative aims to accelerate the implementation of smart urban solutions in PED projects, foster the co-development of innovative financial instruments with stakeholders, and define optimal business models that consider the value creation ecosystem. By collaborating with local authorities and financial institutions, the project will support suitable financial schemes, ultimately facilitating the effective and sustainable uptake of new businesses and driving a successful urban transition.

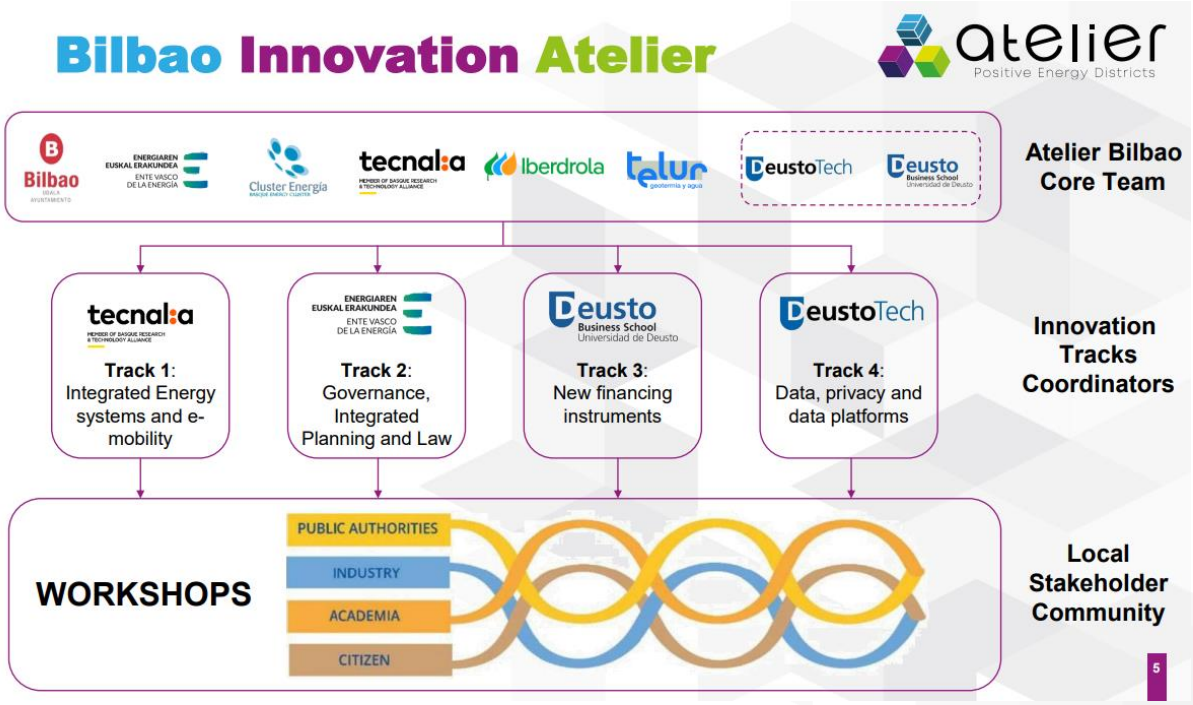
3. Overall Approach

3.1. Bilbao

3.1.1 Context description: Planning and participants

Context

In Bilbao the Innovation Atelier meetings were organized by the Basque Energy Cluster, a cluster of stakeholders from the area that work on energy. The Cluster has more than 200 members including industry, energy suppliers, grid operators, local government and knowledge institutes. The local coordinator of Track 3 is Deusto**.** They are in charge of developing projects in line with local governmental goals and objectives. Together with the core team (see image below) they set the agenda for the workshops.



Schematic picture of the Bilbao Innovation Atelier

Participants

During the project, the Bilbao Innovation Atelier organised 4 workshops on new financing instruments. Except for the last one, all sessions were organized online. The session varied in sizes from 14 to 26 participants. As the cluster plays a central role in facilitating and organising the meetings, in addition to the project partners, other members of the cluster were often invited to whom the topic could potentially be of interest.

Planning

The workshops took place between November 2022 and October 2023.

Activity	Goal	When
Financing energy savings: experiences and alternatives	Dissemination of research results, input for next steps	December 10th, 2020
Experiences and good practices of public-private collaboration for the financing of energy efficiency	idem	July 6, 2021
Good practices in financing energy savings	idem	November 25, 2022
Experiences and good practices for financing energy savings. Public-private collaboration.	idem	September 9, 2023

Table 2: Planning of Bilbao Workshops

3.1.2 Outcome of the Innovation Ateliers, Deusto

3.1.2.1 Workshop Financing energy savings: experiences and alternatives

Date: December 10th, 2020
Online
Time 9:30. 12.30
Participants: 25

Structure and main contents

On December 10th, a workshop organized within the framework of Innovation Atelier Bilbao, the participatory instrument defined by the Bilbao City Council in collaboration with other partners of the ATELIER project, took place to contribute to the transformation of Zorrotzaurre into a Positive Energy District through an open innovation process.

The workshop, led by Deusto Business School, featured an outstanding panel of representatives from the Basque Government, Greenward, Stratenergy, Triodos Bank, Smart Solar-Iberdrola, GoiEner: EVE, and the participation of ATELIER partners. The workshop was attended and participated by a total of 25 people.

The 7 panelists addressed the issue of financing energy saving and CO2 emission reduction projects from their respective organizations.

In the first part, after a brief presentation of the Bilbao ATELIER project by Amagoya Madariaga of the Bilbao City Council, each speaker focused their presentation on the description of

existing tools and solutions to finance energy savings and the reduction of CO2 emissions and put forward examples of the types of projects and profiles of clients served in the projects carried out by their organizations.

The second part, with a more dynamic format, consisted of an open discussion in which the panelists responded to the questions and comments made by the attendees.

3.1.2.2 Experiences and good practices of public-private collaboration for the financing of energy efficiency (Rehabilitation of residential buildings in Zorrozaurre)

Date: July 6, 2021
Online
Time: 10:00-12:00
Participants: 15

Summary of the meeting

Structure and main contents

On July 6th, a workshop organized within the framework of Bilbao Innovation Atelier, the participatory instrument defined by the Bilbao City Council in collaboration with other partners of the ATELIER project, took place to contribute to the transformation of Zorrotzaurre into a Positive Energy District through an open innovation process.

Chaired by Jon González from Bilbao City Council and Laura Baselga from Deusto Business School has covered the objective of transmitting in-depth knowledge of the specific case of efficient, sustainable and comprehensive rehabilitation developed in the Zorrotzaurre neighborhood. The workshop was attended by a total of 15 people in which the 3 panelists shared their knowledge, experience and best practices in the rehabilitation project.

In the first part, after a brief presentation of the Bilbao ATELIER project by Jon González from Bilbao City Council, the Area Councilor, Nora Abete, shared the work philosophy applied during the 10-year transformation of the degraded area and afterwards, each speaker focused his presentation on key aspects and methodology applied to address the quantitative and qualitative challenges developed in the rehabilitation project of 42 centuries-old homes.

The second part of the workshop was more interactive, giving the word to attending partners of the consortium and offering them the opportunity to make comments and resolve their doubts by asking SURBISA their queries.

3.1.2.3 Good practices in financing energy savings

Date: November 25, 2022
Online
Time: 9:00-11.00
Participants: 26

Structure and main contents

On November 25th, a workshop organized within the framework of Innovation Atelier Bilbao, the participatory instrument defined by the Bilbao City Council in collaboration with other partners of the ATELIER project, took place to contribute to the transformation of Zorrotzaurre into a Positive Energy District through an open innovation process.

The workshop, led by Laura Baselga from Deusto Business School, featured an outstanding panel of representatives from the **GNE Finance** : Borja Gamuzio; **Deutsche Bank:** José Antonio Aguilera; **Giroa-Veolia**: Mikel Yarza**;** y **BIDEBI:** Pedro Rodríguez. The workshop was attended and participated by a total of 25 people

The 4 panelists addressed the issue of financing energy savings from their respective organizations.

In the first part, after a brief presentation of the Bilbao ATELIER project by Jon González of the Bilbao City Council, each speaker focused his presentation on the description of existing tools and solutions to finance energy savings and provided examples of the types of projects and the profiles of clients served. After each of the presentations, a turn for questions was opened and each speaker answered, providing relevant information for the attendees.

3.1.2.4 Experiences and good practices for financing energy savings. Public-private collaboration. The role of ESCOs, one-stop shops and private initiative in energy savings

Date: September 9, 2023
Online
Time: 10:00-12.30
Participants: 14

On September 28th, a workshop was held as part of the Innovation Atelier Bilbao, a collaborative initiative established by the Bilbao City Council in conjunction with fellow partners of the ATELIER project. This event aimed to contribute to the transformation of Zorrotzaurre into a Positive Energy District through an inclusive open innovation process.

Participants and stakeholders

The workshop, organized by professors Laura Baselga and Kristina Zabala from Deusto Business School, featured an outstanding panel of representatives from Fundación Europace (Jordi Ayats), Txari Vallejo (VVMM de Bilbao), Tomás Humada (Iberdrola) and Aznar Sánchez (Mugabi).

The workshop was attended and participated by a total of 14 people belonging to the different partners of the Bilbao Atelier Project.

Approach and methodologies

The 4 panelists addressed the issue of financing energy savings from their respective organizations. In the first part, after a brief presentation of the Bilbao ATELIER project by Jon González of the Bilbao City Council, each speaker focused their presentation on the description of existing tools and solutions to finance energy savings and provided examples of the types of projects and the profiles of clients served. Drawing from tangible experiences, each speaker addressed key questions:

- What are the pivotal takeaways from the developed energy-saving models?
- What role do public institutions play in this context?
- How does the one-stop shop model enhance an efficient energy savings plan?
- Which elements should be emphasized or avoided in promoting energy efficiency?
- What contribution do private companies make in this domain?
- How does an ESCO engage in an energy-saving project?

After each of the presentations, a turn for questions was opened and each speaker answered, providing relevant information for the attendees.
The workshop was held face-to-face at Deusto Business School facilities in Bilbao Campus.

3.2. Civiesco

Summary of deliverables and milestones

WP	No.	Title deliverable	Owner	Type	Dissem. level	Subm. date	Due month
3	D3.4 (D20)	WP3 – D3.4 – D20 – 31st Dec 2023 Highlights and results Track 3: New financing instruments Reporting of main results and highlights of the PED Innovation Ateliers in Amsterdam and Bilbao, dedicated to the Innovation track 3 – New Financial instruments. Describing the results and impact of the Innovation Atelier in the implementation of the Smart Financing (ie. business models) solutions in the Lighthouse cities.	CIV	Report	Public	31st Dec 2023	M50

Table 3: Civiesco deliverables and milestones

Summary of key exploitable results

Civi will enable ATELIER with a portfolio of a number of innovative financial results based on the co-design activities done with the cities, both LHCs and FCs, which can be exploited by the consortium, and shared with the board of coordinators and the sister projects.

3.3. Amsterdam

3.3.1 Context, planning, participants

Context

Local partners are: City of Amsterdam, REPUBLICA, Amsterdam University of Applied Sciences, Edwin Oostmeijer Projectontwikkeling, Waternet, Amsterdam Institute for Advanced Metropolitan Solutions (AMS), Spectral, DNV-GL, TNO, GreenChoice, Fraunhofer ITWM, Waag Technology & SocietyINKS.

Throughout the project, the Amsterdam Innovation Atelier organized nine meetings focused on new financial instruments to support the implementation of smart urban solutions in the Buiksloterham developments. This topic encompass a wide range of issues. Most workshops had a problem-solving orientation, aimed at addressing specific challenges that arose during the project. Topics were selected accordingly.

At the beginning of the project, the emphasis was primarily on business challenges in Buiksloterham and other comparable places to learn from. Looking at the development of clean energy projects their basis is delivering energy against a price. Many financial instruments are designed accordingly. However, in a PED the business case differs. For instance, solar panels are not only there to produce electricity for the open market, but also to deliver to house or car batteries, a heat grid, or to neighbours. Thus they create more value than money only. Moreover, in a PED these solar panels probably are part of an integrated energy grid with production, storage, aggregation and sharing of electricity and heat. This is the right habitat to profit in various ways from solar panels and other devices. This profit consists of multiple benefits and not only the price of a single product on the market.

Multiple benefits ask for a different business model, and ask for blended finance. As the project evolved, the focus shifted from business models to finance, and especially blended finance. This led to discussions on ways to organise this finance. To organise this the investment platform appears to be important. Also this platform can be the basis for a fund directed at financing multiple benefit business cases. Throughout the project all participants where open to the shift from single purpose to multipurpose business cases, since as practitioners they acknowledged that their work concerns these kind of business cases.

Planning

The workshops took place between March 2023 and November 2024.

Activity	Goal	When
Workshop on Financing and business models for energy communities	Dissemination of knowledge, next step in finding out the connection between the multiple benefit business case and blended finance.	March 14th, 2023
Workshop on the Investment Platform as a Bridge between Business Case and Finance	idem	June 15th, 2023
Workshop on How to Finance the Value Case of the PED	idem	June 15th, 2023
Workshop on How to Finance the Value Case of the PED	idem	June 16th, 2023
Workshop on Financing Multifunctionality	idem	April 17th, 2024
Workshop Financing two or more investments at the same time	idem	Nov 21th, 2024

Table 4: Planning of Amsterdam Workshops

Participants

All workshops had two goals: 1) Dissemination of knowledge to the attendants, and 2) getting feedback from the attendants, since all were representatives of organizations working on

PEDS: municipalities, representatives of other governmental agencies, energy companies, inhabitants, local SME's, knowledge institutes. In all workshops attendants came from the lighthouse and fellow cities. Thus the core team of the Amsterdam Innovation Atelier also participated in these discussions.[2] With this kind of attendants each workshop was a next step in finding out the connection between the multiple benefit business case and blended finance.

3.3.2 Outcome of the Innovation Ateliers

3.3.2.1 Workshop on Financing and business models for energy communities

Date: March 14th, 2023
Bratislava
Time 14.00 - 15.00
Participants: 24 (representatives of fellow cities)

Summary of the meeting

The example of investing in a portfolio of preservation of six schools in the Amsterdam-PED-area was used to learn about the relation between business models and financial instruments. Purpose thereof was to gain knowledge about new financing instruments for PEDs, and about connected issues of governance.

3.3.2.2 Workshop on the Investment Platform as a Bridge between Business Case and Finance

Date: June 15th, 2023
Riga
Time 09.40 - 10.40
Participants: 25 (representatives of fellow cities)

Summary of the meeting

Setting up an investment platform can help public, private and civic parties to mobilize and structure money for their PED. The platform can provide in a continuous feedback loop allowing the partners to learn from each other and make use of expertise that is available throughout the partnership.

3.3.2.3 Workshop on How to Finance the Value Case of the PED

Date: June 15th, 2023
Riga
Time 11.30 - 12.30

[2] The Amsterdam core team consist of Municipality of Amsterdam, TNO, Spectral, AMS and Waag

Participants: 22 (representatives of fellow cities)

Summary of the meeting

Integration means that an investor in e.g. greenery gives the investor in energy certainty that he will invest in such a way that it will cool down buildings. Integration means that an investor in e.g. solar panels gives the investor in mobility certainty that he will invest in such a way that electric vehicles can be charged with solar panels. With that certainty investments can be decoupled, but integrated, so that both investors and their financiers can keep risks low.

3.3.2.4 Workshop on How to Finance the Value Case of the PED

Date: June 16th, 2023
Riga
Time 08.30 - 12.30
Participants: 30 (representatives of Skanske PED)

Summary of the meeting

Repetition of presentation of June 15th, but with another audience, people working, living and investing in the Skanske-PED, and their advisors. This workshop contributed to the same results as the June 15 workshop.

3.3.2.5 Workshop on Financing Multifunctionality

Date: April 17th, 2024
Krakow
Time 13.15 - 14.45
Participants: 26 (representatives of fellow cities)

Summary of the meeting

Thesis is that a heat grid is so much more and for that reason doesn't have a shortfall of money. However, is does have a financial problem. This problem is not so big in so far that there is a host of current financial instruments that can help out. This problem is big in so far that public and private parties must be willing to adjust to the reality of multifunctionality of projects.

3.3.2.6 Workshop Financing two or more investments at the same time

Date: November 21th, 2024
Amsterdam
Time 11.00 - 12.30, and 13.30 – 15.00
Participants: 16 (2x8) (representatives of Amsterdam partnership)

We got the chance to practice this workshop on October 14 in Rotterdam (12 participants from local civic enterprise), November 6 in Utrecht, (15 participants from national association of mediators in spatial development) and November 18 in Hilversum (20 participants from energy sector).

Summary of the meeting

A methodology to work with the results of our study of new financial instruments consists of an instrument to account for the costs and benefits of the business case of a multifunctional project, and a business model canvas. These workshops serve to see if both the costs and benefit analysis and the canvas work, and to improve these. With an eye to this a game was developed and tested on November 6, 18 and played on November 21. See Section 3.4.8 for a description of this game.

4. Results

4.1. Deusto

4.1.1 Workshop Financing energy savings: experiences and alternatives

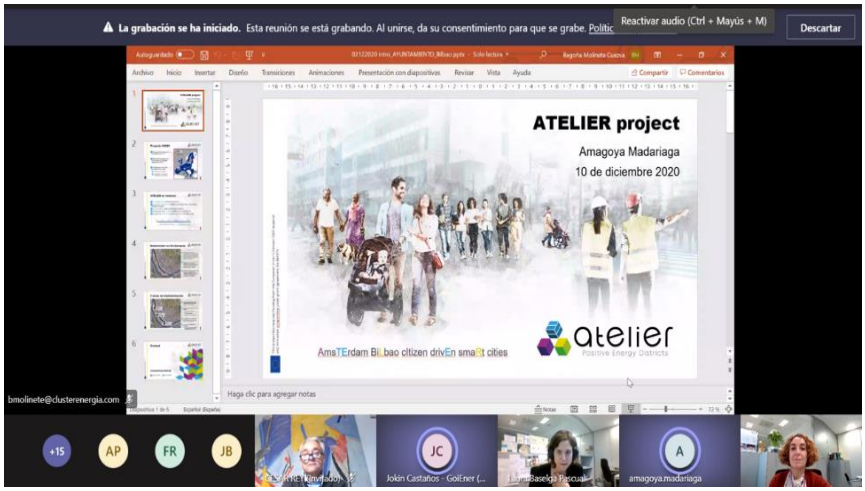
Main conclusions of the workshop

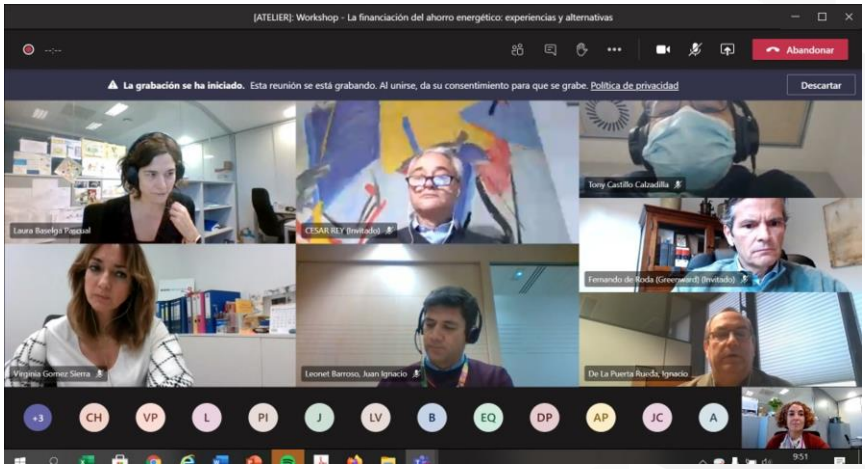
1- One of the panelists pointed to the decarbonisation challenge set for 2050, which involves an intervention in nearly 1,100,000 homes in the Basque Country. Financing is key issue and is part of the solution and must be 1) Easy to access 2) Affordable and 3) Fair and 4) Should generate trust. He shares the "Opengela" experience that focuses on the intervention in the most vulnerable neighborhoods.
2- Financing is an important barrier, especially in the most vulnerable neighborhoods. It is important to simplify the information, make it easy to communicate. An example of a good practice is shared related with the "Opengela" project and the neighborhood offices.
3- It is important to talk about energy savings, but it is also important to talk about improving the quality of life of citizens and the right to have a decent home in terms of light, energy, heating, etc.
4- Public-private collaboration is essential in building rehabilitation projects. The public part should offer guarantees to the private sector (i.e. clear rules and regulations). As an example, it should be possible to extend the repayment terms of loans for financing energy savings (15-25 years) to make it affordable for the most vulnerable people.
5- But it is important to look for a realistic solution. There are no public resources to subsidize 70-80% of the rehabilitation projects. It would be necessary to refine the recipients of the aid, who are those who really need it. The challenge would be for public funding to cover people who are not eligible by the private sector.
6- There are financial entities with sustainable business models that have sustainability and social objectives. Example Triodos and Greenward.
7- It is important to raise the sensitivity towards the need for energy saving. Raise collective awareness towards the importance of energy saving.
8- The role of ESCOs as dynamizers of the energy transition process. Example of good practice of public-private collaboration in TxominEnea in Donostia presented by Stratenergy.
9- New financing formulas through PPAs services (Smart Solar-Iberdrola case), energy cooperatives for self-generation and self-consumption projects (Goierner case).
10- The existing subsidies are aimed at: urban building sector (housing, services, administration), efficient transport and mobility, self-consumption, biomass, geothermal energy, thermal envelope, etc.
11- Incentives, in addition to subsidies, take the form of tax deductions (electric vehicles, biomass boilers, high-performance heat pumps, geothermal use).

As a general conclusion, and as a balance, the workshop allowed 1) to share financing tools and alternatives and some good practices 2) to disseminate new forms of financing 3) to identify existing financing tools and their characteristics 4) to determine the profile of the

financed agents and possible profiles that have not been covered up to now 5) identify synergies, collaboration opportunities and joint action initiatives.

To close the workshop, Laura Baselga, from Deusto Business School, intervened to thank the panelists and attendees for their participation and their work in their respective projects, hoping to hold a second workshop to continue deepening the financing of energy saving projects.





4.1.2 Experiences and good practices of public-private collaboration for the financing of energy efficiency (Rehabilitation of residential buildings in Zorrozaurre)

Main conclusions of the workshop

1- The suitability of public-private collaboration is highlighted for future projects in the light of the successful experience of the rehabilitation project presented in the workshop.

2- The issue of approaching the neighborhood from the beginning is addressed as a key tool for overcoming the difficulties involved in carrying out an urban transformation of these characteristics, focusing the development of the project from a perspective of social cohesion always aligned to technical component. Successfully developed solutions are exposed:

   a. Neighborhood is taken into consideration from the initial stage (2001-2004), endowing it with an active role, attending to its desire to remain, consolidating the existing stock of centennial homes, undergoing rehabilitation in the later phase under criteria of energy efficiency and accessibility in coexistence with the future blocks that will house around 5,000 new homes.

   b. In 2001, a Management Commission was formed, made up of the majority owners mobilized by the Neighborhood Association, the City Council, the Port and companies that owned land.

   c. Subsequently, a neighborhood information office is located in the neighborhood itself. The Technical Architect attends weekly office to answer questions and queries.

   d. Four financial sources are enabled: the Management Commission which contributes 50% of the total expenses (evaluated at € 4,500,000); neighborhood group contributes 48% (€ 58,000 of average investment per home receiving direct aid of up to € 30,000); the City Council and the Basque Government.

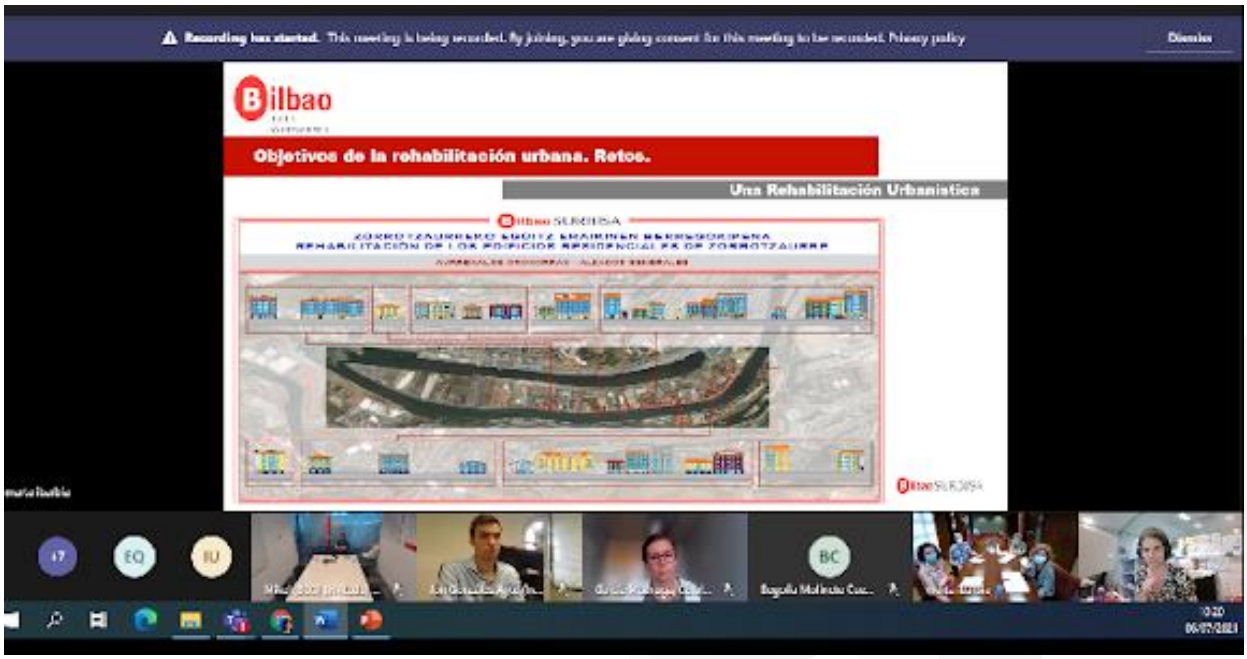
   e. A special deposit is provided by Kutxabank to manage spills and subsidies as support through joint accounts.

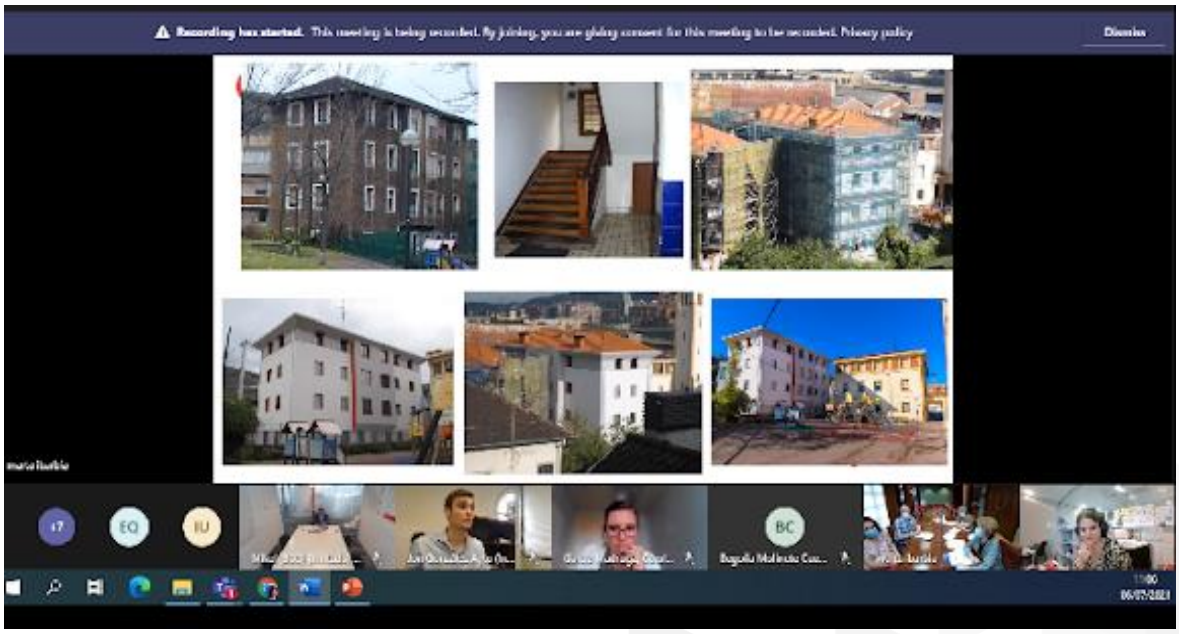
   f. Microcredits are enabled from the social area as an innovative financing experience.

   g. A specific regulation is developed.

As a general conclusion, the challenge and difficulty of considering the link between history and future in relation to the concept of urban regeneration is highlighted, assuming the uniqueness of each building. To close the workshop, Laura Baselga, from Deusto Business School and Jon González from Bilbao City Council, thank the panelists and attendees for their participation.

Pictures of the workshop.





4.1.3 Good practices in financing energy savings

Main conclusions of the workshop

1. The workshop offered the participants a social vision of the cases of the rehabilitation of the most vulnerable neighborhoods in which rehabilitation actions are a priority. The role of public-private collaboration in housing rehabilitation in areas or neighborhoods where vulnerable people live (by age, income, housing characteristics, etc.) is highlighted. The Opengela case (GNE Finance), the Agree Project (BIDEBI) and the rehabilitation of a neighborhood near the Madrid airport (Deustch Finance) are examples of this type of action.

2. The importance of the role of communities of owners as a decision-making unit in the rehabilitation of old buildings and in the financing of the related rehabilitation works is highlighted (Deustche Bank). The importance of convincing communities of owners with weighty arguments and simple financing schemes is highlighted.

3. At a technical level, the ability to quantify the difference between the current cost of heating and domestic hot water and the future cost that is projected once the rehabilitation of the home is carried out is relevant, with the aim of facilitating the process of "evangelization" of the benefits of rehabilitation for all owners (Giroa-Veolia).

4. The importance of professionalizing the process and generating trust. The importance of transparency in the information provided to residents, both on the characteristics of the project and the cost of the work (BIDEBI), is highlighted.

5. The important role of one-stop shops as a comprehensive information point for people who must undertake rehabilitation projects (GNE Finance and BIDEBI).

As a general conclusion, the workshop made it possible to 1) share financing tools and alternatives and some good practices 2) disseminate new forms of financing 3) identify existing financing tools and success stories in their application.

To close the workshop, Laura Baselga, from Deusto Business School, intervened to thank the panelists and attendees for their participation and work in their respective projects.

4.1.4 Experiences and good practices for financing energy savings. Public-private collaboration. The role of ESCOs, one-stop shops and private initiative in energy savings”

Results

The workshop provided participants with the opportunity to:

1) Gain firsthand insights into the primary lessons learned from home rehabilitation for enhanced energy efficiency.
2) Engage in a constructive dialogue about the principal challenges associated with rehabilitating homes to improve their energy efficiency.
3) Identify key factors conducive to the success of such rehabilitation projects.

Success factors and lessons learned

Noteworthy among them are:
1- The imperative of public-private collaboration to achieve decarbonization goals. The diverse profiles of the workshop speakers, encompassing private sector representatives from Iberdrola, Mugabi and Fundación Europace, along with the public sector (VV.MM. of Bilbao), exemplify the necessity for collaborative efforts in attaining our decarbonization objectives.

2- The critical role of trust in home rehabilitation projects. Instilling confidence in residents is pivotal to the triumph of these initiatives. It is emphasized that trust-focused rehabilitation

efforts, especially in areas inhabited by vulnerable populations (determined by factors such as age, income, and housing conditions), yield commendable results. The case of Otxarkoaga (VVMM de Bilbao) serves as an illustrative example of this approach.

3- The significance of providing a centralized service to streamline decision-making for residents embarking on rehabilitation projects. Mugabi exemplifies innovative new business models within the private sector, offering a centralized service distinguished by its value proposition of simplifying the process and encouraging neighbors to undertake rehabilitation projects.

4.2. Civiesco Technical Report

Civi was involved in the task 3.2 – Establishing 4 innovation tracks in the PED Innovation Ateliers and leads the Innovation Track no.3 together with the Work Package leader TNO and with the other ITs leaders with the objective to establish in each of the cities PED Innovation Ateliers, connecting the specific knowledge needs of the PED Demonstrator projects with the available expertise and knowledge in the Innovation Atelier partnership.

	Bonds and large Loans	ABS - Asset-Backed Security	EPC	Revolving Fund	The equity Corowdfund
City Level (City Climate Contract)					
PED or district level (Replicable or scalable)					
Building level					
Packaged Solutions (for example District Heating, Public e-Mobility, etc)					
Measure/innovation level					

Table 5: Overview of Financial Instruments

As such, it has been created an iteration draft representing a matrix of the potential schemes to be investigated based on the scale of the interventions, starting from the broader CCC up to the single intervention. Based on the feedback and on the iterations with the cities, it has been established a bullet points list of potential items of interest, to be further investigated and populated in the forthcoming months:

- Business Models and Funding Schemes suitable for pure refurbishments of buildings and group of buildings
- Benchmark for long terms of returns and stretched discounted pay-back time
- Blending schemes to pipeline funding mechanisms for Public Private partneships, example of EPC and SPV

- Blend the use of public funds, grant with new investment schemes compliant with new EU legislation;
- Business models and funding schemes for renewable energy community coupling PV and EV, Energy communities using crowdfunding
- Library of possible Packaged solutions, as an example charging points for Ev and bikes

Finally, the Innovation Track n.3 has assessed a portfolio of possible and applicable funding schemes based on the features of the interventions and on the current trends in the market. Basically, it is possible to settle for five financing categories:

Equity: includes all those financing methods that involve exchanges of shares

Debt: includes all those financing methods in which a debtor and a creditor are present

Third party financing: includes all those financing methods in which a third party is involved, for example an Energy Service Company or a rental company

Calls, competitions and non-performing loans: includes all those financing methods in which non-performing loans are granted or not (usually public funds)

Other types: includes all other categories that have not been previously identified

The bonds and the large loans

Green bonds To finance environmental or climate projects investing in renewable energy, energy efficiency, pollution prevention and control, biodiversity, clean transportation, sustainable water management, climate change adaptation, eco-efficient products, production technologies and processes.

Sustainability bonds To finance a combination of green and social projects (certain green projects with social co-benefits or certain social projects having environmental co-benefits).

Sustainability-linked bonds The financial or structural characteristics (the coupon rate) can fluctuate depending on the achievement of predefined sustainability targets by the issuer.

Green loans To finance exclusively green projects addressing key areas of environmental concern, such as climate change, natural resources depletion, loss of biodiversity, and air, water and soil pollution.

Sustainability-linked loans Instrument paid by the borrower, where the interest rate is dynamic and linked to some selected sustainability performance indicators, such as carbon emissions or an ESG target.

Social bonds To finance social projects, including projects aiming at creating food security and sustainable food systems, at sustaining vulnerable groups in the aftermath of a natural disaster, or at alleviating unemployment stemming from a socio-economic crisis

It is fundamental to know how a green/whatever bond could be used, which are the main features for issuing a bond, the dimension, the role of the originator, the issuer, the role of the second opinion.

The Asset Backed Security

The Asset-Backed Security is an investment security collateralized by a pool of assets, (loans, leases, credit card debt, royalties, or receivables). ABS is like an **MBS mortgage-backed security**, except that the underlying securities are not mortgage-based.

For investors, asset-backed securities can be an alternative to corporate debt. ABS is financing schemes, issued against securitization operations, like the normal bonds. The procedure for creating an ABS - securitization - is the act by which a company separates a series of receivables from its balance sheet, "packages" them appropriately and sells them on the market, together with the cash flows they generate, through the SPV with the aim of generating liquidity.

The Energy Performance Contract

The Energy Performance Contract is a form of 'creative financing' for capital improvement which allows funding energy upgrades from cost reductions. Under an EPC arrangement an external organization (ESCO) implements a project to deliver energy efficiency, or a renewable energy project, and uses the stream of income from the cost savings, or the renewable energy produced, to repay the costs of the project, including the costs of the investment.

Essentially the ESCO will not receive its payment unless the project delivers energy savings as expected.

The revolving Fund

The revolving fund is an investment scheme able to leverage an amount of money to trigger additional investments. For example**, a city has 10 million** but it needs 180 million to follow-up investments. According to market, the 10 million fund should be matched with at least 170 million € of equity at market conditions (the typical ratio equity/loan is 20/80).

This means that the financial leverage should be activated, by increasing the costs of the equity repayment and it frustrates the non-cyclical nature of the investments. Settling a dedicated Revolving Fund scheme, by funding interventions in equity and shifting to a mix of equity grants and loans. The added value of the scheme will allow the revolving equity to be repaid sooner and activate the loop of the iterative process.

A city, or its Special Purpose Vehicle, will establish several cut off dates, the pre amortizing period, the size of the loan maximum eligible per each project and the bindings for the repayment (in which percentage, in which annual rate and in how many years). This will bring **the 10 million fund to be committed several times** for several projects and will work as a leverage. How much the 10 million could achieve is a matter

of selling the above listed operational variables. The scheme incorporates and fine-tunes some features of what is currently in use by:

- EIB – the structure of the intermediated loans for SMEs and mid-caps

- CINEA – the mechanism related to the CEF Transport blending and reflow – 20% funding gap rule for works implementation

- Some crowdlending platforms – the principles of convertible loans.

Thanks to the Revolving scheme, the equity obtained by a city will be the first to be repaid according to the Economic and Financial Plan. It will be establishing a pre amortizing period, giving the investment project a liquidity buffer, waiting for the development of the revenue stream and the cash in-flow. It will be possible to establish the fist tranches of the return from debt through the discounting of future revenues. The investment project can also be securitized and the assets part will become the junior part.

The Equity crowdfunding

Over the past years, and especially during the pandemic period, the public sector finance has been stressed without possibility to Fund and Finance any “low income or long-term returns project”. The equity crowdfunding has the potential to offer a new model of finance via an investment-based business model that generates social, environmental and economic returns.

On November 2020, The EC issued the new Regulation on European Crowdfunding Service Providers (ECSP) for business, creating uniform rules across the EU for the provision of investment-based and lending-based crowdfunding services related to business financing. If we look at the positive energy districts, those based on crowdfunding schemes show several features: citizens invest in their own social dimensioned district, even with a focus on renewable energy sources and low pollutant activities; new financially viable business cases generating green local jobs; new use of abandoned and brown field public and private spaces.

A benchmark on crowdfunding instruments reveals that the equity crowdfunding would be a new tool of civic engagement with local residents and service users. The average size of several crowdfunding campaign (the possible cap that a PED could profile for district demonstration) is around 350k € for each district.

The commitment is generally from the Institutional public investors/authorities for the 45% and to the private investors for the 55% equally split between Institutional Private Investors and small-retail-crowded investors.

4.3. TNO: Economy, Law, Policy, Governance, and Finance for PED's

4.3.1 Introduction

A user utilizes the incoming energy for lighting, heating, cooling, powering devices, industrial processes, or for transporting people or goods. An active user, in addition, plays a role in energy supply: production, transport, storage, delivery, and distribution. Production involves the development and operation of locations for energy generation, such as converting sunlight into electricity via solar panels, or wind into electricity via wind turbines.

In investment strategies, government policy, and laws, the active user is now indispensable. Probably the most important reason for this is technology; solar panels, wind turbines, and even district heating systems are investments that are within the reach of the active user themselves or their collectives, such as the energy cooperative. There are other explanations, such as the economic benefits of renewable energy and sharing it with others, the enjoyment and social cohesion that come from doing it together with others, and, of course, the desire to be sustainable.

The active user takes work off the hands of companies and governments, thus changing the energy sector. It is driven by the market and government, but now a new player is emerging who behaves differently. Sometimes the active user acts as a market player, sometimes as a citizen, and sometimes differently, for example, by sharing energy or not aiming to make a profit. Also different is the use of energy supply for entirely new purposes, such as climate adaptation, social cohesion, or combating energy poverty.

To best describe the change within the energy sector, the word "community" is helpful, a word that has been embraced within this sector. This inspires many, even outside the energy sector. It is slowly developing into a central element in thinking about how things must change as society moves away from fossil fuel resources and other unsustainable habits. Other words that have been embraced in the sector are the Positive Energy District (PED) and the energy valley, respectively a neighborhood and a region wherein which inhabitants and companies find each other as active users and cooperate.

This text begins with the facts of energy supply now that generation is increasingly taking place in the immediate vicinity of the user, such as in a PED or energy valley. Besides this decentralization, projects like offshore wind farms and new nuclear power plants maintain the central nature of production. Therefore, the economy, law, policy, governance, and finance do not reverse but must find the right balance between central and decentralized energy supply. With that in mind, they can then be addressed separately. Finally, implementation is discussed: how to act, based on the given ideas about the economy, law, policy, governance, and finance?

4.3.2 The Balance Between Centralized and Decentralized Energy Supply

In industrialized countries, energy has for a long time primarily come from oil, natural gas, and coal. These fossil energy sources are increasingly being replaced by renewable energy sources, such as solar, wind, biomass, biogas, hydrogen, hydropower, aquathermal energy, geothermal energy, and nuclear power. In case of both the dominant, fossil supply, and the emerging, renewable supply there are several carriers, but in the case of renewable sources, the variety of carriers is greater, making it more multi-carrier.

There are more differences between the dominant and emerging energy supplies, including the fact that the dominant supply is highly centralized, while the emerging one is more decentralized. This is the latter, because the use of sustainable energy carriers can often be done on location, even on the roof of your own home with solar panels, or with heat in the soil under that home. At the same time, there is also sustainable production at central locations, for example with wind at sea, production of hydrogen gas at sea, or nuclear energy. The difference is that transport no longer only goes from large power stations to decentralised locations where energy is used, but also between decentralised locations where energy is used and produced.

Wind energy and hydrogen production, and even nuclear energy with a small plant, can also be close to the user. The difference is that transport and delivery no longer only go from large power plants to decentralized locations where energy is used, but also between decentralized locations where energy is used and produced, for instance a PED. The emerging energy supply has multiple directions; it is multi-vector, and this goes even further.

The dominant energy supply consists of at least three sectors: oil, natural gas, and coal. Within each of these are the sectors of production, transport, storage, delivery, and distribution. This multi-sectoral nature is stronger within the emerging energy supply because it works with more energy carriers. However, not only is the variety greater, but also the coordination between the different sectors. For example, in a low-temperature heating network, coordination takes place in supplying this network with heat stored in water, waste heat, electricity, and sometimes more, such as gas.

Another example of coordination is the supply from a wind turbine to a heating network that converts the electricity into heat and stores it. This works best when it is very windy because the market price of electricity then drops and supplying it to a heating network can be more profitable than selling it on the open market. An alternative at that moment is to charge batteries or turn on equipment that does not always need to run. Production, storage, and use are balanced effectively, which can help prevent congestion during transport. Coordination takes place between more than just energy carriers, but also between sectors such as production and transport, and between production and use.

The active user has a role that goes beyond just production, also taking on a role by acquiring storage and helping to ensure balanced distribution, which allows transport to operate with less congestion. The emerging energy supply is more multi-sector than the dominant supply, and more coordination takes place between the sectors. This makes the emerging energy

supply even more multi-vector, not just in terms of transport between decentralized locations, but also between production and storage, and storage and transport.

Good coordination of the use of, for example, a wind turbine makes that its electricity is used or stored at the best possible moments. This can reduce the total need for wind turbines and that is beneficial for space usage. Coordination not only affects the sectors within the energy supply itself but also sectors outside it, such as spatial planning. A completely different example is the effect of an energy cooperative on social cohesion in a neighborhood, where active users come together to do much more, such as installing green roofs and setting up a system for electric car sharing.

The energy sector influences, among other things, the spatial planning sector and the social sector, but this influence is also reciprocal. Good spatial planning can take energy into account in new developments, and strong social cohesion helps collectives of active users grow faster, into an energy cooperative, for example. The multi-sectoral nature of energy supply is both internal and external, within and outside the energy sector itself. Multi-vector means internal and external coordination. In this coordination, the community plays a crucial role; it emerges through coordination and vice versa.

When so many sectors are coordinated with so many vectors both within and outside the energy sector, it stands to reason that some sectors will work closely together, perhaps even integrate. A highly technical example is solar panels that immediately produce hydrogen gas. This is an example of integration between sectors within the energy sector, and another example is the contract of a large wind farm with its users. It states that the users will adjust their behavior to the times when it is or is not windy. The wind farm guarantees a lower price for this and thus secures its guarantee of payment of that price, even when it is very windy and the price would otherwise be negative.

An example of integration outside the energy sector is the collaboration between an electrolyser and a water treatment plant. The electrolyser produces hydrogen and three by-products: heat, pure water, and oxygen. These latter three are useful in the water purification process. Another technical example is using a car's battery to make a house energy-neutral; at the same time, panels on the roof of that house are used to charge this battery.

Integration can create added value that is more than the sum of its parts. For example, the electrolyser and water treatment plant are freed from transport problems of heat, pure water, and oxygen, and the homeowners have a very cheap energy source for their car battery and do not need to purchase a separate battery for their house. Such extra benefits from integration come in addition to the various benefits already created within and between the different sectors. The energy sector is multi-benefit. Altogether, it is multi-carrier-sector-vector-benefit. This occurs more at decentralized than at centralized locations, but the latter do not disappear. All of this is significant for the economy, law, policy, governance, and finance of locations like the PED.

4.3.3 Economy

Increasing Scale and Broadening Scope

In the traditional energy supply model, revenues primarily come from the production, transportation, storage, delivery, and distribution of a single energy carrier, such as oil. In contrast, the emerging energy supply model utilizes a multiple revenue approach: the use of a single resource, such as a heat network, benefits as many sectors as possible, both within and outside the energy supply chain. For survival and growth, it's essential in both models to keep costs as low as possible and revenues as high as possible. However, the methods for determining costs and benefits differ significantly between the two models.

The costs for producing and delivering fossil fuel are high. Costs for investments, CAPEX, are high. Think of a power station to produce electricity with natural gas, and infrastructure going to and from this station. Although the operational expenditures (OPEX) are easier to oversee, a large amount of electricity must be delivered to recover all costs and begin generating profit. The more electricity produced, the lower the additional costs for production, and the greater the profit. This single revenue model focuses on maximizing the production of one product, often paying little attention to other impacts, both positive and negative. Positive and negative side effects are ignored unless the positive effects yield significant returns or the negative effects are so severe that they cannot be morally or legally ignored.

For instance, electricity production from burning fossil fuels generates residual heat. In many cities, the value of this positive side effect has been recognized, leading to the development of heat networks. However, in many other cities, this heat was simply released into the air or surface water, a negative side effect that has been increasingly regulated over time. These regulations incentivize the sharing of residual heat with the surrounding area, which reduces the use of fossil fuels and lowers CO2 emissions. If the electricity producer is allowed to offset these reduced emissions against their overall emissions, this further incentivizes the sharing of residual heat.

The single revenue model primarily focuses on increasing the scale of production and delivery of a single product, with secondary attention given to broadening the scope, such as earning additional income from residual heat alongside electricity, the primary product in this example. The multiple revenue model, on the other hand, prioritizes examining all effects of the primary product and identifying ways to generate income from them. While there's no objection to scaling up, the focus is on further broadening the scope, maximizing revenue from multiple benefits.

System Integration

Generating income by creating more multiplicity within the energy sector involves creating more connections within the chain of production, transportation, storage, delivery, and distribution. An example of this begins with energy sharing: members of an energy community buy, sell, or share energy directly with each other rather than through traditional energy suppliers. For instance, a household with surplus electricity from its solar panels can sell or share it with a neighbor, thereby optimizing the use of these panels.

The benefits of energy sharing include reduced energy costs, as members of an energy community can trade energy at lower rates than traditional suppliers. It also encourages the use of locally produced renewable energy, reduces dependence on fossil fuels, and lowers greenhouse gas emissions. Additionally, it eases pressure on the electricity grid by balancing supply and demand locally, which can reduce the need for grid reinforcement—a critical factor in both residential and industrial areas nowadays.

Energy communities also offer another example of creating more connections within the chain by providing flexibility in balancing supply and demand. Community members adjust their energy production and consumption in response to market signals and grid needs. They can reduce or shift their energy usage when the grid is under pressure, especially during peak hours. They can also store energy when supply exceeds demand and release it when demand is higher, and the grid has capacity.

Active users and energy community members can further enhance their impact on the supply-demand balance through aggregation. Aggregation involves combining multiple small-scale energy sources, such as rooftop solar panels, home batteries, and electric vehicles, to function collectively as a single power plant and supply energy to the grid in a coordinated manner. Offering flexibility, whether through aggregation or not, provides multiple benefits, including reinforcing grid stability and reliability.

Like energy sharing, flexibility reduces energy costs and enhances the stability and security of renewable energy sources, helping to prevent power outages. It also decreases reliance on fossil fuels and reduces greenhouse gas emissions, partly by lessening the need for expensive and polluting peak power plants. Flexibility, particularly through aggregation, also creates new revenue streams for active users, as they can be compensated for their services to the grid and participate in the energy market.

Energy sharing and flexibility are distinct activities within the energy sector, yet they can reinforce each other. By sharing energy at the right times and involving as many people as possible, flexibility increases. This mutual reinforcement is just one example of how various activities within this sector can amplify each other’s impact. This process is known as system integration and is synonymous with broadening the scope within the energy sector. Another example is cable pooling, where users share limited space on an electricity cable without simultaneous usage.

System integration aims to optimize the energy system by locally matching supply and demand in real-time, aligning production, storage, and conversion to minimize transport over networks and maximize the use of local renewable resources. In other words, it makes optimal use of the energy system's multi-carrier-vector-sector-benefit nature. This approach is better suited to the emerging, sustainable energy supply than the dominant, fossil energy supply.

For example, the business case for a wind farm is weaker whereas the wind is stronger since then the price is lower. However, system integration between the wind farm and the customer can encourage the latter to maximize their electricity consumption when the wind is strong and minimize it when the wind is weaker. By establishing agreements and adjusting prices

accordingly, both the wind farm operator and the active consumer benefit. System integration can incentivize market participants to offer the active consumer co-ownership in the wind farm, motivating them to optimize their consumption in a way that benefits both parties. It is advantageous for both parties to make these agreements through the energy community of the active consumer, for instance in a PED.

A striking example of system integration begins with *peak shaving*, which reduces large peaks in energy usage. Net operators face significant challenges in accommodating peak energy demands. For instance, a crane in a harbor lifting a full container from a ship consumes a lot of energy, but then may remain idle for a while, requiring far less energy. Installing a flywheel between the crane and the electricity grid allows the flywheel to supply the peak energy and then recharge from the grid. Part of this recharging can also come from lowering the container, as this movement can generate electricity. This enhancement of the flywheel's business case is a strong example of system integration.[3]

Social Value

There are two ways a sustainable producer can broaden their scope: internally and externally. Internally means that the producer works with multiple energy services simultaneously, such as flexibility. Instead of specializing in a single service and delivering as much of it as possible (scaling up), the producer seeks to strengthen the synergy between multiple services (broadening scope). Externally means the producer considers the effects on other societal sectors and the benefits that result from this. The energy sector influences many other sectors in society, such as construction, agriculture, and climate, which in turn affect the energy sector.

It is well-known that both residents within their neighborhoods and companies in their business parks, are willing to pay more for energy that they generate collectively with other residents or companies. The additional cost goes towards future projects or to residents or businesses facing financial difficulties. Some of the other residents and companies are willing to pay for this out of the goodness of their hearts, but also because they expect to benefit from it. Collaborating on a sustainable energy system in the PED will eventually lead to energy security and control over pricing when residents or companies co-own the energy system.

Energy, energy security, and control are three values that residents or companies receive for a slightly higher energy price. Their energy system offers multiple benefits and provides more than just these three values. For instance, many people in their neighborhoods appreciate the additional social cohesion that arises from an energy community, usually a cooperative. If this community exists for several years, it often realizes more than just energy projects, such as shared cars, more greenery in the neighborhood, or a network that provides heating and cooling. These can also deliver significant added value.

Networks that provide heating and cooling to a neighborhood are included in the plans of almost every Dutch municipality to make energy use more sustainable. However, the revenue from selling heat and cooling is not enough to cover the costs of setting up, operating, and

[3] A characteristic of system integration is that it also triggers a chain of beneficial effects. For example, working with the flywheel produces a very accurate user profile.

repaying a network.[4] In a densely populated urban area, for example, the shortfall could be thirty million euros over a thirty-year lifespan. This is not much for a city district where a network helps to provide more than just heating and cooling as benefits. There are also additional benefits, the so-called co-benefits.

If the heating-cooling network is built in phases, modularly, there are good opportunities to create synergy: the construction of this network takes place in coordination with other infrastructure work, such as replacing sewers or road surfaces, or implementing climate adaptation measures, including better water drainage solutions and more greenery in the neighborhood. This way, the ground only needs to be dug up once, and all the work can be done by a single contractor. This saves money on the work and reduces the disruption, as the ground would otherwise need to be dug up twice.

Creating synergy can occur during construction and also in management. In their tender process, municipalities can request the integration of more projects during both construction and management. This saves money on both sides and is a significant step towards closing a thirty-million-euro gap. Every municipality looks for these opportunities, tries to plan them, and is more flexible in doing so when the heating-cooling network is built modularly. There are also more co-benefits.

One co-benefit that quickly increases in value is the reduction of congestion in the electricity grid. A network that provides heating and cooling can be helpful in this regard. This network requires electricity, but less than most other solutions. Additionally, heat storage is a good use of electricity when there is an excess. Grid congestion is especially an issue during these times, and when locally generated electricity can be stored locally, it is beneficial. Heat storage also reduces the overall need for electricity, which in turn reduces the space required for wind turbines and solar panels.

Perhaps not the entire heating-cooling network, but certainly several modules, can be partly owned by the users—both companies and residents. They usually establish a cooperative for this purpose, and there are almost eight hundred such cooperatives in the Netherlands, more than ten percent of which work on heating and cooling. It is established that these cooperatives have more effects than just the sustainability of energy use. Sustained and growing social cohesion is one of the main effects, leading to more activities in the neighborhood and increased well-being as a co-benefit.

If a heating-cooling network is partly owned by the users or by the government, there is a strong incentive to keep the price of heating and cooling low. This does not guarantee a low price but does ensure the greatest possible control over it. This provides a municipality with the assurance that the heating-cooling network will never raise the price more than necessary and will minimize the risk of energy poverty. A co-benefit of this network is that the costs for a municipality to keep people out of poverty will never rise more than necessary.
The connections of the energy system with society are multi-sectoral. Thus, within and outside the energy system, work is being done towards multiple goals simultaneously, creating multiple benefits. These benefits go beyond those mentioned earlier, including employment, education,

[4] See Factsheet ‘Onrendabele top collectieve warmtesystemen’, CE Delft, juli 2021

and the promotion of democratic participation. These social values can be financially valuable, though not enough to cover the thirty-million-euro gap, but perhaps a portion of it. To determine this, as well as to assess the value of system integration, a cost-benefit analysis is necessary.

Cost-Benefit Analysis

Many producers are accustomed to deploying all necessary resources for a single goal, rather than multiple goals. A typical business case involves a single product, with its associated costs and benefits. The premise is that as scale increases, the marginal costs decrease, leading to higher benefits. In a multi-faceted business case, the scope is crucial. As the scope broadens, costs and benefits change, for instance, in the case of a PED aiming first to become energy-neutral and later even energy-positive. An important step in this direction is the installation of solar panels, both individually and collectively. The next step is energy sharing, followed by providing flexibility, possibly even through aggregation. Determining the costs and benefits can be approached by ascending six steps:

First Step: Increasing Revenues

The solar panels, energy sharing, and aggregation each have their own revenues. Stacking these three activities generates more revenue than from just the solar panels, or just the solar panels and energy sharing together.

Second Step: Increasing Efficiency

Energy sharing increases the efficiency of the solar panels, and aggregation increases the efficiency of both energy sharing and the solar panels. This is not just about stacking activities, but also integrating them in a way that they reinforce each other. Due to the extra efficiency from their mutual reinforcement, these revenues exceed the sum of their parts. This results in additional revenues.

Third Step: Decreasing Marginal Investment Costs

When parties begin sharing energy, investments are needed in equipment such as meters, cabling, and software. In a conventional business case, these capital expenditures (CAPEX) must be covered by the revenues from this single activity—energy sharing. However, the revenues from solar panels increase due to this new activity of energy sharing. Therefore, it makes sense to distribute the costs for investments over both the old and new activities. This lowers the costs for the new activity compared to a scenario where the investment must be made independently of the previous one. With the new step, the marginal costs decrease. If another new activity, such as aggregation, follows, this process repeats: the costs are spread over three activities, thus reducing the marginal investment costs once again.

Fourth Step: Decreasing Marginal Operating Costs

As mentioned, energy sharing increases the revenue from the solar panels, so it is appropriate that a portion of these revenues also covers the operational expenditures (OPEX) of the energy-sharing system. Moreover, the operation of the panels and this energy-sharing system will practically merge, so it is logical to share these costs as well. If the next step, aggregation, is taken, this principle will apply again. With each subsequent activity, the marginal operating costs decrease as they are shared with the previous activities.

Fifth Step: Decreasing Marginal Financing Costs

Adding energy sharing improves the solar panels. Adding aggregation improves both energy sharing and the solar panels. The combined business case keeps improving. It also becomes more resilient: if one activity underperforms temporarily, the others can help support the whole. This increased resilience reduces risk. If financiers recognize this, they may be willing to provide funds at lower interest rates. With each addition to resilience, the marginal financing costs can decrease.

Sixth Step: Decreasing Marginal Transaction Costs

Implementing an energy-sharing system increases transaction costs. However, many of these costs have already been incurred with the installation of the solar panels and the necessary cooperation. If the involved parties continue to the next step, aggregation, it again holds that they have already learned much about the energy system and each other in earlier steps. They do not need to incur these costs again. In fact, they can recoup part of these costs because the subsequent steps are now easier. With each next step, the marginal transaction costs decrease.

	Revenue from stacking	**Revenue from more efficiency**	**Marginal costs for investment**	**Marginal costs for operation**	**Marginal costs for finance**	**Marginal costs for transactions**
Current benefits from energy system	a	b	c	d	e	f
Extra profit from next step	<a	<b	<c	<d	>e	>f

Table 6: Cost – benefit analysis

a) Increase through more stacking
b) Increase when integration makes previous efforts more efficiency
c) Decrease due to shared costs (CAPEX)
d) Decrease due to shared costs (OPEX)
e) Decrease due to increased resilience and reduced risk
f) Decrease due to prior learning and collaboration

The integration of solar panels, energy sharing, and aggregation is an example of system integration—broadening the scope within the energy sector. The six steps above show how the costs and benefits of this integration can be determined. The value of broadening the scope beyond the energy sector, known as societal integration, can also be determined using these six steps. System integration and societal integration are prerequisites for increasing revenues (a and b) and reducing costs (c through f).

Collaborative business models for PED's

The discussion above highlights the potential that can be achieved through system integration: through (cross-sectoral) collaboration between system stakeholders, additional value can be created as stakeholders are able to bundle resources towards energy production. Additionally, residual value previously left untouched (overproduction of energy, irregularities between supply and demand for energy or efficient timing of energy consumption) can be capitalized upon to allow for further value creation. Collaboration enables stakeholders to make joint investments for new energy equipment or enable cost-sharing to achieve favorable business cases.

The logic of how collaboration can contribute towards value creation and capture calls for an understanding of the (collaborative) business models that can employed for PEDs. Such business models capture how a (collective of) stakeholders come together to share resources, make joint investments and achieve synergies in terms of energy production and consumption. This is with the intention of achieving mutually beneficial business scenarios, in which all stakeholders are *better off* through participation in the new business model. The resulting stakeholder network can comprise of both active users, small or large-scale energy producers as well as governments depending on the scope of the PED and the potential for shared investment opportunities.

Collaborative business models are designed with the purpose of creating a favorable business case for each network stakeholder. To do so, collective goals related to sustainable energy production and consumption should be connected and balanced to the individual objectives of stakeholders involved. For example, public-private collaboration between governments and energy producers will call for achieving trade-offs between profit maximization through the energy system (as a typical key objective of private companies) versus realizing societal access to (sustainable) energy by citizens or end-users (as the primary driver for governments) such that for both stakeholders a mutually beneficial business scenario is established. Therefore, establishing new collaborative business models for PEDs require an understanding of the needs and objectives of stakeholders involved for the energy system and alignment between these objectives for collective action.

Collaboration and collective action also calls for agreements on how stakeholders organize themselves. As such, collaborative business models include formalized decisions on how collaboration as part of PEDs is structured and governed. Depending on the type and size of stakeholders involved, different governance models may be considered to divide responsibilities, coordinate decision making and to establish formalized agreements towards making investments.

4.3.4 Law

Introduction

The conditions that the law imposes on supply in PEDs stem from energy law; in the Netherlands soon to be covered under the Collective Heat Supply Act (Wcw) and the Energy Act. These are public law requirements that will be included in permits and subsidy regulations. Other public law requirements arise from environmental law, procurement law, and support schemes for renewable energy, as well as the prohibition on unauthorized state aid. Additionally, parties in and outside PEDs, impose requirements on each other in contracts. These requirements must align with private law, which also imposes other requirements, such as those related to establishing a legal entity. Parties must ensure that their actions comply with these legal frameworks.

Below, we will discuss the legal principles currently gaining attention in relation to the emergence of the community as a player in the energy supply sector. First, we will explore the rise of the community in law, particularly in energy law. Second, we will examine energy sharing, which is gaining more legal recognition as a direct consequence of this rise. In addition to this environmental law, state aid and procurement laws are addressed because these legal areas raise many questions concerning communities inn PEDs. Finally, the focus will be on legal entities.

The Community in Law

The law grants powers to the government and legal entities. Until two hundred years ago, the law also granted powers to groups or communities. Differences in class, culture, and religion at that time led to varying degrees of authority for community members to act. Most traces of this have been removed from the law, though not entirely. In disciplinary law, members of associations and professional groups still have certain rights. The International Covenant on Civil and Political Rights (ICCPR) and the European Convention on Human Rights (ECHR) protect the rights of minorities. In this context, it is noteworthy that over the past decade, communities have been making a comeback in the legal landscape.

Article 2.6.7 of the Social Support Act (Wmo) includes the "Right to Challenge," which allows a community to challenge the government to take over the execution of a task. This law has been in effect since 2015. The proposed law to strengthen participation at the decentralized level was approved by the House of Representatives on October 23, 2023. This law aims to institutionalize the right to challenge in a much broader range of sectors than the social sector only. Since early 2021, two European Directives—2018/2001 and 2019/944—have introduced the concept of the energy community. Although their implementation in the Netherlands is still ongoing under the Wcw and Energy Act, the rules in these directives are binding. Directive 2019/944 describes the energy community as a legal entity that:

a) Is based on voluntary and open participation and is effectively controlled by members or shareholders who are natural persons, local authorities (including municipalities), or small enterprises;

b) Aims primarily to provide environmental, economic, or social community benefits to its members, shareholders, or the local areas where it operates, rather than generating financial profit;
c) May participate in generation (including from renewable sources), distribution, supply, consumption, aggregation, energy storage, energy-saving services, electric vehicle charging services, or provide other energy services to its members or shareholders.

Energy Sharing

Energy sharing is often a core activity within an energy community. Members of an energy community can jointly generate energy and share it among themselves. This allows members to benefit from lower energy costs and greater autonomy over their energy consumption. Additionally, sharing within an energy community enables more efficient management of the production and use of renewable energy. Energy that is produced in surplus at one time can be shared with members who need more energy at that moment, contributing to a more stable and sustainable energy system.

Energy sharing involves the transfer of surplus energy production from one party to another for consumption. Examples include solar energy on a sunny day or wind energy on a windy day. A few years ago, the European Clean Energy Package introduced the concept of energy sharing, an administrative process in which renewable energy is allocated to consumers. These consumers must have control over the installation, be non-professional, and operate on a non-profit basis. This grants households, small and medium-sized enterprises, and public entities the right to participate in energy sharing as active consumers. A PED is a good place for just this.

Energy sharing allows active consumers to self-consume renewable energy produced at a location other than their own connection point. The primary goal of energy sharing is to provide access to sustainable resources and enhance consumers' resilience against high and volatile electricity prices. It specifically aims to enable citizens who currently face financial and spatial barriers to become active consumers.

The Clean Energy Package does not fully define what energy sharing entails. Recent proposals to amend the Electricity Market Design (EMD) do specify what energy sharing is, its objectives, and the requirements for it. Some member states have already implemented these requirements, but not all. Additionally, there is an anticipated secondary effect: citizens who engage in energy sharing may also unlock their flexibility. When parties in the same region share energy, it reduces the need to transport energy over long distances, lessening the strain on the grid and reducing energy losses along the way.

Environmental Law

Since early 2024, a new Environmental Act has come into force in the Netherlands. The former law had a three-tier system: vision, plan, permit. The new law has a four-tier system: vision, program, plan, permit. The vision is non-binding for both the government and citizens, the program is only binding for the government, the plan is binding for both the government and citizens, and the permit is binding for citizens. Different government bodies can jointly develop a program. They can focus on the general development of an area, but they may also choose

to specialize and create a program, for instance, focused on energy or energy within a specific area.

State Aid and Procurement Law

When a government contracts work to a company, it often must select the best company through a procurement process. If the government provides a subsidy to a company, this state aid is only allowed if it does not distort competition with other companies. European law concerning the prohibition of unauthorized state aid allows support for energy communities in certain cases because they are communities, not companies. Regarding procurement, many believe that energy communities should not have to compete because they are not businesses. However, many legal questions still surround this issue.

A community can take over work from governments and companies, or market parties. Looking at the work of companies, a community can take over tasks usually performed by market parties. A strong example is the energy community, often organized as an energy cooperative. This community can also take over government tasks, such as those a municipality might have to promote energy sustainability. In this case, the community is taking work away from the government. When the community, for instance, produces its energy or provides services to make energy use more flexible, it takes over work from the market. Directives 2018/2001 and 2019/944 empower energy communities to do so.

If the EU legislator had considered the energy community to be a business in these Directives, they would not have made such an effort to distinguish between the community and companies. The main goal of this distinction is to give the energy community an equal position in the market. The incorrect conclusion would be that an energy community is therefore the same as a company—quite the opposite: because it is such a different entity, rules are needed to allow the energy community to compete with companies. There is still much uncertainty about these rules, especially regarding the community taking over government tasks. Is a tender process required, or not?

Looking at the work of local governments, a community can challenge a government by arguing that the community can better perform a government task than the government itself. A company can make the same claim. In other words, the government can choose between the market and the community. This is also the principle of the Decentralization Participation Act.[5] This idea can even be traced back to the Maastricht Treaty.[6] If a local government opts for the community approach, the right to challenge applies, and no tender is needed.

When a company takes on work from the government, the government ensures it is done in the public interest, for example, through procurement conditions. The government would do the same when a community takes over the work, but this community positions itself as citizens, differing from companies. It's not that employees of companies cannot feel like citizens in their work, but when executing a government contract, this is not a requirement.

[5] See Explanatory Memorandum, p. 19

[6] Chiara Salati, The forgotten meaning of the EU principle of subsidiarity. Horizontal subsidiarity in Italian local governments, Governance Papers DiGoP 02/2023, Eurac Research, Bolzano/Bozen, Italy, 2023, https://doi.org/10.57749/hcdq-2p97.

When a community takes over work, it formally receives a government contract, but both sides expect that the members of the community will act as citizens. Legally, this follows from the fact that the right to challenge is based on the right to petition.[7]

Just as members of a community are considered citizens under the Decentralization Participation Act, they are also viewed as citizens in the two EU Directives. Directive 2019/944 even explicitly refers to "citizen energy communities." Citizens strive to maintain a societal provision, in this case, energy, and seek an alternative path to the market or government. This path is the community, which stands alongside the market and government. Crucial to this is that the members of the community act as citizens and not as private individuals pursuing their self-interest.

The weakness of any community is that it becomes exclusive, where members only care for each other and not for society at large. Consistently, all recent EU and Dutch legislation concerning communities has required that they exclude no one. Even when they focus on their immediate surroundings, as the legislator expects, communities do so with a broader public interest in mind. Both EU Directives require open participation in providing environmental, economic, or social community benefits to their members or the local areas where they operate. It is precisely this open participation that ensures that these community benefits are not exclusive. This applies even to a homeowners' association that acts as an energy community, as it is open to collaboration on energy matters with others.

Non-exclusive community benefits are synonymous with the public interest, especially when the members of the community are citizens and not private individuals. The legal conclusion is, therefore, that communities work in the public interest. This conclusion is also supported by the actual behavior of communities. Looking at the hundreds of energy cooperatives that have emerged in the last ten to fifteen years, they almost without exception exhibit the behavior that is the legislator's starting point. Exclusive behavior is rare, is quickly noticed, and such a community is not included, for example, in a regional network of communities.

Legal Entities

For most companies in an area, their core activities might be related to products like soft drinks, fashion, or car repair, rather than energy supply. In their business model, energy is not a profit center but a matter of energy security and cost management. These companies are not competitors when it comes to energy, which makes it easier for them to collaborate in a PED. The same applies to residents who aim for an energy-neutral, or even energy-positive, neighborhood. They can invest together, share energy, and undertake other related activities. With this in mind, these companies and residents become active energy users.

For the vast majority of active users in a PED, energy is not their core activity but an essential part of their operations. However, over the past few decades, it has become an increasingly important component. Nowadays, more and more users are actively involved in producing, transporting, storing, supplying, and distributing energy, particularly electricity and often heat as well. This involvement can include activities like energy sharing and balancing. It is

[7] See Explanatory Memorandum p. 17 en 27 of the proposed law to strengthen participation at the decentralized level.

advantageous to do this collectively, as a group of residents or companies, and even in collaboration between residents and companies.

We are already seeing groups of residents and companies coming together, as well as partnerships with the government. They are also engaging with companies whose core business is energy and who offer their services. The coordination between all these parties can be informal, resulting in agreements such as a contract between a resident and a solar panel supplier, or between a company and a battery provider, or the government learning how to implement its policies. How can a more formal governance structure emerge that enables companies, residents, and the government to work together within a PED and with parties from outside the PED?

The establishment of an association is a step that parties can easily take. They appoint a board that carries out tasks and is accountable to the members, based on a one-person-one-vote principle. The association does not need to have legal personality as long as it limits itself to coordinating among members, with other similar groups organized at the local or regional level, and with governments. The need to formalize arises when an association begins to engage in business activities, such as joint investments or entering into a collective contract with companies whose core activity is energy.

The association can engage in business in two ways: 1) by becoming the owner of enterprises, or 2) by transforming into a cooperative. A foundation, private limited company (BV in the Netherlands), or public limited company (NV in the Netherlands) is less suitable for organizing collective participation and ownership. However, a collective can house activities within a foundation, BV, or NV, which would then be owned by the association or cooperative. These steps are all aligned with European energy legislation, which has introduced the energy community as an entity that accommodates collectives of energy users and in which the government can also participate.

Joint entrepreneurship could involve, for example, setting up a wind turbine or a battery together. As mentioned above, it is wise to establish this under a separate legal entity, such as a BV. There can be many additional steps, such as whether the BV is 100% owned by the association or cooperative of the collective, or whether shares are also held by others. Coordinating the activities of this BV with the requirements of energy and tax law also requires attention to ensure it can truly operate in service of the collective; different legal domains can sometimes work against each other.

4.3.5 Policy

Looking at PEDs, the EU is leading in formulating policies. Further, investment as a policy tool is the level at which statements can be made about policies involving PEDs. Given that energy transition largely involves investment, this is not surprising. This also justifies attention to financial strategies.

EU Policy

Energy policy instruments such as the Energy Efficiency Directive (EED) and the Renewable Energy Directive (RED) recognize the role that residents and businesses, particularly small

and medium-sized ones, can play at local and national levels to accelerate the energy transition. The EU promotes national and regional energy management ecosystems and cooperation between businesses, residents, and between businesses and residents. Establishing partnerships can enhance market acceptance of energy efficiency measures and the use of renewable energy.

Businesses and residents share energy-related assets for renewable energy generation, energy networks, energy storage, energy services, or energy exchange, such as recovering and using waste heat from industrial and production processes. They also share energy itself; as mentioned, EU regulations on energy sharing are already in place, but their implementation is still ongoing in most member states. For PEDs, sharing is likely to become significant, especially as grid congestion issues increase.

The European Commission encourages rolling out energy management systems under the EU Save Energy Communication and the revised Energy Efficiency Directive. Involving businesses and residents in the transition to clean energy and reducing their domestic ecological footprint is crucial for the European Green Deal and to meet the Fit-for-55 package. It is also essential for meeting the REPowerEU plan to phase out the EU's dependence on Russian fossil fuel imports. Additionally, it is important for the Green Deal Industrial Plan and the overall competitiveness of EU businesses.

As emphasized in the Green Deal Industrial Plan, achieving climate neutrality by 2050 will require full mobilization and deeper collaboration among all players active in Europe's net-zero industry value chains. Exposure to energy prices, increased global competition, and potential transition risks related to changing regulations, market demand, and buyer/supplier procurement criteria put increasing pressure on businesses. New business models and financial arrangements are needed to adapt to the current energy crisis and to decide to invest in energy efficiency or renewable energy projects.

The Governance regulatory framework does not mention direct consequences for the built environment and construction models. However, it requires member states to update their National Energy and Climate Plans (NECPs) in draft form by the end of June 2023 and in final form by June 30, 2024, to reflect increased ambition. Through these NECPs, there may be implications for the built environment.

Investments

Using the six steps A through F, as mentioned in chapter 3, an investor understands what the multiple business case looks like and thus where they are investing. In the perception of most governments and individuals, the singular business case plays a central role, not the multiple one. For example, that risks decrease (step C) and transaction costs (step D) as well, is counterintuitive and therefore unfamiliar to many investors. Normally, they drop out when they bear too many risks and costs and receive too little return relative to others, known as the split incentive. However, at the area level, parties are willing to advance costs, for example, for climate, and expect returns in the future, such as social cohesion, which investors are not used to.

Investors still focus too much on the goal-oriented and legitimate use of resources, such as in energy, water, and soil. The alternative is to focus on resilience in collaboration between parties aiming to achieve goals at the area level, such as in energy, water, and soil. Multiple value creation at the area level means a radical reversal of risk, return, and impact. Guidance in this area is based on effects and intended impact, multiple value creation. If they also collaborate within a community, they can benefit from transaction costs that have already been incurred. Businesses or residents, or both within a PED expand the amount of money available for the energy transition. They have two qualities that make them an important partner:

1. Capital

The government and large energy producers are no longer the only investors, as the active consumer also invests in generation, storage, and even transport. The active consumer's own financial resources can be a lever for producers to engage with a collective of active consumers within a PED. At that point, their social capital is also of great importance: by forming an energy community, they create significant value for themselves and for the producer, who gains a group of customers willing to engage and pay a fixed price.

2. Broad Prosperity

For an energy company, energy is a means to make economic profit. For an energy community, it is also a means to achieve social profit, both physically and socially. The community can use the economic profit, for example, for climate adaptation or to combat energy poverty, including for businesses. By working as efficiently as possible, the community can limit the space needed for wind and solar by making the most of available heat. This is another example of managing profit differently, broad prosperity.

These two qualities drive governments and energy companies to take the active consumer and their energy community seriously. They also motivate these active consumers themselves to take their role in the energy sector seriously. A shift is occurring from a market arrangement with private energy producers and a government overseeing it, to a societal arrangement where businesses, the government, and energy communities of active consumers use energy for economic and social profit. Energy becomes a means to more goals, but practical tools are needed; the PED is well suited for this. The PED creates favorable conditions for the government to invest its money. Instead of public money being a lever to unlock private money, now collectively mobilized private money is a lever to unlock public money. This represents a new vision of public tools. Collectively mobilized money changes the financial landscape; this is certainly of interest to the Dutch government as it invites input in the National Program for the Energy system (NPE).[8]

More and more industrial areas are developing into energy hubs, and more and more residential areas are developing into PEDs. Together within an energy valley they can contribute to the stability and capacity of local energy infrastructure. The multi-carrier-vector-sector-benefit energy systems in hubs and within PEDs contribute to such an energy system that also grows on a larger scale, regionally, nationally, and even cross-border. The Dutch central government and provinces have recognized this in their design of new infrastructures. However, the Draft Energy Main Structure Program and each province's designs still show

[8] P. 13.

one-way traffic from central producers to passive users. This does not have to be a problem, as one-way traffic is part of the new system, but it must be aligned with it, system integration.

Financial Strategies

Financial instruments reveal that strategies for financing system integration and social integration are more extensive than initially thought.[9] This is particularly true for instruments used by parties when divesting real estate. For instance, land ownership in the Netherlands is largely held by municipalities. When selling to a developer for the creation of a residential area, the municipality has several options to require an integrated approach. Some of these options are contracts, while others stem from environmental law.[10]

In addition to real estate ownership, municipalities have funds allocated for various purposes. An integrated approach brings together different objectives, such as establishing a district heating network with goals like energy provision, greening public spaces, recreation, and climate adaptation. Typically, there are four separate budgets for these four objectives, and a single budget is used for a single project. This aligns with the usual method of accountability within the government. Two strategies to enable integrated projects are pooling funds and breaking down budget silos.

A notable example of pooling and breaking down silos is the practice of combining tasks, such as installing a heating network while simultaneously replacing sewer systems. This way, the ground is opened only once, and all the work can be done by a single contractor. This approach saves money on the work and minimizes disruption, as otherwise, the ground would need to be opened twice. Combining tasks can be applied to both construction and maintenance. Municipalities can request integration of multiple projects in their tenders, for both construction and management.

Besides consolidating budgets for an integrated project, it's also possible to stretch a single budget to accommodate an integrated project. For example, funds allocated for sewer replacement can be used for greening a neighborhood. This greening helps retain water, reducing the need to fully replace the sewer system. Essentially, green measures become another means to achieve the same goal intended for the sewer funds, fitting within the purpose for which the money was allocated. This money cannot be diverted to an entirely different purpose, such as employment and income.[11]

A municipality can initiate an integrated project itself or participate in an integrated project initiated by another party, whether public or private. In such cases, the municipality expects a result, such as increased greenery when a water board initiates a project involving more nature. Conversely, the water board can participate in a green project by the municipality, expecting better water management in return and paying for it. This is known as outcome payment and is an innovative concept well-suited to integrated projects.

[9] See Natuurverdubbelaars, p. 13 in report: Integrale fondsvorming voor waardecreatie | City Deal Openbare Ruimte.
[10] Natuurverdubbelaars, p. 15-19
[11] Natuurverdubbelaars p. 20-21 (see also Dorst, Van der Heijden, Rambharos forthcoming)

Investment Platform

To accelerate investments and improve their effectiveness, there is a need for insights into stakeholders, projects, budgets, and potential financial partners at the level of the PED. Within PED-focused investment platforms, government, businesses, residents, and investors collaborate on a joint PED investment plan. The goal is to achieve consensus on the plan and start its implementation. It is essential to better coordinate investments from individuals, businesses, and government entities to achieve the necessary volumes. This will also provide a more accurate picture of investments, enabling better public and private budgeting in advance.

The activities of the investment platform focus on financially restructuring sectoral projects at the PED level into bundles of integrated projects that create multiple values or co-benefits (for example, installing a heating network while also updating the sewer system and creating green space) by aligning public, private, and civic resources. Additionally, the platform provides a continuous feedback loop, allowing partners to learn from each other and utilize the expertise available within the partnership. Involving businesses and residents in the investment platforms is an added innovation that will support deeper engagement of these parties within participating PEDs. All this will lead to an integrated approach resulting in:

- Reduced financial costs for the energy transition (mitigation and adaptation) of buildings and public spaces, as fewer separate construction activities are needed.
- Increased financial resources for the energy transition through greater involvement of private/institutional investors in energy action.
- A clearer understanding of the financial costs of implementing sustainability measures, enabling better public and private budgeting in advance.
- Insight into possible combinations of different financial streams for various challenges in the PED.
- Identification of existing regulatory obstacles to innovative financing models and the development of solutions.
- Inclusion of social values in PED investment plans and reduced disruption from construction activities.

Businesses and residents can be involved through crowdfunding. They can be part of project development, connecting with potential financing options via the investment platform. Through the platform, businesses and residents can become an integral part of co-creating multiple projects. This not only fosters a more collaborative community but also increases local actor involvement in addressing energy and climate-related issues.

The result is an investment platform, focused on a PED, used for implementing a joint investment plan. This helps cities overcome structural barriers to mobilizing private investments for energy actions and aligns public and private investments. The best examples of platforms within a PED can be found in the practice of energy cooperatives, the best examples within an energy valley are Business Improvement Districts. Although most do not consider themselves an investment platform, their behavior does align with that concept.

The investment platform offers a new tool for a more integrated financing approach. This results in more control options during the implementation of energy actions and more financial resources for these actions. The platforms also facilitate bundling programs and projects into portfolios that achieve larger scales and provide better long-term investment opportunities. Through these activities, the multi-year financial perspective for each PED can become more realistic. The investment platform will explore various financial instruments for involving businesses and residents, such as crowdfunding, participation in projects through local energy cooperatives, or regional funding programs.

4.3.6 Governance

Introduction

The rise of the active user and their community is transforming the governance of the energy sector. This section will address the governance issues currently attracting attention due to the emergence of the energy community as a player in energy provision. The key topics include the tripartite governance structure, the role of the community alongside the market and government, and data. The control of data significantly impacts governance, depending on which of these three parties holds it. Following that, we will discuss a critical aspect of community governance itself: entry and exit—when a party participates and when it does not. We will then examine a unique governance relationship between parties: reverse procurement, which can occur in the relationship between government, market, and community. Finally, we will focus on the mobilization of funds, a crucial governance issue.

Tripartite Governance

Privatization at the end of the last century gave the market a leading role in the energy sector alongside the government. Their bipartite relationship still defines the sector today, but there is movement in this dynamic. The active user is emerging as a third party, introducing tripartite governance. Driving forces behind this shift include new technologies enabling decentralized energy production and giving active users a stake, as they can own production units. This extends to system integration, which can even allow active users to influence an offshore wind farm.

Active consumers can set up their own smaller onshore wind farms or establish district heating networks, but they need energy producers as partners and service providers. Government partnership is also important, as financiers, regulators, and protectors of weaker parties within the new tripartite arrangement. Currently, there is debate about whether the government should even own district heating networks and start a heat company. This would reintroduce the old utility model, but the energy community could also start a heat company, representing a new type of utility. Roles are already changing and will continue to evolve, illustrating tripartite governance.

Tripartite governance is an ongoing development in which market parties, governments, and active users adapt to each other and to changes in technology and society. As a result, one party may be more influential than another, depending on time and place. Consider the difference between a prosperous village where residents take control and a city neighborhood

with multi-problem families. In the former, consumers will have significant influence over production, whereas in the latter, the government will be more important, and energy producers will be granted concessions by the government.

Maintaining open collaboration among parties is crucial. An interesting example is the supplier of a flywheel that helps with peak shaving. This device can be purchased or rented by a company or an energy community. This contributes to energy democracy as the user gains access to important equipment. In a new development related to flywheels, parties for whom this development is significant can join with the supplier to invest in a company undertaking this development. This is also a form of sharing power within the energy sector.

Data

As an ancillary benefit, the supplier of flywheels provides highly detailed user profiles of its customers, as optimal peak shaving requires it. Knowing one's user profile well contributes to good governance by clarifying how compatible users are with each other to best coordinate their usage. Not having control over these data limits users' freedom and hinders their pursuit of sustainability. When data are in the hands of others, such as network companies or software providers, it immediately impacts the governance of the energy sector. The data are not held by the directly interested parties but by those whose interests are considered alongside those of the directly interested parties. The influence of these latter parties fades into the background, potentially alienating the governance of an energy system from its direct stakeholders.

Entry and Exit

It is known that residents within their neighborhoods and companies on their business sites are willing to pay more for energy they generate collectively. This additional cost goes to future projects or to residents or companies in financial difficulties. Some of the residents and companies will be willing to pay out of goodwill, while others will do so expecting benefits. Collaborating on a sustainable energy system in the area will eventually provide energy security and price control when residents or companies are co-owners of the energy system.

The various values or multi-benefits realized by an energy system must be aligned. This means optimization: maximizing one value, such as the best price, will often reduce the other values. For a party participating in the collective, the best, meaning lowest price, may weigh heavily. So much so that they are not willing to pay for additional values. This party exits the collective, thereby forfeiting other benefits. Each collective must consider that the optimal balance between different values for individual parties may be less attractive than maximizing one or more values outside the collective.

Reverse Procurement

In their responsibility for the sustainability of energy provision, governments are involved in the creation of district heating networks. A company looking to offload its waste heat can find significant assistance from a government. The government is asked to participate, leading to a form of reverse procurement that is increasingly seen outside the energy sector. A variant of this is the Right to Challenge.

With the Right to Challenge, the government informs communities that they can propose alternatives to government policy. This is a new governance tool to improve government policy with alternatives from communities. Besides being attractive to the government if the alternative is better than its own ideas, it is also appealing because it shows how the government gains partners willing to change themselves to build society together. This results in a dual agreement: the government receives a better offer and better partners from the community, and the community can realize a project it desires with government collaboration.

When the government receives an offer, it cannot simply disregard its procurement obligations. It must do so when companies can provide a competitive offer. These are companies that can operate anywhere, but not those that are part of a community strengthening its own environment and willing to make changes for this purpose. For example, in the case of a district heating network, their goal is not to profit from the network but to offload their waste heat and strengthen the local environment. Another company, seeking to profit from operating heating networks, might be given the opportunity to participate. The government will need to put this out to tender.

Mobilization of Funds

Working with multiple benefits raises financial questions, often politically charged and revealing a governance culture focused on main benefits rather than co-benefits. However, ignoring secondary benefits is a luxury that decision-makers can afford less and less. An integrative approach, which involves utilizing co-benefits, is undeniably emerging. A governance culture and politics focused on main issues clash with the trend towards integration, and financing in particular exposes this problem.

Organizations, their culture, and politics are fully structured for single-focus operations, presenting a significant barrier to integrative working. This barrier also applies to the use of financial instruments. Overcoming this barrier requires rethinking these instruments and methods for their application. Understanding the business case is necessary because otherwise, it is unclear what exactly is being financed. One way to understand this is by breaking it down into components; these are steps A through F clarified in chapter 3.

Multiple projects require forms of financing where different stakeholders contribute structurally. In this context, investment platforms and funds can offer solutions. Such financing forms are not sources of funding themselves but can optimize and create new financial flows. Moreover, integrative investment forms can stimulate the essential collaborative culture for multiple projects. Although their use is still limited, they offer potential.

Investment Platforms

The goal of an investment platform is to align, structure, accelerate, and expand decision-making regarding investments from public, private, and civil stakeholders at the PED level. Potential business cases are evaluated based on the PED investment plan. The aim is to create business cases that bring trust and accountability to the investment decision, whether this decision is made for financial or impact reasons, or a combination of both. This integrated business case is a compilation of information and includes the reasoning for initiating a project. It outlines a clear path to an attractive return on investment, whether financial, social, or both.

Examples of investment platforms include a civil servant who brings colleagues together for a financing issue, or a specific task force organized by the government to connect certain actors. Generally, an investment platform is discussed when the following tasks are performed:

1. Preparing Projects for Financing: Developing business cases while keeping ownership within the PED.
2. Financing Projects: Connecting existing financing options such as regional, national, and European subsidies, philanthropy, and impact investments.
3. Facilitating Collaboration: Investment platforms can play a role in bringing parties together. By uniting involved parties, mutual learning is promoted and collaboration is encouraged.

An investment platform brings together managers of various funds and budgets. They can pool their money and learn from each other simultaneously. Pooling money means that one budget holder points out the opportunity for another to participate, thereby improving the allocation of their funds. This is the essence of an investment platform. Importantly, such a platform has the potential to evolve into a fund. In that case, it has a portfolio of projects and can take on the risk of a project failing. Such risk insurance is crucial for a PED and its development, so viewing a platform as a step towards a fund is beneficial.

It is clear that the investment platform ensures mixed financing. This is also known as blended finance—the strategic use of public financial resources, philanthropic funds, community money, and other sources to mobilize a broad range of additional capital for sustainable development projects. The goal is to address market failure and often government failure, and to attract private investments in sectors or cases that are otherwise deemed too risky and thus financially unattractive.

In blended financing structures, various stakeholders such as financial development institutions, governments, philanthropic organizations, local communities, and private investors come together to share the risks and benefits of an investment. By combining different sources of capital, the risk burden can be distributed among the parties, making it proportionate to the benefits they can achieve.

Investment platforms do not manage a fund. They function as intermediaries to organize integrated project financing by facilitating more or less direct financial interactions between financiers and projects. However, an investment platform can establish a fund to achieve its goals and streamline these financial flows. Additionally, an investment platform can set up a Special Purpose Vehicle (SPV) for a specific project.[12] This is another form of integrated project financing without creating a fund.

An SPV shares some similarities with a fund. Like a fund, an SPV pools capital from various parties and is created with a specific purpose. However, an SPV differs in several fundamental ways from a fund. For instance, an SPV is often established for a specific transaction or project. It is a temporary financing pool with a limited lifespan. SPV financiers are limited to those

[12] See discussion paper ICLEI

actually involved in the realization of the financed project. In contrast, funds can have a greater distance between the project and the financier.

Funds

Members of a PED investment platform who wish to collaborate on an integrated project pool their money together. They do this in a coordinated manner to fully benefit from cost reductions and additional quality achieved together. The idea is that there is a difference between leading all financial flows separately to the integrated project and doing so structurally through a fund. This means a structure with money for both the long and short term, resulting in different costs and conditions. The idea is that this latter approach is more efficient. A fund can provide a way to spend money more effectively and responsibly on an integrated project.

An important difference between an investment platform and a fund is that a platform works on a project, whereas a fund manages a portfolio—a pipeline of projects. Thus, the entire portfolio can bear the risk of a project failing or a significant but challenging project moving forward. Moreover, a portfolio can provide assurance to decision-makers, making it easier to commit to a project. Furthermore, funds can be used on a revolving basis, allowing for a single contribution to make more impact over the fund's lifetime.

Funds manage money provided by financiers and enable structural financing. The fund pot can be filled with debt (loans) and equity (shareholders' capital), as well as funds that do not need to be repaid (subsidies or donations). When both types of financing return to the fund pot, it is referred to as blended finance. A fund thus provides a way to raise and distribute money but is not a standalone source of funds. In other words, the fund needs to be capitalized. Funds have a clear organizational structure and are managed by a fund manager who determines the allocation of funds.

The benefits of a fund include:

- Ability to Raise Large Sums: Can raise substantial amounts, spread risks, and enable structural financing for capital-intensive and complex challenges.
- Facilitates Long-Term Project Financing: Can handle differences in timing between income and expenditures and compensate for early write-offs (stranded assets).
- Greater Spending Flexibility: Offers more freedom than public budgets, which are earmarked for specific purposes.
- Can Invest in Societal and Risky Projects: Public and public-private funds can invest in societal and risky projects, filling gaps where the market fails.
- Can Co-Finance the Initiation Phase of Integrated Projects.

Funds and investment platforms are not mutually exclusive but can complement each other and be combined for financing tasks. A fund can build on previous successful project financing through an investment platform and further develop the collaborations and coordination emerging from those processes.

4.3.7 Finance

Introduction

Blended finance is most commonly known for financing a project using financiers who can take on significant risk and ask for a low interest rate, such as the government. If things go well and the risk decreases, other financiers, such as commercial ones, step in; they take less risk and demand a higher interest rate. This involves mixed money—funds provided with both high and low risk. From traditional risk-return and impact thinking and acting, the focus is shifting towards outcome-oriented financing.[13,14] Blended finance, or better yet, outcome-oriented blended finance, fits within this framework.

In an increasing number of areas, there is a district portfolio where various public, private, and civil parties contribute funds. These contributors can also take different risks, but the money is blended in another way. For instance, the portfolio may contain funds earmarked for energy, climate, or specific environmental purposes like soil quality or biodiversity. These funds may come from different budget holders who need to allocate money locally, interlocally, or regionally. They see opportunities to invest this money in projects that benefit everyone. Mixed money means not only different risks but also different goals.

Outcome-oriented blended finance can boost new forms of care for and management of the area and its values, such as a PED. It can create financial space for supporting a multi-year program, as intended in the Environmental Planning Act, see chapter 4. In this framework, parties learn to integrate tasks, divide responsibilities, and maintain and generate multiple area values.

Existing financial instruments are usually designed to finance a project for a single stakeholder using that stakeholder's own resources. For example, if a stakeholder can get a loan for their project, that loan is the financial instrument. Integration requires financing forms where other stakeholders also play a role, such as when they jointly take out a loan. Investment platforms and funds specifically aimed at integration are emerging to prepare and arrange this.

An investment platform is not a financial instrument like a loan; rather, it is a method for organizing financing. Similarly, a fund is not an instrument; a fund can use instruments like loans to distribute money. Like investment platforms, funds can optimize financial flows and create new streams. They can enable the essential collaboration and integrated investment needed for integration. The following will focus on funds and their potential to support integrated projects.

Funds for Multiple Value Creation in Practice

There are few practical examples of (revolving) funds for multiple value creation. Existing funds often have broad spending purposes but do not necessarily address multiple purposes in the financed projects. These projects usually have a singular focus. Thematic funds are generally

[13] Bril, Herman and Schramade, Willem, Strengthening Investment Portfolios through Resilience – A Primer (December 18, 2023). Available at SSRN: https://ssrn.com/abstract=4667697 or http://dx.doi.org/10.2139/ssrn.4667697

[14] https://drift.eur.nl/nl/publicaties/waarde-voor-geld-synthese-transitiegesprekken-financiele-sector

less integrative compared to area-based funds. Funds may be established for financing a particular development and cease to exist once the area is developed. Other funds may be designed for infinite longevity as part of the success model.

Fund Formation

A fund can be structured in various ways. To establish a fund, several aspects are important. First and foremost, the fund must have a clear objective. Additionally, the following aspects need to be clarified:

Financiers

Who are the potential financiers?

The financiers to be involved depend on the anticipated benefits of the projects to be financed, their scale, and the timeline. Financiers can come from different sectors:

- Public Sector: This includes government bodies at various levels, such as ministries, provinces, municipalities, water boards, and executive organizations and services. The semi-public sector is also included here: organizations serving a public interest and largely funded by public funds, such as housing corporations, network operators, or the Bank of the Dutch Municipalities. These parties have societal goals that often align with investments in multiple value creation. In addition to financing projects, they can also fund projects by using existing funding streams.
- Private Sector: This includes all parties not in the public sector, such as companies, NGOs, and individuals. Private parties are particularly inclined to invest based on anticipated cost savings or revenue.
- Civic Sector: In addition to well-known financial institutions, both public and private, individuals are increasingly becoming financiers. Local citizen initiatives, for instance, are examples of integrated projects that raise funds from individuals through crowdfunding.
- Other Parties: Besides stakeholders directly involved, non-directly involved parties can also act as investors, provided the fund meets their financing conditions.

Financial Conditions of Financiers

What are the (financial) conditions of these financiers?

Each party will have different financial conditions. For public and civic parties, societal value typically outweighs financial benefits. For private parties, it is generally important that their investments are repaid over a certain period. Social return and financial return are both forms of return, but they measure different types of value and have different objectives. Social return is not directly about money but about the value an investment or project generates for society; social return can be challenging to express in financial terms. Financial return is the financial result of an investment, measured in monetary terms.

Fund Structure

What financing instruments are used?

There are several ways parties can contribute financially to a fund. We distinguish between instruments intended primarily for funding, such as subsidies, donations, or contributions, and instruments meant for financing, such as loans or capital contributions. Financiers are accustomed to using public money as leverage to attract private money, and vice versa. A new

leverage point is emerging: collective money used to obtain public funds, or the other way around. This third leverage can also be used to obtain private money from, for example, a commercial bank, or vice versa. This is a shift in the financial landscape that the government can leverage to accelerate the energy transition. Communities can help by mobilizing this money and offering the government opportunities for collaboration.

How Does the Money Flow?
Based on the available financial instruments, a structure for the fund can be designed. There are many ways in which money can flow into a fund, and the choice depends on the involved parties and their financial instruments. Money can be contributed to the fund through periodic or one-time subsidies, contributions, or capital investments, but also through loans or equity.

Project and Activities
What is the financing question?
It must be clear where the financing challenge lies. There should be a distinction between where funding and where financing are needed. Where are the current financial gaps for the projects to be realized? These could include stranded assets—assets that need to be depreciated more quickly due to changes in the spatial environment. Alternatively, the financing question could be more focused on non-material investments, such as financing process costs for bringing together different parties.

What project phase and activities are being financed?
Generally, projects are divided into four phases: the initiation phase, the design phase, the realization phase, and the management phase. The financing needs in these different phases vary by project. For integrated projects, there is often a financing challenge in the initiation and design phases because parties need to come together to develop an integrated plan.

What is the revenue model of the projects to be financed?
Some funds are primarily focused on attracting financing: loans that must be repaid from project revenues. Projects funded by the fund need to demonstrate what their revenues will be. These could include cost savings or innovative revenue streams, such as payments for carbon sequestration or outcome payments. Outcome payments are a way to raise money for an integrated project, with more examples including loans and bonds, which are classic financing instruments. Particularly with high societal value, governments and financial institutions are willing to offer favorable terms on interest rates, repayment periods, or guarantees. Application to integrated projects is still in its infancy. For instance, governments often still use subsidies for singular purposes rather than for integration. Banks, insurers, and charity funds also face the challenge of financing integrated projects and are learning how to address them.

Through the revenue that flows back into the fund, interest can be paid, and new projects can be financed: thus, the fund becomes revolving. These revenue streams can be mapped in various ways. By conducting a cost-benefit analysis, as outlined in chapter 3, long-term costs and benefits can be projected. Based on this analysis, a revenue model for the fund can be developed, possibly with the help of a financing ladder.

Design & Organizational Structure

At what scale?

Funds can be thematically focused on a set of challenges within a specific policy domain, such as a Green Fund or Climate Fund. These “challenge-driven” funds often operate at a supra-regional or national level. There are also funds for specific spatial developments, which could exist at local (neighborhood), urban, or provincial scales, think of a fund for a PED.

Terms of Investment

What is the timeframe? – Depending on the anticipated benefits?

Some funds finance (part of) the projects in their portfolio throughout the entire project duration. Other funds may only finance the realization phase and not the research or preparation phases. The management phase can also be part of the fund’s financing. There is also the possibility that funds are specifically established for a particular development. Once this development, such as the construction of a durable PED, is completed, these funds may be dismantled, with remaining money flowing back to the financiers.

What is the fund budget/number of projects?

Funds can differ based on the scope of the projects they finance. Some funds finance projects with a broad value potential, while others select their project portfolio based on a single challenge and typically finance projects with a singular societal contribution. In this context, a thematic fund such as a Green Fund or Climate Fund would fit.

What is the governance structure?

Funds can have different governance structures depending on the fund’s purpose, size, and legal structure. Common governance models include a Board of Directors, Investment Committees, or a Supervisory Board. Additionally, a fund manager must be appointed to handle the professional day-to-day management of the fund.

Types of Funds

There are various ways a fund can be structured. The fund structure heavily depends on the involved parties (public or private) and the underlying financing mechanism. Each party has a different interest in participating in a fund. Several characteristics determine the fund’s structure:

- Financiers: These may be public only, public-private, or public-private-civic.
- Financing Instrument: We distinguish between two types:
    - Funding: Subsidies, budgets.
    - Financing:
        - Debt: Providing a loan. These can be short-term loans (<30 years), which are more suitable for non-revolving funds, or long-term or even perpetual loans, which are better suited for revolving funds.
        - Equity: Providing money as equity in the project, in exchange for a stake in the project and dividend payments. These can be tradable or non-tradable loans or shares.
- Fund Structure:
    - Pooling Incoming Funds: Combining all incoming funds.

    - Distinguishing Between Funds from Different Sources: For example, keeping a portion of the subsidy separate for technical assistance and pipeline development.
- Repayment to Financiers:
    - Non-Revolving: Parties receive repayment and interest from the revenues of projects financed by the fund.
    - Revolving: The revenues from projects that flow back into the fund are used to finance new projects. Interest or dividends are returned to financiers, but there is no repayment or it occurs only after a very long period (>30 years). Financiers may be able to trade their debt (in the form of a bond) or equity in the fund, thus liquidating their stake and exiting.
- Project Financing Methods:
    - Standard Financing Conditions: Financing projects under standard conditions.
    - Impact-Based Conditions: Financing projects based on societal impact.
    - Financing Different Phases: Financing different phases of one or more projects.

4.3.8 Implementation

How to act based on the given ideas about economics, law, policy, governance, and finance? What is the implementation of these ideas in a PED? The answer to this question will not delve deeply enough to provide a toolkit. Instead, it outlines a methodology on which a toolkit can be developed at a later stage.

Economics

Determine the value of a multi-faceted investment using the following canvas, with an example of two values that can be stacked within the multi-faceted business case of a low-temperature district heating network. This network provides summer warmth in winter and winter cold in summer from an underground thermal storage system. A wind turbine owned by the community generates electricity for the heating network. In cases of excess electricity at negative prices, this electricity is converted into heat in the thermal storage system. This more efficient use of energy decreases the need for investment in generation capacity.

Step 1: Fill in the canvas

1) Which product is being delivered?

- Heating and cooling

1a) Is this a product that you can offer on the market?

- Yes

1b) Is this a product that you can deliver on behalf of or instead of the government?

- Yes

2) What other product can we deliver now that we're already working on the first one?

- Electricity that is used to produce heat and can be stored as heat

2a) Is this a product that you can offer on the market?

- Yes

2b) Is this a product that you can deliver on behalf of or instead of the government?

- Yes

3a) Do investment costs decrease now that we are delivering another product?

- Yes, less investment in generation capacity now that the wind turbine can add to storage

3b) Do usage costs decrease?

- Yes, the wind turbine makes operations cheaper

4) Do both products together deliver a better, new quality?

- Yes, heating and cooling and electricity amplify each other

5) Do yields increase with the addition of the new product?

- Yes, the heating network and the wind turbine are both more profitable

6) Now that we are learning to combine two products, are we ready for more?

- Yes, transaction costs have been incurred, which can pay off again

7) Do future partners see less risk now that we have learned to combine?

- Yes, this can lower the threshold

Step 2: Calculate the results from the canvas

Now that we know this

- To which market party or (semi-)government can I deliver?
- What is the approximate reduction in costs for investment and usage?
- What is the approximate increase in my revenue due to the new product and the mutual reinforcement between products?
- Which transaction costs do I not need to incur?
- How much does the reduced risk save me in financing costs?

Step 3: If a subsequent product, such as a battery or flywheel, arises, repeat Steps 1 and 2

Game

The following game, see also paragraph 3.3.2.6, can be helpful to make parties aware a what at PED is, and what it's business case and finance is:

The Game of the Positive Energy District

Each participant chooses one of seventeen interests that matter in a PED and looks for opportunities to connect their interest with the interests of other participants.

Series of societal interests represented by the participants:

1. New Construction
2. Renovation
3. CO2
4. Combating Grid Congestion
5. Charging Stations
6. Greening the Neighborhood
7. High-Temperature Residual Heat
8. Combating Heat Stress
9. Spatial Quality (e.g., integrating transformer houses)
10. Low-Temperature Heat (Aquifer Thermal Energy Storage)
11. Making Use of Existing Work (e.g., district heating in conjunction with sewer replacement)
12. Social Cohesion (e.g., energy cooperative)
13. Batteries
14. Electric Car Sharing
15. Combating Energy Poverty
16. Providing Flexibility and Aggregation
17. Solar Panels on Roofs

Four Questions After Connecting Interests during the Game of the Positive Energy District

Question 1: What are the five most telling chains of interests? Then split into five groups to analyse these chains.

Question 2: Analyse these chains How is the chain structured? What are the activities that make it up and how are they connected? Make a drawing thereof. Then choose a nice connection between two activities.

Question 3: Create the business case for two activities within the chain Try to create the business case for the connection between the two activities.

a) There are additional revenues due to the stacking of activities that would not otherwise exist.
b) Both activities can reinforce each other, or one can reinforce the other (this is not always necessary, and then there is only stacking).

c) The new activity can benefit from the investments (CAPEX) of the first, and vice versa. For these investments, both activities can compensate each other, but less than if each were to invest alone. The additional investment costs decrease.
d) Both activities can share their operating costs (OPEX), reducing the additional operating costs.
e) The resilience of the business case increases, and the cost of capital due to risk decreases.
f) Collaboration between both activities means more transaction costs. However, they learn together, and with each subsequent step, they benefit from this, and the transaction costs decrease further.

	Revenue from stacking	**Revenue from more efficiency**	**Marginal costs for investment**	**Marginal costs for operation**	**Marginal costs for finance**	**Marginal costs for transactions**
Current benefits from energy system	a	b	c	d	e	f
Extra profit from next step	<a	<b	<c	<d	>e	>f

Table 7: Cost – benefit analysis of multiple business case

a) Increases due to additional stacking
b) Increases when the additional stacking reinforces previous stacking
c) Decrease due to shared costs
d) Decrease due to shared costs
e) Decrease due to greater resilience
f) Decrease because much has already been learned together

Question 4: Who would want to pay for this and how? Return to the entire chain, but now with (hopefully) a better idea of the business case. Who would want to pay for this chain?

Law

- As an active user, resident, or business, establish an energy community for the PED when the benefits of collective action outweigh those of individual action.
- As a government, assess whether participation in the energy community for the PED is worthwhile, and consider if it is the government's role to take the initiative.
- Determine the best legal form for the energy community for all parties involved, especially for the government to be able to participate.
- Anticipate the introduction of more legal opportunities for sharing energy within the energy community for the PED
- As a government or governments, develop an energy program for the PED.

- Clearly communicate to your own staff, citizens, and businesses which policies can be implemented through the community and which can be implemented through the market.
- Clarify when the government can collaborate with active users within an energy community and the conditions the community must meet.

Policy

In a PED, discussions about the use of an energy community or an investment platform can help public, private, and civil parties develop ideas for formulating policies for the energy transition. The platform is a lighter form of organization compared to the energy community. The establishment of a legal entity is required for the energy community, whereas an investment platform might be sufficient with a covenant or a Memorandum of Understanding (MoU). This document will outline who is involved, include a clear mission statement, define roles and responsibilities, and set KPIs.

When establishing an energy community or setting up an investment platform, the following three steps can be helpful to get them up and running:

Step 1: Stakeholder Analysis

Which stakeholders need to be involved at the neighborhood, regional, and national levels? An analysis is necessary to gather data on barriers to investment and criteria for participation. Consider selection criteria such as:

- Legitimacy
- Actual and potential influence
- The urgency they assign to the problem
- Practical considerations
- Inclusivity

Step 2: Appoint a Coordination Team

Participants in the investment platform appoint a coordinator who is responsible for developing and periodically updating an action plan. To create this plan, an inventory of potential business cases is required.

Step 3: Development of Integrated Business Cases

The coordinator prepares potential integrated business cases. The challenge is to align different investments, create financial solutions by combining projects, incorporate CO2 reduction in project prioritization, and involve unusual stakeholders, such as insurance companies.

The investment platform, and particularly the energy community, can lead to joint investments. These investments may serve as the foundation for a shared energy system, where parties provide proactive and real-time flexibility during periods of energy surplus or scarcity within the limits of the connection to the energy grid. Several investments are then evident:

Infrastructure Development

- Implementation of smart meters: Invest in the installation of smart meters, renewable energy sources (such as solar panels), and energy storage systems within the community.
- Smart Grids and Storage Systems: Investments in smart grids, energy storage systems, and renewable energy installations.

Technology Implementation

- Blockchain-based platforms: Develop and implement a blockchain-based platform and smart contracts to facilitate peer-to-peer (P2P) trading.
- Advanced infrastructure: Implement advanced metering infrastructure, energy management systems, and communication technologies.

Community Education

- Educate community members: Teach community members about the benefits and mechanisms of P2P trading to encourage participation and trust.
- Engagement and understanding: Educate and engage community members to actively participate and understand the benefits of flexibility services.

Governance

- Assess the impact of new technology: As administrators, stakeholders, and service providers, consider how new technology affects the governance of a government, company, or community. Determine, for example, who should own equipment based on this technology, as well as data ownership and its impact on governance.
- Be aware of co-benefit stakeholders: Be alert to stakeholders who benefit from your actions. If these co-benefits are valuable to them, they may want to co-invest in subsequent steps to enhance these benefits.
- Invite participation: Encourage other parties to join investment platforms to align, structure, accelerate, and expand multiple investments. If the platform requires a more formal structure, consider jointly establishing a fund for multiple investments.
- Leverage community strength: Look for ways to harness the strength of the community to develop solutions that benefit everyone. If a solution is better for a government, offer to take on the work. Signal to the community that it can propose taking over government tasks if it can perform them better. Be mindful of procurement law as a government entity.

Finance

Studies by the Dutch Council for the Living Environment (RLI) on transition financing and government and market failures indicate that governments need to be more proactive and less passive in facilitating and stimulating multiple transitions.[15.16] Recommendations for governments include taking on one or more of the following roles:

[15] https://www.rli.nl/sites/default/files/Systeemfalen%20in%20het%20leefomgevingsbeleid%20-%20december%202023_0.pdf
[16] https://www.rli.nl/publicaties/2022/advies/financiering-in-transitie

1. Provide incentives to reduce risks: Such as partial risk guarantees, insurance, and warranties.
2. Enhance multiple returns: For example, through standardization and framework-setting.
3. Build public-private-community partnerships: For instance, by participating in projects or programs at the area level.
4. Adopt new financing mechanisms: Such as concessional and social loans, and subsidies.
5. Tailor government contracts and orders: To address multiple objectives, for example, by taking on program responsibility.

There are various government instruments that can be effective in leveraging public capital to unlock blended finance for multiple projects. It is recommended to use one or more of the following instruments:

1. (green) infrastructure funds linked to ecosystem services
2. Loan guarantees
3. Tax incentives
4. Seed financing programs
5. Venture capital matching programs
6. Innovation funds
7. Public equity funds
8. Revolving funds
9. Challenge funds
10. Preferential returns (if applicable or not by the government)