COST Action 19126

Positive Energy Districts European Network

Deliverable 1.1

Database of existing PED projects and innovations

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Executive Summary

DISCLAIMER: This document summarizing the framework and plan of development of the open PED Database was prepared on 30. 6. 2021. As of 28. 2. 2022 the development of the database entered final preparatory phase after a comprehensive alignment with partner initiatives IEA Annex 83 and JPI Urban Europe. Therefore, some parts of this document are no longer up to date. For more definite information about the PED Database framework please consult refer to the following Article: Turci, G.; Alpagut, B.; Civiero, P.; Kuzmic, M.; Pagliula, S.; Massa, G.; Albert-Seifried, V.; Seco, O.; Soutullo, S. A Comprehensive PED-Database for Mapping and Comparing Positive Energy Districts Experiences at European Level. Sustainability 2022, 14, 427. https://doi.org/10.3390/su14010427.

Changes implemented on 28. 2. 2022: Changed chapter numbering and chapter overview in the text of Introduction, removed text colouring in Chapter 6 and Annexes.

The Database of the Positive Energy Districts (PED Database) is the deliverable of the Task 1. 1 Create a comprehensive PED database by mapping existing concepts, strategies, projects, technological and non-technological innovations related to PEDs in Europe, part of the Working Group 1 (WG1) PED Mapping, Characterisation and Learning.

The PED Database is envisaged as open online resource for two primary target groups: (1) research community and (2) municipalities and practitioners active in PED project implementation. Its aim is to uphold one of the main aims of the COST Action, i.e. to maximize the benefit to target groups in terms of advancing scientific, technological or social knowledge as well as the added value generated by networking at pan-European level and beyond.

This document summarizes the work on the development of the PED database framework within the period from 11/2020 to 6/2021. The online database solution is yet to materialize. As of 6/2021 the pilot testing of the information collection questionnaires has started.

This database is conceived by following these three main actions:

- **Mapping**: sharing experiences and progresses on PEDs research among experts in both administrative and in the energy and construction sectors;
- **Framework definition**: consolidation of some common definitions, requirements, indicators (KPIs) and methods to evaluate the possibility of implementing these districts in different contexts (e.g. new construction/existing districts, Northern Region/Mediterranean Area, etc.);

Database implementation: dissemination of knowledge, concepts, skills and solution through a web platform tool in order to pave the way for further capacity-building creation with reference to the major domains of PEDs (scientific, technological, social, economic and regulatory innovation and breakthroughs), and based on the identification and filtering of the driver information (database input) able to accelerate and to engage public authorities in the implementation of PEDs.

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Introduction

The Database of the Positive Energy Districts (PED Database) is the deliverable of the Task 1. 1 Create a comprehensive PED database by mapping existing concepts, strategies, projects, technological and non-technological innovations related to PEDs in Europe.

The aim of this deliverable is to provide the conceptual framework and the first building block to the PED Database that will be developed throughout the continuation of the Action.

The PED Database is envisaged as open online resource for two primary target groups: (1) research community and (2) municipalities and practitioners active in PED project implementation. Its aim is to uphold one of the main aims of the COST Action, i.e. to maximize the benefit to target groups in terms of advancing scientific, technological or social knowledge as well as the added value generated by networking at pan-European level and beyond.

This document summarizes the work of the team of Task 1.1 lead by Beril Alpagut (Demir Enerji) on the development of the PED database framework within the period from 11/2020 to 6/2021. It includes the following chapters: 1) PED Database Framework, 2) PED Database Glossary, 3) Information and data collection for the PED Database, 4) The online IT solutions, 5) Vision for the long term development of the PED Database, 6) Data ownership, Data protection, Intellectual property rights, 7) Contacts, 8) Annexes:

- ANNEX I_ PED / PED-RELEVANT CASE STUDIES SHEETS
- ANNEX II_ GENERAL PROJECTS or INITIATIVES SHEET
- ANNEX III_ TECHNOLOGICAL INNOVATIONS SHEET
- ANNEX IV_ NON-TECHNOLOGICAL INNOVATIONS SHEET
- ANNEX V_ PED DATABASE GLOSSARY of DEFINITIONS

The online database solution is yet to materialize. As of 6/2021 the pilot testing of the information collection questionnaires has started.

1. PED Database Framework

This Section is based on a draft Conference Paper submitted for the SEB21 conference titled *A comprehensive PED database for mapping European PEDs insights*.

1.1 The Aim of the database

Within WG1, the activities of Task 1.1 are focused on creating a comprehensive PED-Database as an interactive, updatable and user-friendly tool by mapping existing concepts, strategies, projects, technological and non-technological innovations related to PEDs in Europe. The database is developed for non-commercial purposes and shall be openly accessible.

The PED database's design pursues the following scopes:

1. Co-creation of a PED innovation eco-system that, moving from the agreed definition, will uncover information and indicators (both expected and/or assessed performances), and facilitate the implementation of PEDs around Europe.

2. Systematization of the information in order to address specific needs and targets from an inclusive set of stakeholders engaged in each phase of the PED implementation process.

3. Supporting the creation of capacity building, based on a wider knowledge from innovation and lessons learnt to overcome barriers and take advantage from opportunities derived from the advanced mapping of solutions and performances obtained in previous or ongoing experiences on PEDs.

4. Envisioning of needs (demand aggregation) and expected strategies to adopt (scenarios of intervention) for a more effective energy planning process and decision-making, able to promote and facilitate the achievement of large scale conscious sustainable urban areas.

5. Supporting municipalities and researchers in the PEDs implementation process, considering both the renewal of existing areas and the realization of new sustainable, energy efficient and carbon free urban development.

The PED-Database framework is configured as a multidisciplinary and open tool, that starts from the aggregation and systematization of the gathered information, then returns a set of multiple features related to the PED concept, including both technological and non-technological innovations. Therefore, the designed framework is systematized in a way that the information collected would turn into a whole picture of case studies and implemented projects.

This database is conceived by following these three main actions:

- **Mapping**: sharing experiences and progresses on PEDs research among experts in both administrative and in the energy and construction sectors;

- **Framework definition**: consolidation of some common definitions, requirements, indicators (KPIs) and methods to evaluate the possibility of implementing these districts in different contexts (e.g. new construction/existing districts, Northern Region/Mediterranean Area, etc.);

- **Database implementation**: dissemination of knowledge, concepts, skills and solution through a web platform tool in order to pave the way for further capacity-building creation with reference to the major domains of PEDs (scientific, technological, social, economic and regulatory innovation and breakthroughs), and based on the identification and filtering of the driver information (database input) able to accelerate and to engage public authorities in the implementation of PEDs.

The PED-Database is conceived as a cross multidisciplinary contributions between COST Action Working Groups and it foresees the alignment with both IEA-EBC Annex83 and JPI Urban Europe, which are other international initiatives that are focusing on PEDs implementation. We can summarize the database realization in two main phases (see **Figure 1**): the first one is aimed at defining PED Database general framework and at mapping PED projects and initiatives among all COST Action partners. The second phase, using the developed framework, is focused on PED-Database implementation starting from mapped PED project and initiatives.

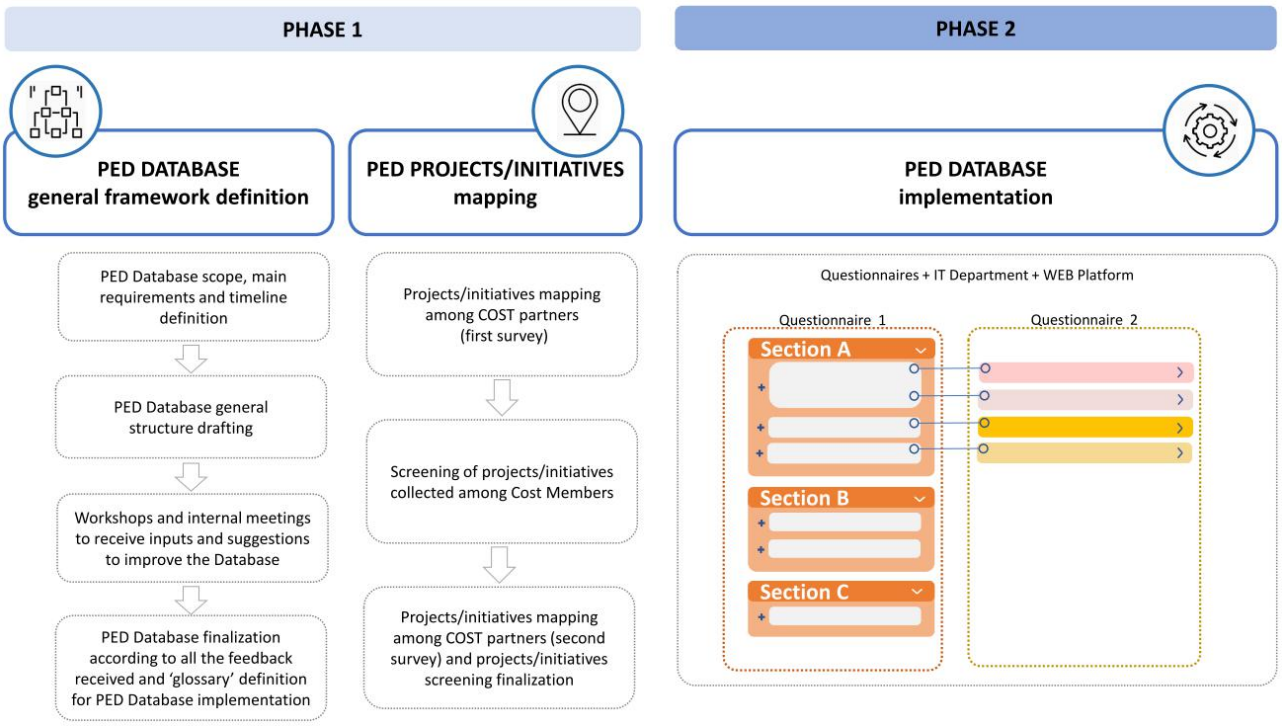

Figure 1: PED-Database working phases

In the first phase, the WG1 works in parallel on the definition of the PED-Database general framework and on the mapping of PED projects and initiatives among all COST Action stakeholders. **Figure 1** shows the step-by-step implemented process during the first phase. As a first step, in order to define PED-Database scope from specific target groups and main requirements, a first workshop among WG1 partners was held collecting some ideas, expectations and possible directions. Then, Task.1.1, moving from this wish list, performed a comparative analysis of different relevant databases and platforms to understand which kind of structure and content PED-Database should have to meet key stakeholders needs. Meanwhile, in order to proceed aligned with JPI Urban Europe and IEA-EBC Annex 83, different meetings and document exchanges were performed.

These first steps led to the definition of a first schematic structure of the database, the so-called "Big Picture", with the support of IT experts, which allowed to start discussing new inputs received and implementing other categories and data.

Then, different meetings and workshops were performed with the intent of integrating new inputs and suggestions to improve PED-Database and aligning the work. Finally, PED-Database was finalized according to all feedbacks, together with an adjunct "**glossary**" as guideline for supporting its implementation.

In parallel, a table was shared among all COST members and they were asked to collect PED relevant initiatives and projects in which they were involved or in which they collaborated. For this purpose, the used PED-relevant projects' definition is *district-level projects with high level of aspiration in terms of energy efficiency, energy flexibility and energy production. The projects (its demo sites/case studies) do not necessarily have to meet annual energy positive balance if they meet at least several other major aspects of the JPI UE PED Framework definition* [18].

According to such collection, the screening was performed identifying the following projects and initiatives categories: **PED-focused** (related to PED implementation), **PED-relevant** (not directly focused on PEDs, but that collect experience assimilable to PED concept, such as Energy Communities, Smart Districts, Local Energy Districts), **Not PED-relevant/focused** (focused on a single technology/concept) and **Not enough advised PED** (not easy to categorise because we miss some significant info).

A second survey was then carried out in order to collect projects' information not included in the first mapping survey. As a last step, the complete projects and initiatives screening was performed according to the above-mentioned categories.

1.2 Methodology

1.2.1. Review of the existing database solutions

In order to understand what structure and which contents and functionality the PEDs Database could have, a preliminary analysis of some already existing databases and platforms were performed. Some key questions were investigated: what are Databases/Platforms purposes? What format do they have? What information do they collect? What search options do they offer? What are the options for extrapolating information (paper card, interactive map, charts, diagrams)? To whom are they addressed?

According to this investigation the following parameters were collected and reported in Table 1 below:

- Title;
- Basic info (year of realisation, financing programme, format and main targeted users);
- Scope;
- Main contents;
- Link to the website.

Table 1: Review of the existing database solutions

TITLE	BASIC INFO	SCOPE	CONTENTS	LINK
PEDs BOOKLET	**Year** 2020 **Programme** JPI Urban Europe **Format** Paper format **Users** Municipalities	The Booklet collects 59 pilot case studies at the district scale aimed at activating sustainable urbanization processes in a logic of maximum energy efficiency. It is structured in two sections: (1) PEDs projects, (2) Towards PEDs. Each section is divided in: Projects in Operation, Projects in Implementation Stage and Projects in Planning Stage.	**Booklet - structure:** **- General information** (City, project name, project status, project start-end, contact, project website, size of project area, building structure, land use, financing); **- Overview description of the projec**t; **- Strategies** (goals/ambition, indicators/expected impact, overall city strategies, factors included in implementation strategies, innovative stakeholder involvement strategies, typology of energy supply); **- Success factors**; **- Challenge/barriers**;	https://jpi-urbaneurope.eu/app/uploads/2020/06/PED-Booklet-Update-Feb-2020_2.pdf
OPPLA: Repository of NBS	**Year** 2016-2020 **Programme** OPPLA **Format** Digital format **Users** Public, private and voluntary sectors; large and small organisations, as well as individuals	OPPLA is an open platform and it provides: - **Knowledge Marketplace**, where the latest thinking on natural capital, ecosystem services and nature-based solutions is brought together; - **Ask Oppla**, a crowd-sourced enquiry service, where members of the Oppla community help to answer each other's questions. - **Oppla Community,** an easy-to-use system for networking with other members from around the world. - **Case study repository,** an integrable platform containing example of NBS application.	**Repository - research options:** - Scale - Type **Repository - structure:** - Objective; - Actions; - Lessons learned; - Financing; - Challenges: - Benefits; - Stakeholder - Participatory Planning; - Success and Limiting Factors; - Monitoring and evaluation; - Contacts; - Further information.	https://oppla.eu/case-study-finder
URBAN NATURE ATLAS	**Year** 2017-2021 **Programme** NATURVATION	URBAN NATURE ATLAS contains 1000 examples of Nature-Based Solutions from across 100 European cities.	**ATLAS - research options:** **-** Quick Search by icon (key challenges, urban setting, project cost) -; - Advanced Search - below the map - to identify the projects fitting your interests. **ATLAS - structure:** **- Brief description** (location, city population, project duration, project cost, financing source(s)) **- Overview** (urban setting, key challenges,	https://naturvation.eu/atlas

	Format Digital format **Users** Not specified		main beneficiaries, project objectives, implementation activities); - **Governance** (type of organisation, management set-up, community involvement, details on the roles of the organisation involved in the project, Project in response to...an EU policy or strategy?...a national policy or strategy?...a local policy or strategy?) **- Monitoring** (Expected impacts, details on impacts and indicators usage, presence of formal monitoring system, presence of indicators, presence of evaluation reports, availability of a web-based monitoring tool)**;** **- References**	
C40 CASE STUDIES	**Year** / **Programme** C40 Cities Climate Leadership Group **Format** Digital format **Users** Not specified	C40 CASE STUDIES describes some pilot projects developed in cities which are taking bold climate action, leading the way towards a healthier and more sustainable future.	**C40 Case studies - research options:** - location; - topics; - collection; - benefits; **C40 CASE STUDIES - structure:** **-Title** (brief description, image) - **Benefits** (social, environmental, economic) **- Details** (key impact, project start date); **- What is the project? How does it works?**: **- What are the CO2 reduction goals**; **- Next steps**	https://www.c40.org/case_studies
CASE STUDIES: STORIES FROM NEIGHBORHOOD	**Year** / **Programme** ECODISTRICTS certification standard **Format** Paper format **Users** Not specified	Browse case studies on Ecodistricts from around the world, capturing how neighborhood-scale innovation can drive the development of neighborhoods for all.	**Case studies - structure:** **- Title;** **- Date;** **- Snapshot** (Project type, site size, demographics, economy, anticipated outcomes, key stakeholders); **- Neighborhood overview;** **- Project governance;** **- Early wins** (place, health and wellbeing, connectivity, living infrastructure, resource regeneration) **- Lesson learned + continued challenges;** **- Next steps**	https://ecodistricts.org/case-studies-stories-from-the-neighborhood/
NEIGHBOURHOOD planning +design Learning from best practices	**Year** 2017 **Programme** UBC Stadium Neighbourhood **Format** Paper format	Examples of best-practice neighbourhood design to help unearthing new ideas and assessing potential policy and design possibilities for the Stadium Road	**Best practices - criteria to choose them:** - a latitude similar to Stadium Road Neighbourhood (to ensure similar climate and sun access between buildings); - all but one of the case studies are recent projects (to ensure contemporary construction technologies etc.); - half are located in nearby cities to maximize the potential for local solutions. **CASE STUDIES - structure:**	https://static1.squarespace.com/static/5b914e3150a54fa3b80cc160/t/5b92c1a889858368 5e7f9b23/1536344503815/Case+Studies.pdf

	Users Community and designers who take part in the participatory design process of the neighbourhood	neighbourhood, Vancouver (USA).	**- Title;** **- Site area dimension;** **- n. dwelling units;** **- Construction period;** **- Project overview;** **- Lessons learned** **- Adopted solutions/strategies** (resources+natural systems, place+experience, convenent connection, social cohesion+community) **- Photos;** **- Maps;** **- Comparative capacity** (density, building type)	
SMART SCALE: CITIES TO WATCH 25 Case Studies	**Year** 2020 **Programme** World Economic Forum - Community Paper **Format** Paper format **Users** Not specified	Examples of successful smart city solutions to leverage critical success factors and to move forward smart, sustainable and innovative initiatives and projects	**25 CASE STUDIES - key themes:** - governance and policy; - society; - infrastructure and services; - environment; - business and economy. **25 CASE STUDIES - Sheets' structure:** - what - why - how - scale (implementation in another context)	http://www3.weforum.org/docs/WEF_Smart_at_Scale_Cities_to_Watch_25_Case_Studies_2020.pdf
SCIS (Smart Cities Information System) Platform	**Year** 2020 **Programme** Funded by European Commission **Format** Paper format Digital format **Users** project developers, municipalities, research institutions, industry, experts and citizens from across Europe.	SCIS is a knowledge platform to exchange data, experience and know-how and to collaborate on the creation of smart cities, providing a high quality of life for its citizens in a clean, energy efficient and climate friendly urban environment	**Case study repository - research options:** - Filter by Project type - Filter by Energy - Filter by Mobility and transport - Filter by ICT - Filter by Country/City - Filter by Funding programme **Case study repository - structure:** **- Facts and figures** (geographical area, demonstration area dimension, population in the area, total investment, funding from EU, Final energy savings, primary energy savings, CO2 emission reduction); - **Energy efficiency in buildings** (retrofitted area, newly built area, investment, payback period, final energy demand, CO2 emission reduction, energy supply); - **Key impact;** - **Type of technologies** (energy efficiency in buildings, energy system integration, mobility and transport, ICT); - **Lesson learned** (barrier, solution, challenges, best practices)	https://smartcities-infosystem.eu/sites/default/files/document/the_making_of_a_smart_city_-_best_practices_across_europe.pdf

As can be seen from the table, no existing interactive database on PEDs was identified till now. Only PED Booklet, second version drafted in 2020 by JPI urban Europe, collects PEDs case studies in paper format.

The other analysed databases collect strategies, case studies, projects, solutions and technologies related to sustainability, energy efficiency and resilience in the urban environment. Their analysis,

combined with workshops and meetings with CA partners and relevant stakeholders, was a fundamental tool in order to define the general structure of the PED Database and its different sections ("PED / PED-relevant Case study and PED Lab sheet", "Project and Initiatives sheet", "National Policies and Strategies sheet", "Technological innovations sheet" and "non-technological innovations sheet").

1.2.2. Review of the existing database solutions

In order to identify main PED Database objectives, requirements, target groups and value some workshops among CA members were organised and different alignment meeting with other PED initiatives, such as JPI Urban Europe and IEA-EBC Annex 83, were performed. This work allowed to define Database's schematic structure (see **Figure 2: PED-Database "big picture"**), the so-called "Big Picture", and to start discussing and implementing the received inputs in the Database.

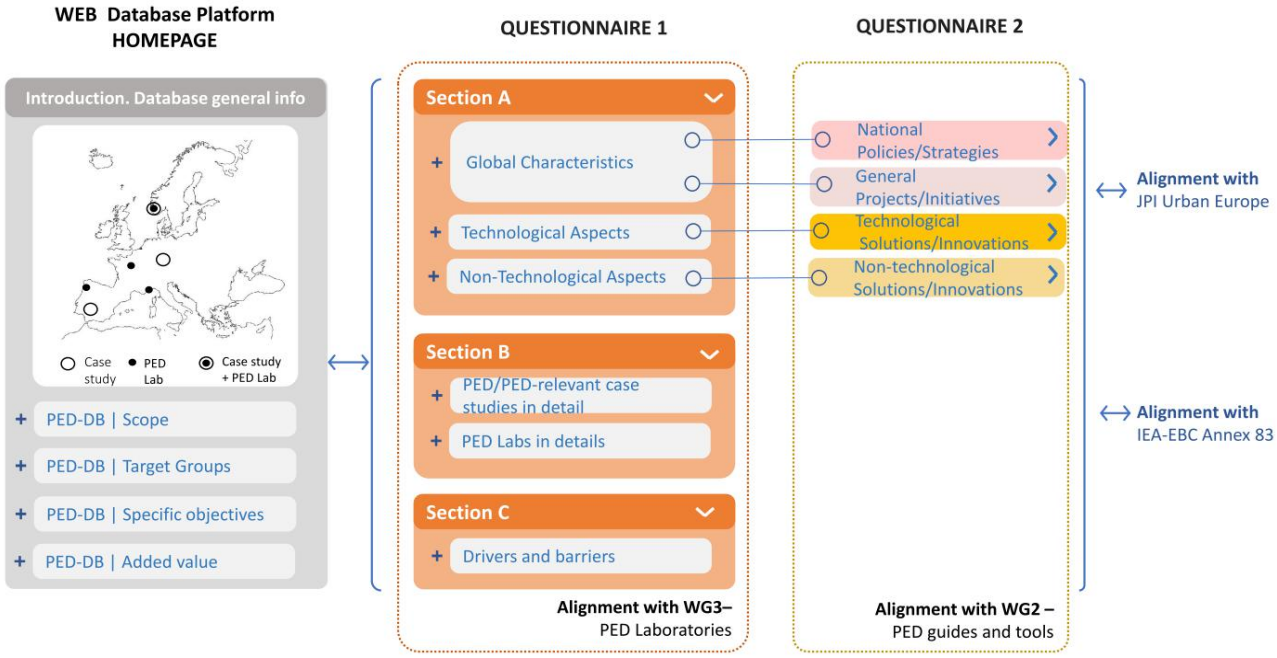

Figure 2: PED-Database "big picture"

As shown in the Figure, the Database is conceived as an online interactive platform, where the homepage is structured as an opening section to the Database with the definition of:

- main scope: the DB aims to devise methods to characterize PEDs and to recommend concepts, solutions, strategies and best practices for PEDs implementation in different contexts;
- specific objectives: the DB aims at collecting information from ongoing PED projects, fostering sharing of competences, investigating barriers and challenges, showcasing viable, feasible, realistic and replicable solutions;
- target groups: the DB addresses mainly to municipal representatives, including those that are new to PED concept and to researchers and expert practitioners;
- added value: the DB is meant to be updatable, interactive, user friendly tool able to map, visualize, search, filler and compare results.

In PED-Database homepage is possible to visualise a list of geo-referenced PED-focuses and PED-relevant Case studies and Labs. Each case study and lab that is referred to the European map is indicated with a symbol. When a symbol is clicked on, a template called “PED / PED-relevant Case Studies + PED LABs in Common” appears on the screen for visualizing detailed information. From this sheet is possible to access both to a more general level of information collecting ‘Project or initiatives’ sheets and ‘National level policies and strategies’ sheets or to a more specific level of information collecting ‘Technological and non-technological innovations’ sheets.

1.2.3. PED / PED-relevant Case Study Sheets

PED-Database is intended to be an online disruptive platform tool that is updatable, interactive, user friendly and that will help the end-user to map, visualize, search, filter and compare results. Since, collecting information from ongoing PED projects; fostering sharing of competences; investigating barriers and challenges are targeted, showcasing solutions that are viable, feasible, realistic and easily replicable will be organized within PED-Database. The selection of the main assessed information and KPIs is based on a holistic and exhaustive methodology which highlights the multiple dimensions when talking about PED, whose definition and characterization is quite open in the context of the on-going international debate. Hence, this is handled by identifying the main categories that allow addressing its multidimensionality nature and the specific insights from each project and initiative according to an inclusive adherence to the PED approach definition in the EU countries.

The main page of the PED-Database displays a list of geo-referenced PED-focused, PED-relevant and PED-LAB projects that are collected from CA19126 partners: 65 projects and initiatives were collected in total. Each case study or LAB located in the European map is indicated with a symbol. When a symbol is clicked on, a template called “Section A- PED / PED-relevant Case Studies + PED LABs in Common” appears on the screen for presenting the information. General information regarding PED site definition, project phase, location, climate zone, project target, district boundary identification, land area, ownership, description of the existing and planned infrastructure including technological and non-technological aspects, fields of application, quantitative data of PED balance (both energy demand and generation) and monitoring, standardization and tools applied can be reviewed on the screen. This Section has linkages to Section B1_PED / PED-relevant Case Studies in detail sheet which displays more information of PED concept and motivation behind design/implementation, population density and project environment. Section A has also connection with Section C Drivers and Barriers. Figure 1 presents the information gathered in the “SECTION A _ PED / PED-RELEVANT CASE STUDIES + PED LABS in COMMON”. All PED Database Case-Study Sheets are presented in Annex I in detail.

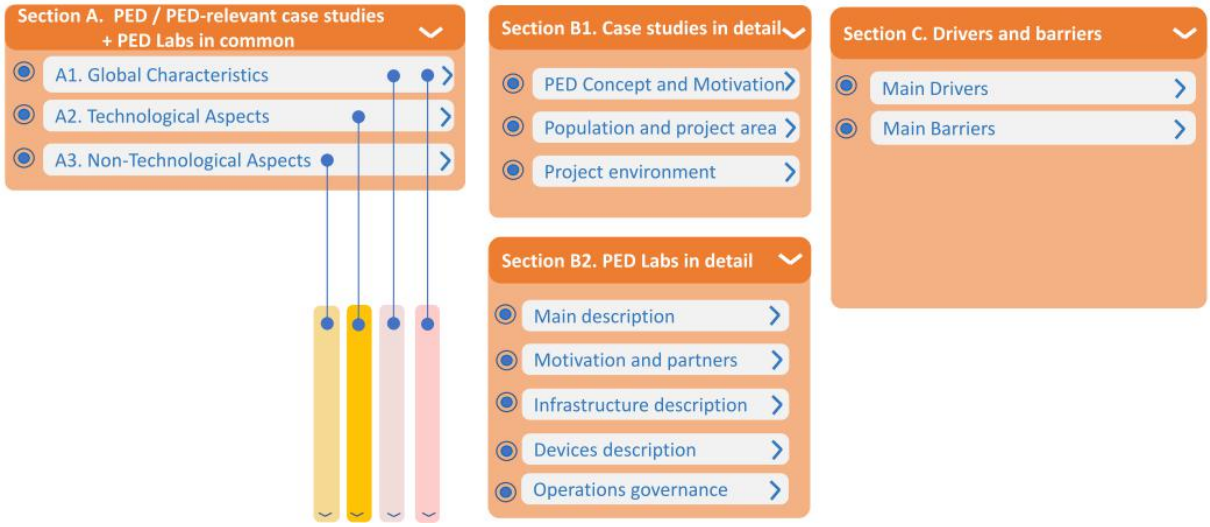

Figure 3: PED-Database "Case Study sheets"

1.2.4. Reference Projects or Initiative Sheet and National Policies and Strategies Sheet

Section A of PED / PED-relevant Case Studies + PED LABs in Common sheet is also linked to "Reference Projects or Initiative sheet" and information regarding objectives of each project, funding model, upscaling strategies and expected impacts can be shared within the template. On the other hand, Strategies at national and territorial levels can also be detailed at a different template called "National Policies and Strategies Sheet". The national strategies sheet will be developed in the next months by potential STSM partners of COST working for WG1.

All secondary questionnaires are illustrated in Figure 4 below.

Figure 4: PED Database General Projects or Initiatives, National Policies and Strategies, Technological & Non-Technological Innovations Sheets

General Projects of Initiatives Sheet is presented in Annex II in detail.

1.2.5. Technological Innovations Sheet

The user is also guided to detail the technology groups (which may define a PED) by linking to the "Technological innovation and non-technological innovation sheets". In the Technological innovations sheet, technology groups can be listed under energy, ICT and mobility sectors, defining an energy system and presenting detailed information on target-built environment, energy system, mobility system, infrastructure and stakeholders' engagement phase. Moreover, innovative business models are accompanied by the energy system information, according to the replication potential, lessons learnt and links to the existing commercial market/project. The figure above also displays the contents of the Technological Solutions Sheet. This sheet will be developed after alignment with WG2 Technical and Non-technical Tools.

Technological Innovations Sheet is presented in Annex III in detail.

1.2.6. Non-technological Innovations Sheet

At the Non-technological innovations sheet, sector of each technology, such as social and civic participation, governance, economic, planning & design key figures, scale, involved stakeholders, replication potential and lessons learnt are also included. Figure 4 above also displays the contents of the Non-Technological Solutions Sheet. This sheet will be developed after alignment with WG2 Technical and Non-technical Tools.

Non-Technological Innovations Sheet is presented in Annex IV in detail.

1.2.7. Other information collection sheets to be implemented

Another section/table of the database envisaged will cover the National level strategies and policies. The respective sheet will cover following main categories/questions. The questions were pre-selected to reflect pre-identified national structural conditions serving as PED enablers. Below is the non-exhaustive list that shall be further developed into full list of parameters and reviewed by COST participants.

- Definitions of PED/similar projects in national regulations and standards – if there is one, where is it to be found. If none is available, what are the other relevant definitions in place or legislation prospects?
- What is the level of regulatory act – in some countries it can be a legislation passed by Parliament etc. but in others it can be just a directive of an energy regulator…
- Which office/authority is the relevant policy-making body that decides on the PED regulation and may support/supports its implementation?
- Market conditions: heat and electricity prices? Competition and monopolization trends in energy production and distribution services.
- Financial conditions – Are there subvention programs available? Are there any dedicated funds? Are they based on direct support/state agencies/private subjects (e.g., financial sector)? Are there any dedicated financial instruments?
- What is the general relation to the city planning (regulations, practices, support schemes for developers, etc.)?

- Who are the main stakeholders/actors being taken into consideration/preferred in the national context?

Work on this section is expected to start in the second half 2021.

2. PED Database Glossary

The Glossary's main purpose is to provide definitions and references to enable better consistency of the data and information collected for the PED Database. The Glossary will be provided to the respondents during the information collection process in order to avoid confusion during the self-filling of the online questionnaire.

Glossary v1.0 is attached to this Deliverable as Annex V. Contribution from WG2 and/or WG3 is still needed to develop the glossary. Once completed it will be included as integral part of the glossary.

3. Information and data collection for the PED Database

To fill in the information about the projects into the Case study sheets, the information and data collection process is outlined as having three stages plus a pilot stage.

Table 2: Data Collection Process stages

Stage	Activity	Result	Format	Who performs	Accessibility
0 (6/2021)	Pilot testing with 3-5 case studies	Verified questionnaire, initial data	Word feedback	Task leader and volunteer case study contact persons	Designated contact persons for projects + T1.1 team
1 (9/2021)	Self-filling of the information into online questionnaire (based on CIEMAT platform)	Raw data from the questionnaires	Spreadsheets	COST Action Member/other designated person responsible for the given project/case study	Designated contact persons for projects + responsible leaders
2 (autumn 2021)	Any inconsistencies/unanswered/unclear answers shall be clarified by the responsible person with the person that filled in the questionnaire	Cleaned data in the internal COST Database	Spreadsheets	Task leader/designated reviewers from all WGs, together with the person collecting data; responsibility to be assigned	To all COST Action members ASAP (Read-only)
3 (autumn 2021)	Upload to the open database from the csv or other compatible format	Cleaned data	Website embedded database	COST Action Member with Database editing rights	Public

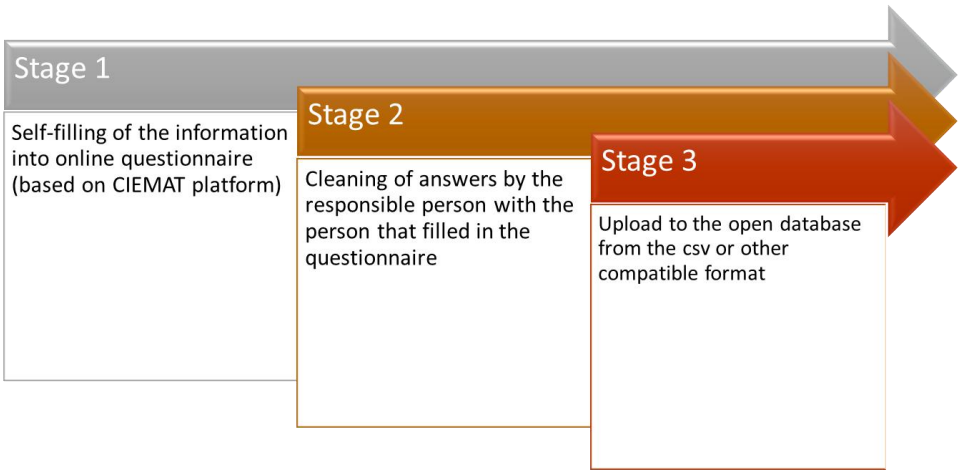

Figure 5: Stages of information collection on PEDs

4. The online IT solutions

The online solution is divided between the online questionnaire and the final open online PED Database embedded into the PED-EU-NET website.

4.1. Tool for the initial data and information collection (Relevant to stages 1 and 2)

CIEMAT online platform: open online tool for questionnaire administration developed by CIEMAT Information Technology Department within the scope of Working Group 3. Based on the arrangement this platform is foreseen to work also for future information collections (several rounds are anticipated) and for upscaling of the information collection with regard to other collection sheets (technology sheets, national strategies etc.).

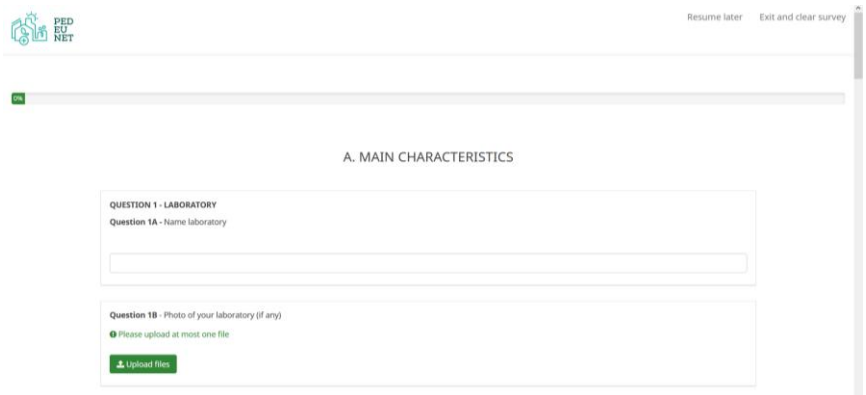

Figure 6: Screenshot with example of the CIEMAT platform (to be adapted based on each round of information collection)*

For the future collections other alternatives to this online questionnaire may be employed, including EU Survey that has been regularly used by other H2020 projects (e.g. SPARCS, SCALE). The advantage of the CIEMAT solution is the possibility to tailor its content directly to the needs of the COST Action.

4.2. The open online PED Database embedded into the PED-EU-NET Cost Action website (relevant to Stage 3)

The online solution of the web embedded database is part of the delivery by the provider of the website solution procured by the Grant Holder. The table below summarizes the initial list of requirements that was submitted to the supplier of the solution.

Title	Backend/frontend	Priority level
Overall design	General	Must-have
Data gathering	General	Must-have
Simple relational Database, compatible with SQL	Backend	Must-have
Multiple user access	Backend	Must-have
Differentiated editor rights	Backend	Must-have
Filesystem (for pictures) provided	Backend	Should-have
Hosted together with the website	Backend	Should-have
OpenAPI standard	Backend	Could-have
Interactive map of projects	Frontend	Must-have
User friendly design	Frontend	Must-have
Embedded into PED-EU-NET web page	Frontend	Must-have
Supporting exports to xls, pdf	Frontend	Must-have
Possibility to customize the data shown based on multiple parameters	Frontend	Must-have
Possibility to customize the data shown based on target group (municipality x researcher)	Frontend	Could-have
Possibility for user to access/browse individual DB tables	Frontend	Must-have
Automatic upload from a questionnaire (xls)	Backend	Should-have

Table 3: Requirements communicated to the external IT solution provider by WG1 leader (3/2021)

5. Vision for long term development of the PED database

The Action will run until the end of 2024 and the leadership has been assessing the options of maintaining the database after that. The COST Action website needs to be kept open and data available for two years after the end of the COST Action.

After the end of the COST Action it might be possible to transfer the database to another host e.g. European Energy Research Alliance or other European initiatives that the CA works closely with. Key factor will be the capacity to maintain the open and living database. If the database

is transferred, there shall be a link made from the original website so that someone looking for the results of the database can get access to the updated one.

6. Data ownership, Data protection, Intellectual property rights and licensing

6.1. Data ownership, Data protection

PED-EU-NET Action respects the principles for data ownership and data protection. The data collected for the database will be treated pursuant General Data Protection Regulation (GDPR) and relevant regulations. No additional specific protection will be applied to enable open access to all results of the COST Action.

Data collected for the purpose of the PED Database contain no sensitive data. The exception are the contact details of the persons who can provide details on the respective PED/PED Lab case studies. Such information on contact details will only be published with a consent of those persons involved. The data collected on PEDs will be made available to the COST Action participants in a protected joint online repository (MS Teams) and published in public domain through the PED database.

6.2. Intellectual property rights and licensing

Dissemination activities related to the PED Database shall be compatible with the protection of Intellectual Property that may stem from activities, any confidentiality obligations and the legitimate interests of the owners of the knowledge that was used for the productions of the Action results and outcomes.

With regard to the Intellectual Property Rights (IPR) policies described in D4.1 the PED Database does not require any background IPR, neither do the organisations involved require signing of the Non-Disclosure Agreement.

Three results of the PED-EU-NET were identified that can be potentially subjected data protection and/or IPR protection.

Pursuant to the relevant IPR regulations it was decided by the authors that no additional specific protection will be applied to enable open access to all results of the COST Action:

- **Internal online questionnaire for information collection** on PEDs, PED-relevant projects and PED Labs. It was developed by CIEMAT IT department and it was kindly provided to serve the needs of information collection of Working Group 1 together with Working Group 3 (focusing on PED Labs). It is used for the purposes of data collection openly without any specific end user license. The source code is available to interested parties.

- **PED Database source code.** For the Database end user rights Creative Commons Attribution 4.0 (CC-BY-NC 4.0) is now being assessed as a possible solution. The Creative Commons Attribution 4.0 International license allows users to copy, modify and distribute data in any format only for non-commercial activities. Users are only obligated to give appropriate credit (attribution) and in-dicate if they have made any changes, including translations.

Relevant D4.1 Text describing the Intellectual Property Rights

No Intellectual Property rights (IPR) are required for the implementation of the Action PED-EU-NET and no development of a commercial product or service is planned under this initiative. However, should Intellectual Property (IP) arise from the Action, it is agreed that:

1. The PED-EU-NET Team Organisations will share ownership of the IP.

2. The PED-EU-NET Team Organisations will require the signature of Non-Disclosure Agreements (NDAs) by authorised signatories when it is planning an activity for which it identifies a risk in the release of information that should be protected.

3. Each PED-EU-NET Team Organisation grants to each of the other PED-EU-NET Team Organisations a royalty-free, non-exclusive licence to use its Background IP for the purpose of carrying out the PED-EU-NET.

4. If one of the PED-EU-NET Team Organisations wishes to exploit any arising IP commercially then it will require the agreement of all Background IP holders involved in the implementation of the Action.

5. The PED-EU-NET Team Organisation commercially exploiting the IP will be required to sign a license agreement with the other PED-EU-NET Team Organisations. The license agreement will set out the breakdown of remuneration (if any) arising from the commercialisation of the IP.

6. The PED-EU-NET Team Organisation commercially exploiting the IP will at its own expense be required to register and maintain any protection of the IP rights, including filing and prosecuting patent applications for any of the Results, and taking any reasonable action in respect of any alleged or actual infringement of those Intellectual Property Rights.

7. Each of the other PED-EU-NET Team Organisations will ensure that its employees and students (if any) involved in the creation of the IP gives the PED-EU-NET Team Organisation commercially exploiting the IP such assistance (except financial assistance) as may reasonably be requested in connection with the registration and protection of the Intellectual Property Rights in the Results, including filing and prosecuting patent applications for any of the Results, and taking any action in respect of any alleged or actual infringement of those Intellectual Property Rights.

8. The PED-EU-NET Team Organisation commercially exploiting the IP grants each of the other PED-EU-NET Team Organisations a royalty free, non-exclusive licence to use the registered or generated IP for the purpose of carrying out the Action and future research. None of the PED-EU-NET Team Organisations may grant any sub-licence to use any of the IP or outputs.

9. Should the PED-EU-NET Team wish to explore the potential IP generated in terms of a spin-out company, then all PED-EU-NET Team Organisations shall meet to discuss and prepare the terms of agreement.

9.1 The Terms of agreement requires to be agreed by and signed by all PED-EU-NET Team Organisations. 9.2 The Terms of agreement shall provide a fully detailed plan for the spin-out.

7. Contacts

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8. Annexes

This Sections includes:

- ANNEX I_ PED / PED-RELEVANT CASE STUDIES SHEETS
- ANNEX II_ GENERAL PROJECTS or INITIATIVES SHEET
- ANNEX III_ TECHNOLOGICAL INNOVATIONS SHEET
- ANNEX IV_ NON-TECHNOLOGICAL INNOVATIONS SHEET
- ANNEX V_ PED DATABASE GLOSSARY of DEFINITIONS

ANNEX I_ PED / PED-RELEVANT CASE STUDIES SHEETS

SECTION A _ PED / PED-RELEVANT CASE STUDIES + PED LABS in COMMON
A.1. **GLOBAL CHARACTERISTICS**
Question 1 – Main information **Q1A**: Name of your case study: Enter Text **Q1B**: Photo (s): (*Upload files):* **Q1C**: What is the definition of your PED site? ☐ PED/PED relevant case study. ☐ PED Lab. Q**1D**: Project Phase of your case study ☐ Planning Phase. ☐ Implementation Phase. ☐ Operation Phase /Already built. **Q1E:** Reference Project: Enter Text **Q1F**: Sources (publication, link to website, deliverable): Enter Text
Question 2 – Location **Q2A:** Geographic coordinates (You can take the coordinates by clicking Link to Google Maps) • X Coordinate (longitude): Enter Text • Y Coordinate (latitude): Enter Text

- ***Q2B:*** Place (georeferenced position): URL link

Q2C: Climate Zone (Köppen Geiger classification). Choose one of the following answers:

☐BWh ☐BWk ☐BSh ☐BSk ☐Csa ☐Csb ☐Csc ☐Cfa ☐Cfb ☐Dsa ☐Dsb ☐Dsc ☐Dfa ☐Dfb ☐Dfc ☐ET

Question 3 – Plant Size

Q3A: Total land area occupied by your case study (sq. m^2) Numerical v

Q3B: District boundary (Choose one of the following answers):

◉ Virtual. ○ Geographic. ○ Functional. ○ Off-grid.

Question 4 –Fields of activity

Q4A: Project targets of the PED case study (check all that apply)

☐ Climate neutrality. ☐ Energy neutrality. ☐ Energy community.

☐ Circularity. ☐ Air quality and urban comfort. ☐ Electrification.

☐ Self-sufficiency. ☐ Net-zero energy cost. ☐ Positive Energy.

☐ PED Laboratory. ☐ Other.

Q4B: Ownership of the installation: ☐ Public. ☐ Private.

More comments: Enter Text

Question 5 – Contact Person (this question is mandatory): email@a.cc

A.2. TECHNOLOGICAL ASPECTS

Question 6 – Description of the existing infrastructure

Q6A: Fields of application (Check all that apply)

☐ Energy efficiency. ☐ Energy flexibility. ☐ Energy production.

☐ Urban management. ☐ E-mobility. ☐ Urban comfort and air quality.

☐ Digital technologies. ☐ Other. Enter Text

Q6B: Energy needs:

Renewable resources: Enter Text

Non-renewable resources: Enter Text

Building Energy Demand / Consumption. Numerical

Other urban Energy Demand / Consumption. Numerical

Other: Enter Text

Q6C: Energy generation (Check all that apply):

☐ Photovoltaics. ☐ Wind turbines. ☐ Solar Thermal Collectors.

☐ Geothermal Energy System. ☐ Waste Heat Recovery. ☐ Waste to Energy

☐ Polygeneration. ☐ Co-generation. ☐ Heat Pump. ☐ Hydrogen.

☐ Hydropower plant. ☐ Biomass production. ☐ Other. Enter Text

Q6D: Energy flexibility (Check all that apply):

☐ Information and Communication Technologies (ICT).

☐ Energy management system. ☐ Demand-side management.

☐ District Heating/Cooling. ☐ Smart electricity grid. ☐ Efficiency Measures

☐ Thermal Storage. ☐ Electric Storage ☐ E-mobility.

☐ Smart metering. ☐ Demand-responsive control systems. ☐ Other.
Enter Text

Q6E: Energy efficiency (Check all that apply):

☐ Deep Retrofitting. ☐ High-performance new buildings.

☐ Smart Public infrastructure (e.g. smart lighting). ☐ Urban data platforms.

☐ Electric, hybrid and clean vehicles ☐ Car sharing. ☐ Traffic control system.

☐ Smart irrigation. ☐ Digital tracking for waste disposal.

. ☐ Other. Enter Text

Q6F: Energy balance regarding energy demand, energy use and energy delivered:

Which method do you use to calculate the global balance?: Enter Text

Do you use or apply ISO 52000?: ○ Yes. ○ No

Are appliances included in the calculation of the energy balance? ○ Yes. ○ No

Is mobility included in the calculation of the energy balance? ○ Yes. ○ No

How is mobility included (or not included) in the calculation? Enter Text

Q6G: Monitoring, standardization and tools applied

Are any experimental measures implemented to evaluate the performance of the installation? Enter Text

Do you have any Standardization process? Enter Text

A.3. NON-TECHNOLOGICAL ASPECTS

Question 7 – Policy framework, Economic models, Social models and Environmental measures

Q7A: Municipal policy /strategy. Enter Text

National and regional policy/strategy Enter Text

Q7B: Identification needs and priorities. Enter Text

Q7C: Economic models (Check all that apply):

☐ Open data business models. ☐ Innovative business models. ☐ PPP models.

☐ Life Cycle Cost. ☐ Circular economy models. ☐ Blockchain

☐ Demand management Living Lab ☐ Other. Enter Text

Q7D: Social models (Check all that apply):

☐ Energy Communities. ☐ Co-creation strategies. ☐ Citizen social research.

☐ Behavioural Change /End-user engagement. ☐ Policy forums.

☐ Social incentives. ☐ Other. Enter Text

Q7E: Planning models (Check all that apply):

☐ Strategic urban planning. ☐ City Vision 2050. ☐ Updated SECAP.

☐ Building /district Certification. ☐ Digital twins and visual 3D models.

☐ District Energy plans. ☐ Other.

Q7F: Climate change mitigation and adaptation measures: Enter Text

SECTION B1_ PED / PED-RELEVANT CASE STUDIES in DETAIL

Question 1 – PED Concept and Motivation

Q1A: PED/PED relevant concept definition Enter Text

Q1B: Motivation behind PED/PED relevant project development Enter Text

Question 2 – Population and project area

Q2A: District population

before intervention: inhab.

after intervention: inhab.

Q2B: Project area

conditioned area: sqm

total land area: sqm

Q3B: Population density

before intervention: inhab./sqm

after intervention: inhab/sqm

Question 3 – Project environment

Q3A: Building and Land Use (Check all that apply)

☐ Residential. ☐ Commercial. ☐ Public. ☐ E-Mobility. ☐ Industrial.

☐ Offices. ☐ Green infrastructures. ☐ Agricultural. ☐ Other.
Enter Text

Q3B: Project Context (Check all that apply)

☐ Urban area. ☐ Suburban area. ☐ Preservation area.

Q3C: Type of intervention (if mixed, please check both)

☐New construction. ☐Renovation.

SECTION C_BARRIERS and DRIVERS

C. DRIVERS and BARRIERS

Question 1 – Select the main Drivers (Check all that apply)

☐ Legal and policy: policy frameworks, incentives, platforms to matchmaking actors…

☐ Technical: energy autonomy, RES generation, advantages of innovative solutions…

☐ Environmental: climate change mitigation, improvement of urban comfort and well-being…

☐ Economic and financial: economic growth, market attractiveness, financial mechanisms, multiple benefits, mortality and morbidity reductions

☐ Social and cultural: citizens well-being, local networks, use of local resources…

Other: Enter Text

Question 2 – Select the main Barriers (Check all that apply)

☐ Administrative and policy: cooperation and coordination between partners, complex procedures, ownership, inconsistent energy policies,…

☐ Legal and Regulatory: inadequate regulations, national/regional/local codes, inappropriate financial incentives…

☐ Technical: more tested solutions, lack of trained personnel, computational factors, scalability, grid instability…

☐ Environmental: effects of project intervention, absence of ambient and urban experimental variables, retrofitting works…

☐ Social and Cultural: inertia, lack of interest, low acceptance, actors involved, lack of social networks…

☐ Information and Awareness: low information about users and consumers, perception of cost and benefits, information asymmetry,…

☐ Economical and Financial: high costs, insufficient financial support, economic crisis, risk and uncertainty…

☐ Market: incentives, prices distortion, actors involved…

Other: Enter Text

Question 3 – Identify the stakeholders at different phases of the PED Labs implementation (Check all that apply)**:**

Question 4 – Other comments: Enter Text

ANNEX II_ GENERAL PROJECTS or INITIATIVES SHEET

PROJECT *'TITLE'*	PERIOD from-to
OBJECTIVE/CONCEPTS (maximum 500 characters) Click or tap here to enter the text.	

FUNDING PROGRAMME/FINANCING MODEL ☐FP7/H2020 (specify the call ……) ☐Interreg (specify the programme ……) ☐National funding (specify ……) ☐Public-Private Partnership ☐Other (specify ……)
UPSCALING STRATEGIES/POTENTIAL (maximum 500 characters) Click or tap here to enter the text.
CASE STUDIES - Case study 1 - Case study 2 - Case study n < LINK TO THE "CASE STUDY" TABLE (zoom -)
EXPECTED IMPACT (list quantitative / qualitative impacts) (link to SDGs if possible) Click or tap here to enter the text.
SOURCES/LINK/WEBSITE Click or tap here to enter the text.

ANNEX III_ TECHNOLOGICAL INNOVATIONS SHEET

INTEGRATED TECHNOLOGICAL SOLUTIONS / IMPLEMENTATION DOMAINS, ENGAGEMENT PHASE and INVOLVED STAKEHOLDERS

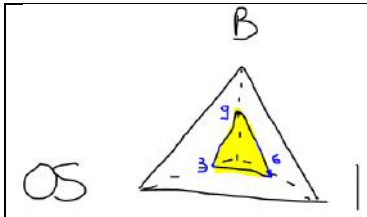
(Please give information about the energy system – technology group by filling the following table)

		Implementation domains														Engagement phase				Involved stakeholders				
Integrated Technological Solutions		**Target Built Environment**				**Energy System**			**Mobility System**				**Infrastructure**											
Sector (Energy, ICT, Mobility & Transport,		Single unit	Buildings	District	City	Production	Efficiency	Flexibility	Private mobility	Public transports	Food and freights	Soft Mobility	Green infrastructure	Water system	Waste disposal system	Security system	Planning	Design	Construction	Operation	Public Administrations	Citizens/Communities	R&I/Universities	Industry/Private Sector	……
1. Energy	XX	x					x																	
2. ICT	XX		x				x												x					
3. Mobility	XX																							

GRAPHICAL DETAIL:

Radar diagram for each implementation domain

> radar on Built Environment



> radar on Energy System
> radar on Mobility System
> radar on Infrastructures

General radar diagram of implementation domains

BUSINESS MODELS / INVESTMENT PLANS:

Business Model	National Level Local Level EU Level	**Funds / Bonds / Incentives** **One Stop Shop** **….**	**Phases …**

REPLICATION POTENTIAL (maximum 500 characters)
Click or tap here to enter the text.

LESSONS LEARNT (if the project is already implemented, please fill this section)

Opportunities & Needs (maximum 500 characters)
Click or tap here to enter the text.

Bounds & Drivers (maximum 500 characters)
Click or tap here to enter the text.

LINK TO COMMERCIAL TECHNOLOGIES (if available):

> LINK TO THE "TECHNOLOGICAL SOLUTIONS" WEBSITE (zoom +)

ANNEX IV_ NON-TECHNOLOGICAL INNOVATIONS SHEET

NON-TECHNOLOGICAL SOLUTIONS
SECTOR: Social, Civic participation, Governance, Economic, Planning and Design
KEY FIGURES / POINTS:
SCALE: building, district, city
INVOLVED STAKEHOLDERS / ENGAGEMENT LEVEL:
REPLICATION POTENTIAL:
LESSONS LEARNT: *Opportunities & Needs* *Bounds & Drivers*
INTEGRATION WITH OTHER TECHNOLOGIES
LINK TO NON-TECHNOLOGIES: > LINK TO THE “NON-TECHNOLOGICAL SOLUTIONS” WEBSITE (zoom +)

ANNEX V_ PED DATABASE GLOSSARY of DEFINITIONS

QUESTIONNAIRE 1 _ SECTION A+B1+C (PED/PED-relevant Case Studies + PED LaBs)

CASE STUDY	ID Parameter	Definition (up to 100 words per definition)	Unit	References for the definition
SECTION A _ PED / PED-RELEVANT CASE STUDIES + PED LABS in COMMON				
A.1 GLOBAL CHARACTERISTICS				
Question 1 – Main information				
Case Study Title	CS001	Name the city/neighborhood/district where the case study is located	Text	
Photos		Map / Aerial View / Photos / Graphic Details	Image	
PED Site Definition				
PED/PED relevant case study	CS002	District- level project with high level of aspiration in terms of energy efficiency, energy flexibilityand energy production. The project does not necessarily have to meet annual energy positive balance, if it meets at least several other aspects of the JPI UE PED Framework Definition (“Positive Energy Districts are energy- efficient and energyflexible urban areas or groups of connected buildings which produce net zero greenhouse gas emissions and actively manage an annual local or regional surplus production of renewable energy.They require integration of different systems and infrastructures and interaction between buildings, the users and the regional energy, mobility and ICT systems, while securing the energy supply and a good life for all in line with social, economic and environmental sustainability.”)	Text	JPI Urban definition together with WG1 group
PED LAB			Text	
PED Phase				

Planning	CS006		Text	
Implementation			Text	
Operation			Text	
Location				
Coordinates	CS009	Geographic coordinate system, latitude and longitude	Numerical	
Address	CS010	Open address of the case study/LAB to identify its exact location on the map	Text	
Question 2 – Location				
Climate Zone				
Köppen climate classification	CS011	BWk = Cold desert climate, BSk = Cold semi-arid climate, Csa = Hot-summer Mediterranean climate, Csb = Warm-summer Mediterranean climate, Cfa = Humid subtropical climate, Cfb = Temperate oceanic climate, Dsa = Mediterranean-influenced hot-summer humid continental climate, Dsb = Mediterranean-influenced warm-summer humid continental climate; Dfa = Hot-summer humid continental climate; Dfb = Warm-summer humid continental climate, Dfc = Subarctic climate; ET = Tundra climate	Text	https://en.wikipedia.org/wiki/K%C3%B6ppen_climate_classification
Question 3 – Plant Size				
Total Land Area (open space)		Total land holdings or open space under common ownership that are contiguous.	m^2	
District Boundary				
Functional	CS015	when buildings are not close to each other, but they are interconnected, thanks to a gas, electric, or heating network.	Text	**H2020 Making-City** - How to Achieve Positive Energy Districts for Sustainable Cities: A Proposed Calculation Methodology.

				https://www.mdpi.com/2071-1050/13/2/710/htm
Geographic		When the boundaries are delimited by spatial–physical limits, including delineated buildings, sites, and infrastructures.	Text	**H2020 Making-City** - How to Achieve Positive Energy Districts for Sustainable Cities: A Proposed Calculation Methodology. https://www.mdpi.com/2071-1050/13/2/710/htm
Virtual		when energy demand is covered by a generation unit, which is shared with other consumption points (e.g., a windmill) and located outside the geographical boundaries of the PED, then it could be considered a virtual boundary	Text	**H2020 Making-City** - How to Achieve Positive Energy Districts for Sustainable Cities: A Proposed Calculation Methodology. https://www.mdpi.com/2071-1050/13/2/710/htm
Off-Grid		when a district is self-sufficient, that means it is not connected to the electrical grid, but also to other utilities like water, gas, and sewer systems. This is advantageous in isolated locations where normal utilities cannot reach and is attractive to those who want to reduce environmental impact and cost of living.	Text	https://en.wikipedia.org/wiki/Off-the-grid
Question 4 –Fields of activity				
Project Target				
Circularity	CS014	Circular systems employ reuse, sharing, repair, refurbishment, remanufacturing and recycling to create a closed-loop system, minimising the use of resource inputs and the creation of waste, pollution and carbon emissions. In the case of PED, the revalorization of waste (such as residues from the different sectors) for the energy production is prioritized, but many other pathways could be taken, considering the cycle of water, food, etc.	Text	Geissdoerfer, M., Savaget, P., Bocken, N. M., & Hultink, E. J. (2017). The Circular Economy–A new sustainability paradigm?. Journal of cleaner production, 143, 757-768.
Self -sufficiency		Self-sufficiency means that within a year, the district will never import energy from outside the boundaries (e.g. consume electricity or gas from the grids)	Text	

Air Quality		The objective of improving air quality is aimed in reducing the concentration of the 5 main pollutants: O3, NO2, SO2, PM2.5 and PM10	Text	
Climate neutrality		Climate neutrality means that on a period basis the carbon dioxide emissions within the limits of the district are compensated with the exported energy or by carbon capture	Text	
Electrification		Electrification is the process in which the supply of any energy needs of a district and/or city, such as the heating needs or the mobility sector, are supplied by electricity-driven technologies.	Text	
Energy Community		Community energy refers to a wide range of collective energy actions that involve citizens' participation in the energy system. Energy communities can be understood as a way to 'organise' collective energy actions around open, democratic participation and governance and the provision of benefits for the members or the local community.	Text	https://publications.jrc.ec.europa.eu/repository/handle/JRC119433#:~:text=Energy%20communities%20can%20be%20understood,members%20or%20the%20local%20community.
Energy neutrality			Text	
Net zero energy cost			Text	
Positive Energy			Text	
Ownership of the case study/PED Lab				
Public			Text	
Private			Text	
A.2 TECHNOLOGICAL ASPECTS				
Question 6 – Description of the existing infrastructure				

Fields of Application				
Energy efficiency				
Energy flexibility				
Energy production				
Urban management				
E-mobility				
Urban comfort and air quality				
Digital technologies				
Energy Balance				
Energy Demand / Consumption	CS026	National standards, national statistical data (with estimated energy demand per square meter dependent on the climate zone of the area, etc.), measured data (if available), or bills can be used to calculate the demand. Furthermore, when structural data of the building and data from the existing system are available, an energy modelling tool can be useful to estimate the demand.	GWh / annum	D4.2 Guidelines to calculate the annual energy balance of a PED www.making-city.eu
Renewable Generation on-site	CS027	After identifying which solutions will be considered for a certain district, energy systems can be listed and the connections between each other (schematics) and the energy source that is supplied to it (biogas, natural gas, solar, wind, electricity from the grid, etc.) can be identified.	GWh / annum	D4.2 Guidelines to calculate the annual energy balance of a PED www.making-city.eu
Technological Solutions / Innovations – Energy Generation				

Photovoltaics	CS029	**Solution Booklet Building Integrated PV** https://smart-cities-marketplace.ec.europa.eu/insights/solutions/solution-booklet-building-integrated-pv		
Wind turbine		**PED Solution Booklet (p.18)** https://smart-cities-marketplace.ec.europa.eu/insights/solutions/solution-booklet-positive-energy-districts		
Thermal collectors		**PED Solution Booklet (p.18)** https://smart-cities-marketplace.ec.europa.eu/insights/solutions/solution-booklet-positive-energy-districts		
Geothermal energy		**PED Solution Booklet (p.18)** https://smart-cities-marketplace.ec.europa.eu/insights/solutions/solution-booklet-positive-energy-districts		
Waste heat recovery		**PED Solution Booklet (p.18)** https://smart-cities-marketplace.ec.europa.eu/insights/solutions/solution-booklet-positive-energy-districts		
Waste-to-energy		**PED Solution Booklet (p.18)** https://smart-cities-marketplace.ec.europa.eu/insights/solutions/solution-booklet-positive-energy-districts		
Polygeneration				?
Co-generation (CHP)				?
Heat Pumps		**PED Solution Booklet (p.18)** https://smart-cities-marketplace.ec.europa.eu/insights/solutions/solution-booklet-positive-energy-districts		
Hydrogen				
Hydropower plant				
Biomass Production				

Technological Solutions / Innovations – Energy Flexibility		
Thermal Storage	CS030	**PED Solution Booklet (p.19)** https://smart-cities-marketplace.ec.europa.eu/insights/solutions/solution-booklet-positive-energy-districts
Electrical Energy Storage		**PED Solution Booklet (p.19)** https://smart-cities-marketplace.ec.europa.eu/insights/solutions/solution-booklet-positive-energy-districts
District Heating and Cooling		**BABLE solutions** https://www.bable-smartcities.eu/explore/solutions/solution/solution/district-heating-cooling-systems.html **Solution Booklet District Heating and Cooling** https://smart-cities-marketplace.ec.europa.eu/insights/solutions/solution-booklet-district-heating-and-cooling
Energy management system		**BABLE solutions** https://www.bable-smartcities.eu/explore/solutions/solution/solution/building-energy-management-system.html **PED Solution Booklet (p.25)** https://smart-cities-marketplace.ec.europa.eu/insights/solutions/solution-booklet-positive-energy-districts
Smart metering, Demand-responsive control systems		**BABLE solutions** https://www.bable-smartcities.eu/explore/solutions/solution/solution/smart-home-system.html **BABLE solutions** https://www.bable-smartcities.eu/explore/solutions/solution/solution/smart-microgrids.html
Smart electricity grid		
Technological Solutions / Innovations – Energy Efficiency		
Deep Retrofitting	CS031	**BABLE solutions** https://www.bable-smartcities.eu/explore/solutions/solution/solution/energy-efficient-retrofitting-of-buildings.html
High-performance new buildings		?

Building services (HVAC & Lighting)				SCIS
Urban data platforms		**BABLE solutions** https://www.bable-smartcities.eu/explore/solutions/solution/solution/urban-data-platform.html **PED Solution Booklet (p.25)** https://smart-cities-marketplace.ec.europa.eu/insights/solutions/solution-booklet-positive-energy-districts		
Smart Public infrastructure (e.g. smart lighting)		**BABLE solutions** https://www.bable-smartcities.eu/explore/solutions/solution/solution/smart-lighting.html		
Electric, hybrid and clean vehicles		**Solution Booklet Electric Vehicles & the Grid** https://smart-cities-marketplace.ec.europa.eu/insights/solutions/solution-booklet-electric-vehicles-grid **PED Solution Booklet (p.41)** https://smart-cities-marketplace.ec.europa.eu/insights/solutions/solution-booklet-positive-energy-districts		
Car sharing		**BABLE solutions** https://www.bable-smartcities.eu/explore/solutions/solution/solution/vehicle-sharing-system.html **PED Solution Booklet (p.21)** https://smart-cities-marketplace.ec.europa.eu/insights/solutions/solution-booklet-positive-energy-districts		
Traffic control system				?
Smart irrigation				?

Digital tracking for waste disposal		**BABLE solutions** https://www.bable-smartcities.eu/explore/solutions/solution/solution/waste-separation-at-source.html https://www.bable-smartcities.eu/explore/solutions/solution/solution/intelligent-waste-logistics.html		
Smart surveillance				
A.3 NON-TECHNOLOGICAL ASPECTS				
Governance	CS032		Text	
Economic				
Open data business models	CS033			
Innovative business models				
PPP models				
Life Cycle Cost				
Circular economy models				
Blockchain				
Demand management Living Lab				
Social				

Energy Communities	CS034			
Co-creation strategies				
Citizen social research				
Behavioural Change /End-user engagement				
Policy forums				
Social incentives				
Planning				
Strategic urban planning				
City Vision 2050				
Updated SECAP				
Building /district Certification				
District Energy plans				

digital twins and visual 3D models				
Environmental	CS035		Text	
Spatial	CS036		Text	
Legal/Regulatory	CS037		Text	

SECTION B1 _ PED / PED-RELEVANT CASE STUDIES in DETAIL				
Motivation	CS003	What is the purpose for implementing the PED Project? What were the reasons that led the initiator to start with PED development?" explain strategies at district/ neighborhood /building level	Text	
Strategies				
Regional Level	CS005	Territorial approaches favoring energy transition and reaching climate targets (Please indicate if policies or plans favoring energy transition exist or if particular strategies, actions or incentives are promoted)	Text	
Municipal Level	CS006	City level approaches favoring energy transition and climate targets. (Please indicate if the Municipality has updated its energy planning and its adaptation strategy according to SECAP or other initiatives)	Text	
Year of Construction	CS013	If the PED has already been implemented, give information for the date of construction	Numerical	
Population Density and Project Area				

Conditioned Area (closed building area)	CS020	Enclosed area of a building, where there is intentional control of the space thermal conditions within defined limits by using natural, electrical, or mechanical means.	m^2	
Total Land Area (open space)	CS021	Total land holdings or open space under common ownership that are contiguous.	m^2	
Project context				
Protected area	CS024	Protected areas or conservation areas are locations which receive protection because of their recognized natural, ecological or cultural values.	Text	https://en.wikipedia.org/wiki/Protected_area
Suburban area		Suburban area is a mixed-use or residential area, existing as part of a city/urban area, or as a separate residential community within commuting distance of one.	Text	https://en.wikipedia.org/wiki/Suburb
Urban area		Area characterized by human settlement with a high population density and infrastructure of built environment.	Text	

SECTION C _ BARRIERS and DRIVERS				
ENABLING FACTORS & DRIVERS				
Legal and policy		policy frameworks, incentives, platforms to matchmaking actors	Text	
Technical		energy autonomy, RES generation, advantages of innovative solutions	Text	
Environmental		climate change mitigation, improvement of urban comfort and well being…	Text	
Economic and financial:		economic growth, market attractiveness, financial mechanisms, multiple benefits, mortality and morbidity reductions	Text	

Social and cultural		citizens well being, local networks, use of local resourceS	Text	
BARRIERS / CHALLENGES				
Administrative and policy		cooperation and coordination between partners, complex procedures, ownership, inconsistent energy policies,…	Text	
Legal and Regulatory		inadequate regulations, national/regional/local codes, inappropriate financial incentives	Text	
Technical:		more tested solutions, lack of trained personnel, computational factors, scalability, grid instability…	Text	
Environmental		effects of project intervention, absence of ambient and urban experimental variables, retrofitting works…	Text	
Social and Cultural		inertia, lack of interest, low acceptance, actors involved, lack of social networks…	Text	
Information and Awareness		low information about users and consumers, perception of cost and benefits, information asymmetry,…	Text	
Economical and Financial		high costs, insufficient financial support, economic crisis, risk and uncertainty…	Text	
Market		incentives, prices distortion, actors involved…	Text	

QUESTIONNAIRE 2 _ GENERAL PROJECTS AND INITIATIVES

PROJECT	ID Parameter	Definition (up to 100 words per definition)	Unit	References
GENERAL PROJECTS and INITIATIVES				
Objectives / Concepts	GP004	What are the technical, social, economic, political, environmental objectives of the project? How is the concept defined to achieve PEDs in this project?	Text	
UPSCALING STRATEGIES/ POTENTIAL	GP006	Which methodology the project/initiative is adopting in order to upscale, replicate and adapt solutions and strategies to different social, geographical and economic context? (i.e., Lighthouse cities and Replicator cities in H2020 projects)	Text	
EXPECTED IMPACT	GP008	What effect took place because of the project / higher level strategic goals. The impact is generated by the project's results.	Text	