Annex 1

March 2022

PED-ID

D3.2 Visual concept for presentation of results of PED assessment

Content

Part 1

Instructions

- Document purpose
- How to use this presentation
- Introduction to 4 communication stages

Part 2

Application

- PED Introduction (level 1)
- Detailed process (level 2)
- Consultation maps (level 3)
- Scenarios (level 4)

Document purpose

- **Supporting presentation** on the
  D3.2 Visual concept for presentation of results of PED assessment

- **Visual concept goals**

  Points out the appropriate visual concept approach and defines the essential elements that need to be communicated with stakeholders

  (Visualization of main points to be communicated from D3.1 Holistic assessment method)

  1. Clear and understandable introduction of the PED topic
  2. Effective communication on the PED aspects to a general audience and stakeholders
     - PED benefits, challenges & barriers, cooperation requirements (data gathering, consultations)
  3. Increasing stakeholder engagement in PED topic
  4. Presentation of PED design steps and resulting scenarios
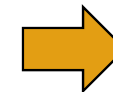
  → **Final yes/no decision on the PED implementation**

How to use this presentation

- **Goal of this presentation is to**

point out the essential (minimal) elements of the visual concept, which should be communicated with stakeholders

1. All steps of the visual concept are described in detail in the D3.2 main document.
2. Part 1 of this presentation serves to acquaint the consultant with the elements of the visual concept, it is not intended for presentation to stakeholders.
   - Opening/Closing part is the same case, however, we would appreciate giving credits to PED-ID project ☺
3. Use the slides from Part 2 as a background/example for your presentation.
   - *auxiliary / explanatory texts or slides in italics can be removed*
4. This presentation shows the content as well as a potential visual approach to it that should be communicated with the stakeholder. Get inspired by it.
5. Feel free to expand the content if it's appropriate for your PED and your stakeholders.
6. Edit content, which is specific to your PED (i.e. maps, specific data, area specifics).
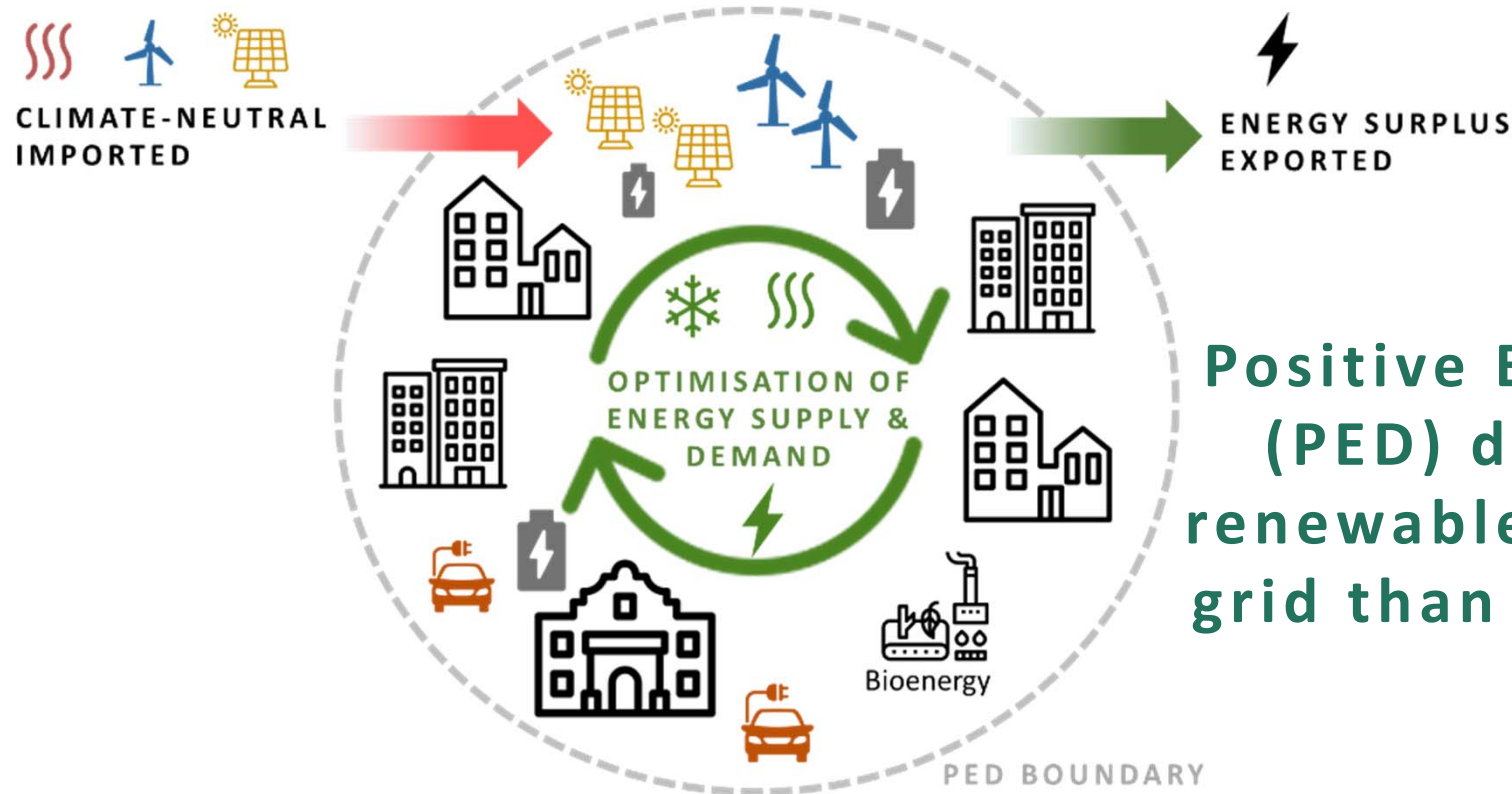
Stakeholder communication is a key aspect!

- communicating the features of PED inception consists **of 4 important communication stages:**

No.	Title	Content	Stakeholder engagement
1	**PED Introduction**	PED definition, basic info on benefits, PED development and next steps	Initial contact with stakeholder, spark interest in PED, nudge to PED inception
2	**Detailed process**	Detailed info on PED development, required data, calculation methods, making of scenarios	Stakeholder learns about his/her commitment and requirements on data provision and the way the data would be processed
3	**Consultation maps**	Comprehensible presentation of prospective area based on the gathered data and spatial analysis, ideally in an interactive map application	Stakeholder learns about the current state and opportunities of prospective area and gives feedback on additional requirements and conditions
4	**Scenarios**	Presentation of feasible scenarios based on the area' features (from #2) and additional requirements (from #3).	Stakeholder learns about possible scenarios to implement PED and issues the final decision

Level 1: PED Introduction

What is a PED?

CLIMATE-NEUTRAL IMPORTED

OPTIMISATION OF ENERGY SUPPLY & DEMAND

Bioenergy

PED BOUNDARY

ENERGY SURPLUS EXPORTED

Positive Energy District (PED) delivers _more_ renewable energy to the grid than they consume

The PED is:

Group of buildings or **urban area**

- Defining the area
- Minimum 3 buildings in respect of positive energy blocks (PEBs)

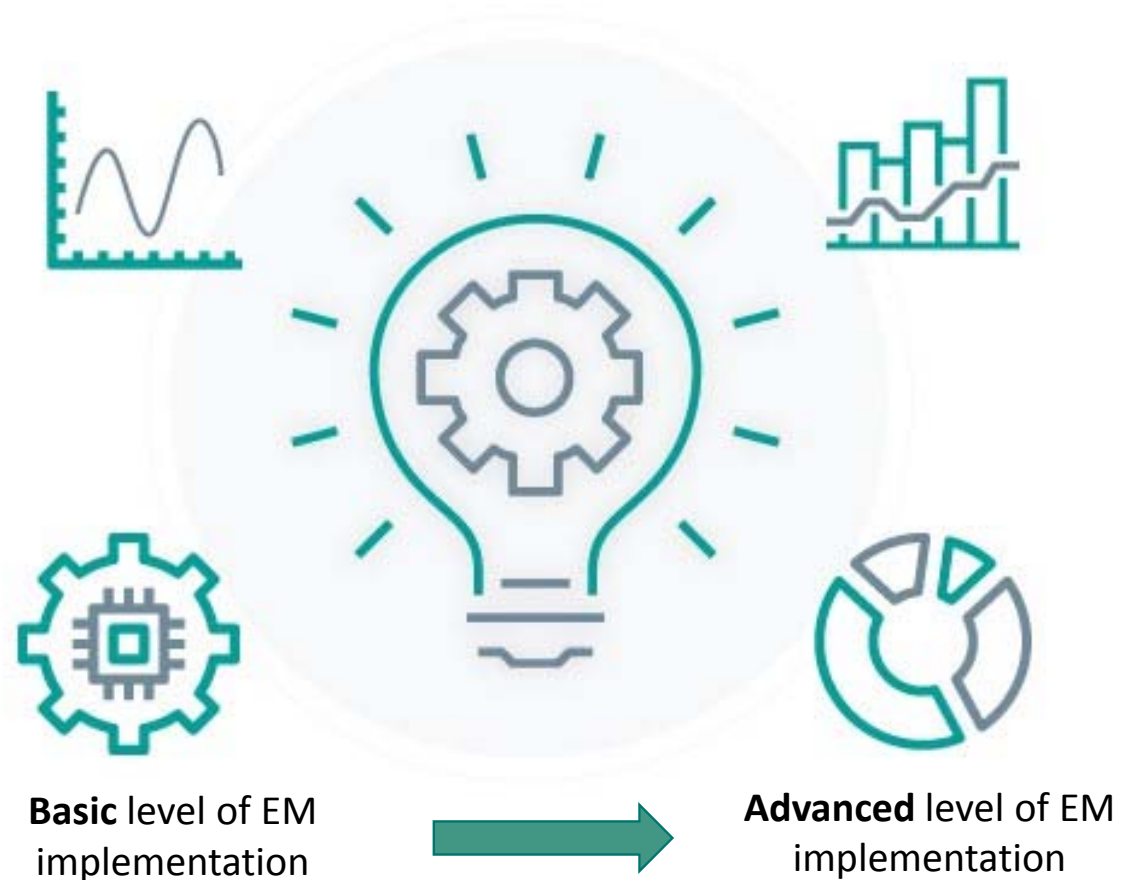# The PED is:

High degree of system and communication integration

- Requires **interconnection** and **interaction** of several sectors (private buildings, public buildings, transport and mobility, infrastructure,…)

The PED is:

Energy management

- A shift from the basic level of EM implementation to the advanced level of EM implementation

- Utilization of the energy flexibility concept and demand-response principle

Basic level of EM implementation → **Advanced** level of EM implementation

The PED is:

Energy efficient buildings

➡️ **Plus energy standard**

➡️ Zero energy standard

➡️ Passive energy standard

The PED is:

Local RES and energy storage

- PEDs rely exclusively on the (local) **renewable energy sources** and **energy storage systems**

- PEDs should achieve **energy surplus**
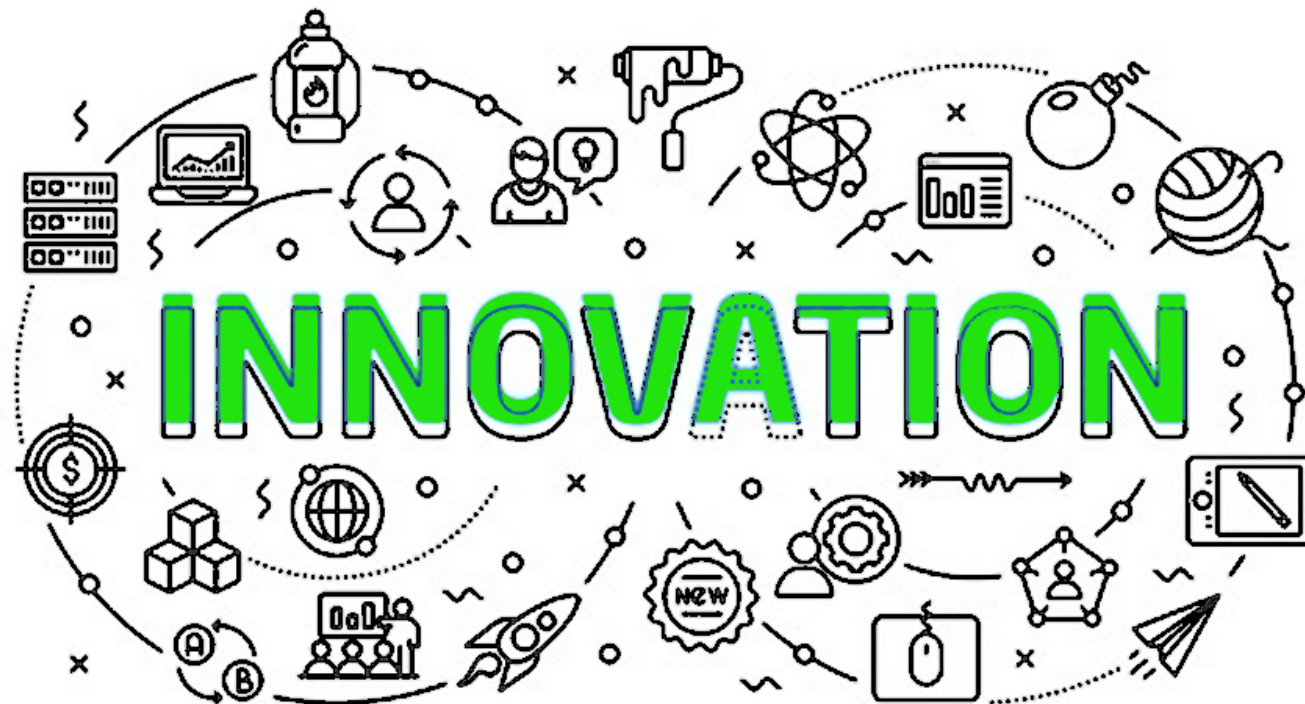
The PED is:

Net-zero energy import and GHG emissions

- PEDs represent path to the (local) **carbon neutrality**

- PEDs strive for **zero GHG emissions balance**

The PED is:

Innovative social, technology, material or technical solutions

- PEDs **are not limited** by the chosen solutions. **Modern and innovative technologies and approaches will be essential** for the PED implementation

The PED is:

Learn more about how PEDs work here **https://youtu.be/jCu98jq-62U**

If it is technically possible, play an information video about PED

The PED is:

Group of buildings or **urban area** that produces

more renewable energy than it consumes: Using exclusively local **renewable sources** and **energy storage systems** to achieve energy **surplus,**

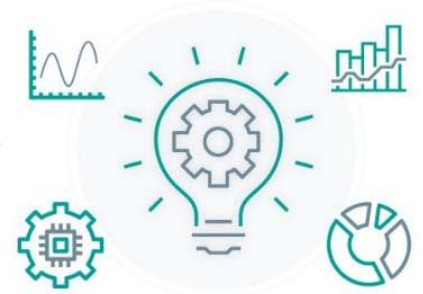Achieve climate neutrality with **net zero carbon emissions**

adopting plus energy standards & **energy efficient buildings,**

Innovative social, technology, material or technical **solutions**

and **energy management** strategies to **lower energy demand.**

16

PED achieves

✓Acceleration towards **carbon neutrality**

✓Acceleration of the **energy-system transformation**

✓Improved **quality of life**

✓Improved local climate & life **quality**

✓Reduction of **energy poverty**

✓Increasing **energy resilience** of the community
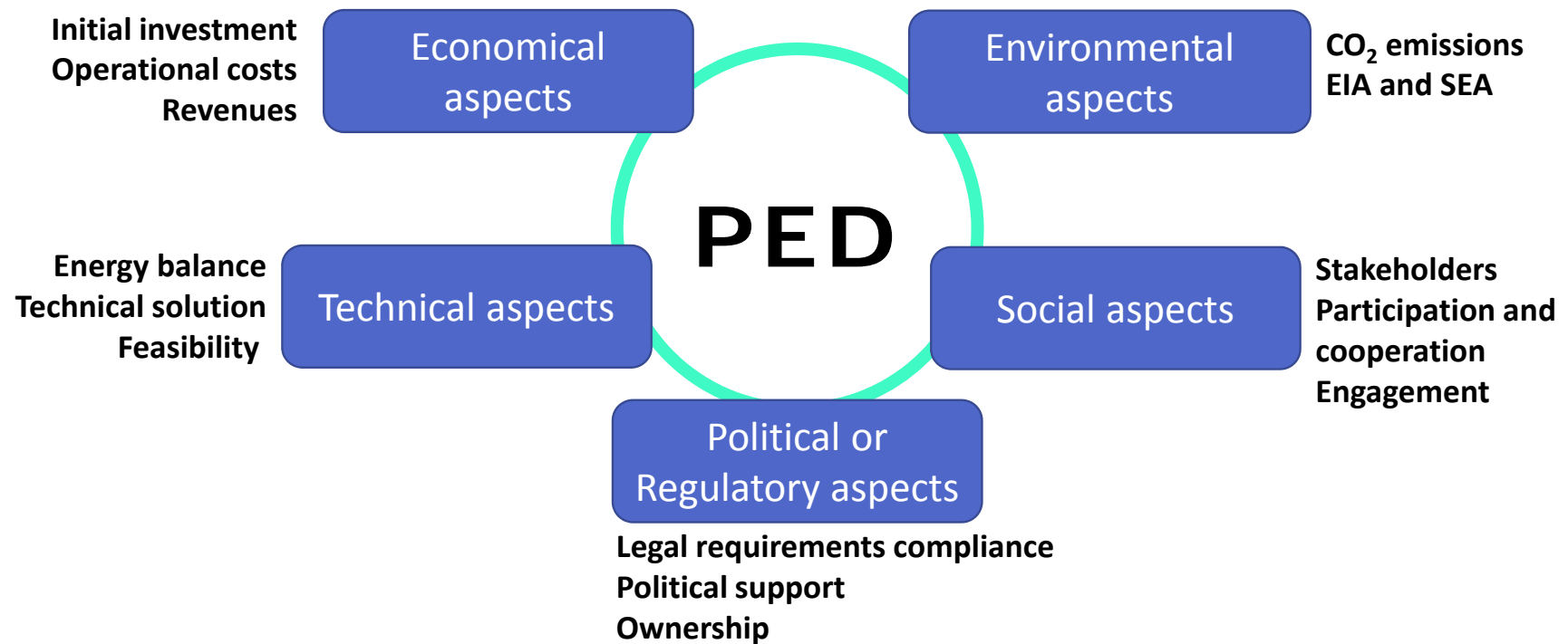
Level 2: Detailed scenario

Detailed scenario

Level 2 (Detailed process) is divided into two interconnected parts:

- *First part aims to **explain in greater detail the structure and mechanics of the analysis to be performed** and further steps in developing PED scenarios*

- *Second part aims **to gather and process the data about the prospective PED area.** Stakeholders cooperation is needed.*

Aspects of a PED:

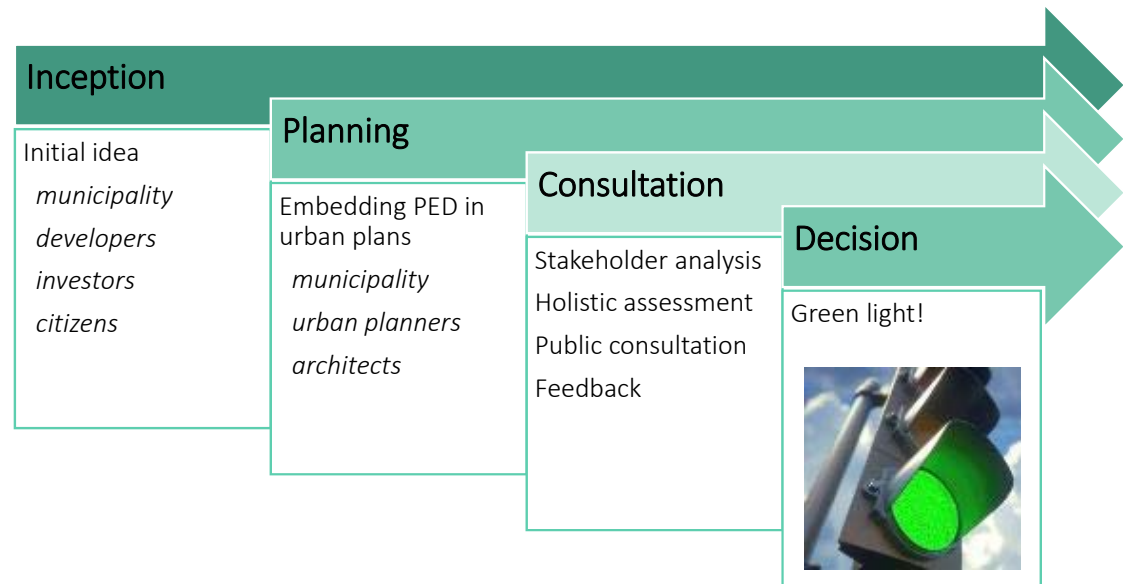At each project phase, different aspects will guide the decision+-making & development:

Initial investment
Operational costs
Revenues

Economical aspects

Environmental aspects

CO_2 emissions
EIA and SEA

PED

Energy balance
Technical solution
Feasibility

Technical aspects

Social aspects

Stakeholders
Participation and cooperation
Engagement

Political or Regulatory aspects

Legal requirements compliance
Political support
Ownership

How to implement a PED?

- Engage Stakeholders:
  tell them the idea, involve them
  to build the project vision.

- Detail info on PED
  development, required data,
  methods...

- Discuss the current situation.

- Formulate scenarios.

- Benchmarking - making PED
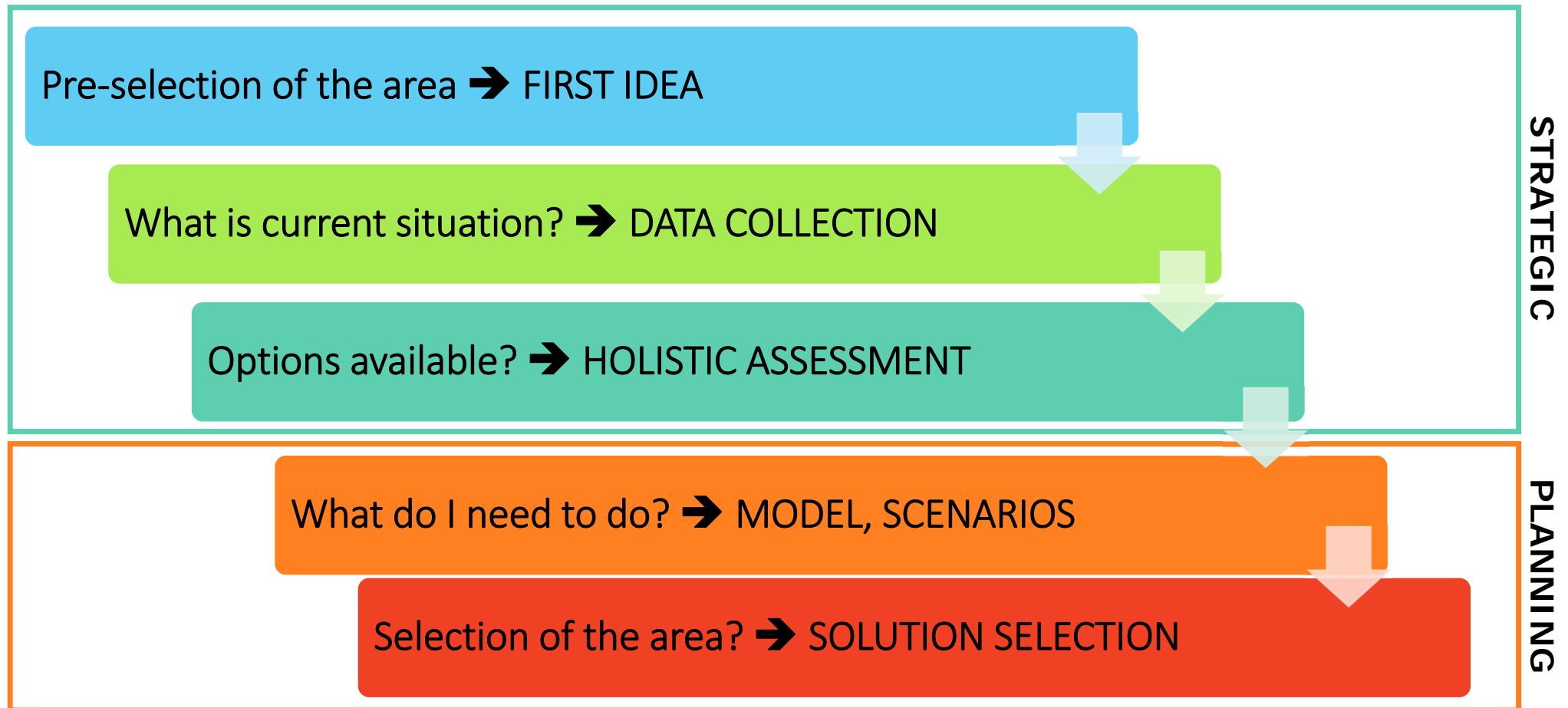 investment decision.

Done in the previous level of visual concept, but can be repeated as new stakeholders and general audience join the cause

Inception

Initial idea
municipality
developers
investors
citizens

Planning

Embedding PED in urban plans
municipality
urban planners
architects

Consultation

Stakeholder analysis
Holistic assessment
Public consultation
Feedback

Decision

Green light!

How to implement a PED?

Process map of a PED:
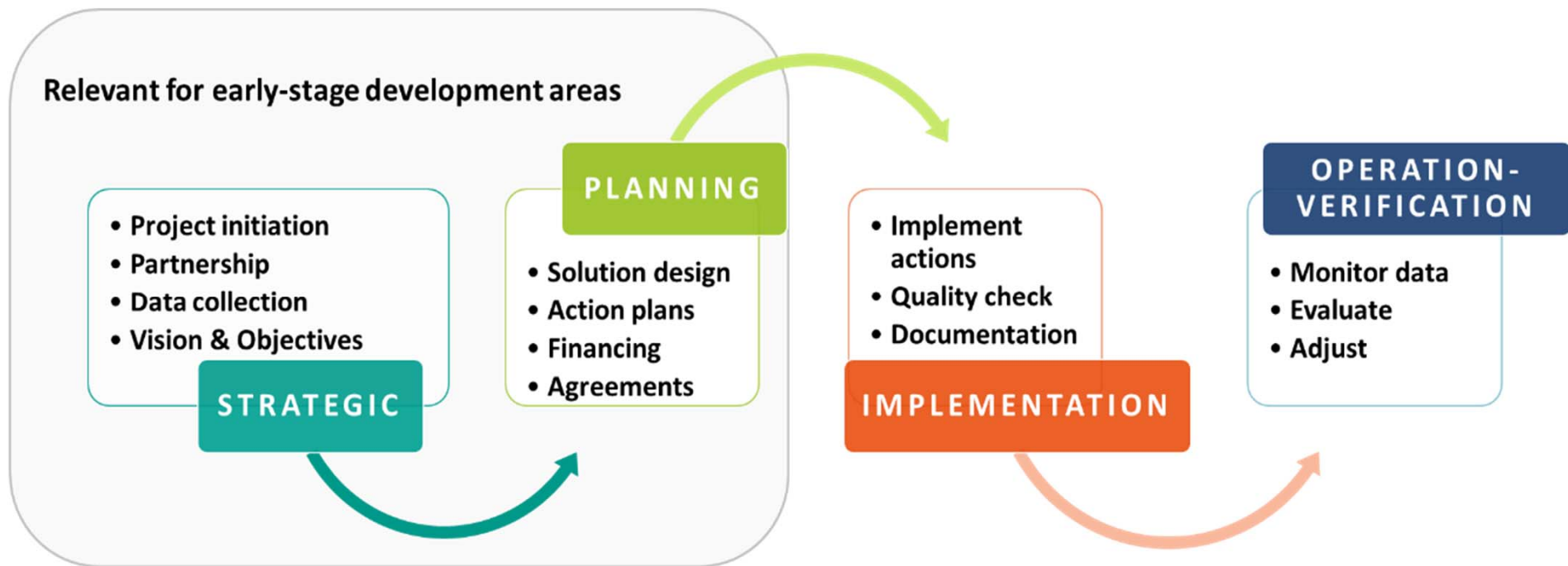
Holistic assessment model:

Pre-selection of the area ➔ FIRST IDEA

What is current situation? ➔ DATA COLLECTION

Options available? ➔ HOLISTIC ASSESSMENT

STRATEGIC

What do I need to do? ➔ MODEL, SCENARIOS

Selection of the area? ➔ SOLUTION SELECTION

PLANNING

23

Pre-selection of the area ➔ FIRST IDEA

- What is the initial status of the area?
- What are the resources available?
- Which stakeholders should be involved?
- Boundaries?

Complexity level	Green field	Extending existing urban area	Renovation of existing area
Implementation	Low	Medium	High
Data collection	Low	Medium	High
Citizen engagement	Low	Medium	High
Ownership / property	Low	Medium	High
Impact on climate protection	Low	Medium	High
Financing	Low	Medium	High

Green-field

PED options

Deep renovation of existing urban area

Extending existing urban area
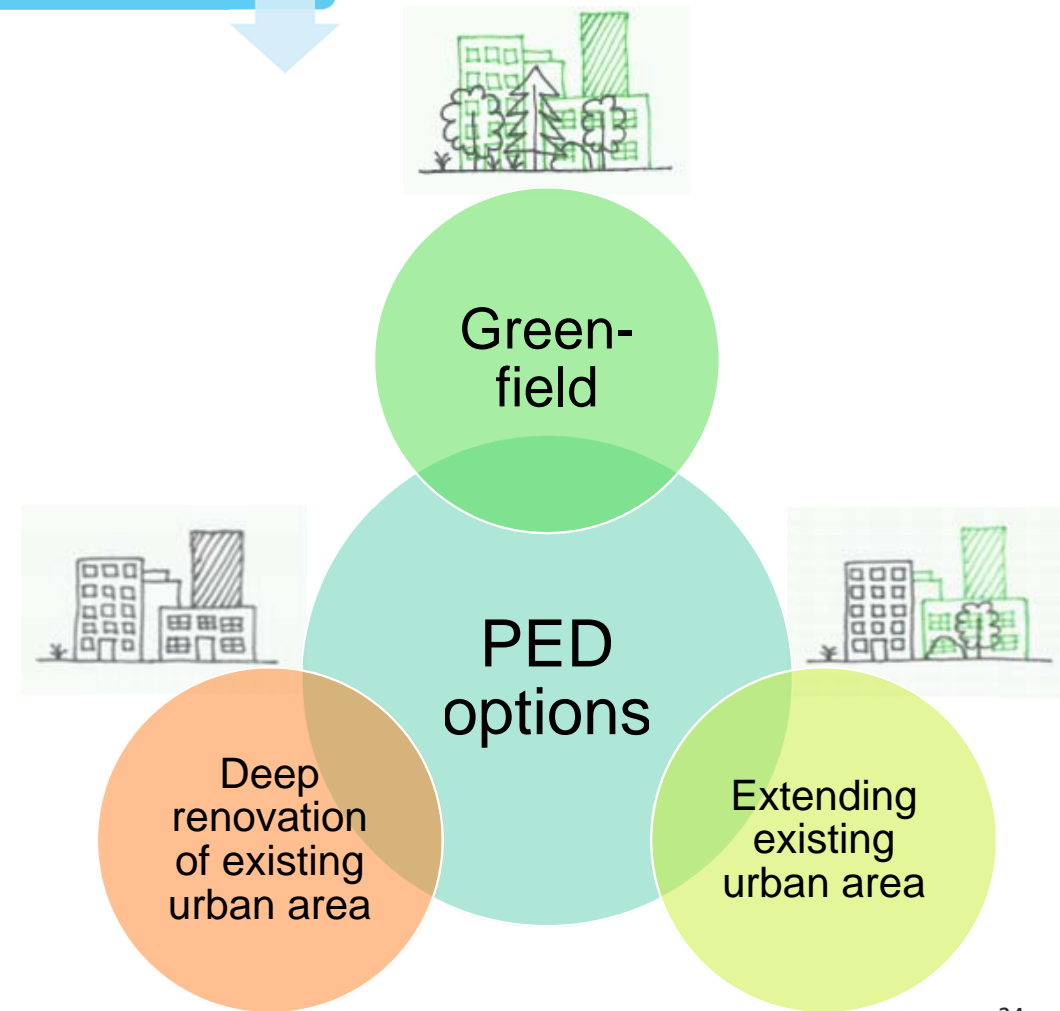
What is current situation? ➜ DATA COLLECTION

- Identify current state
- Estimate energy demand
- Identify and map resources

GIS Energy database
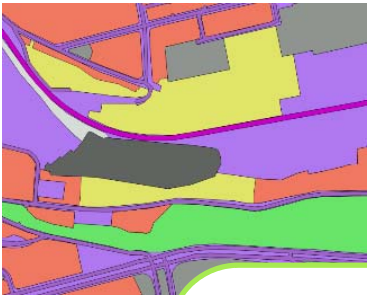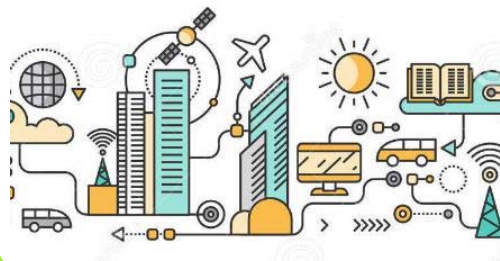

RES potential
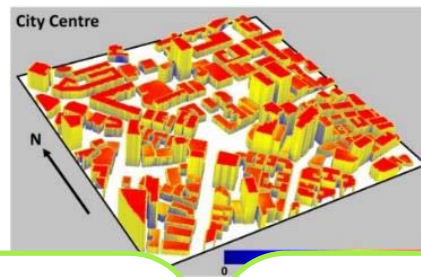
Energy demand
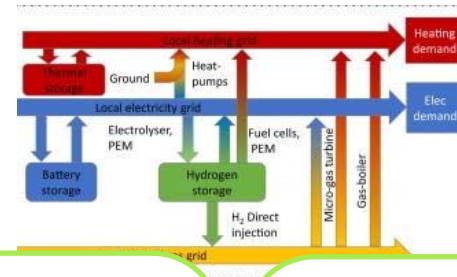
Building Energy Efficiency
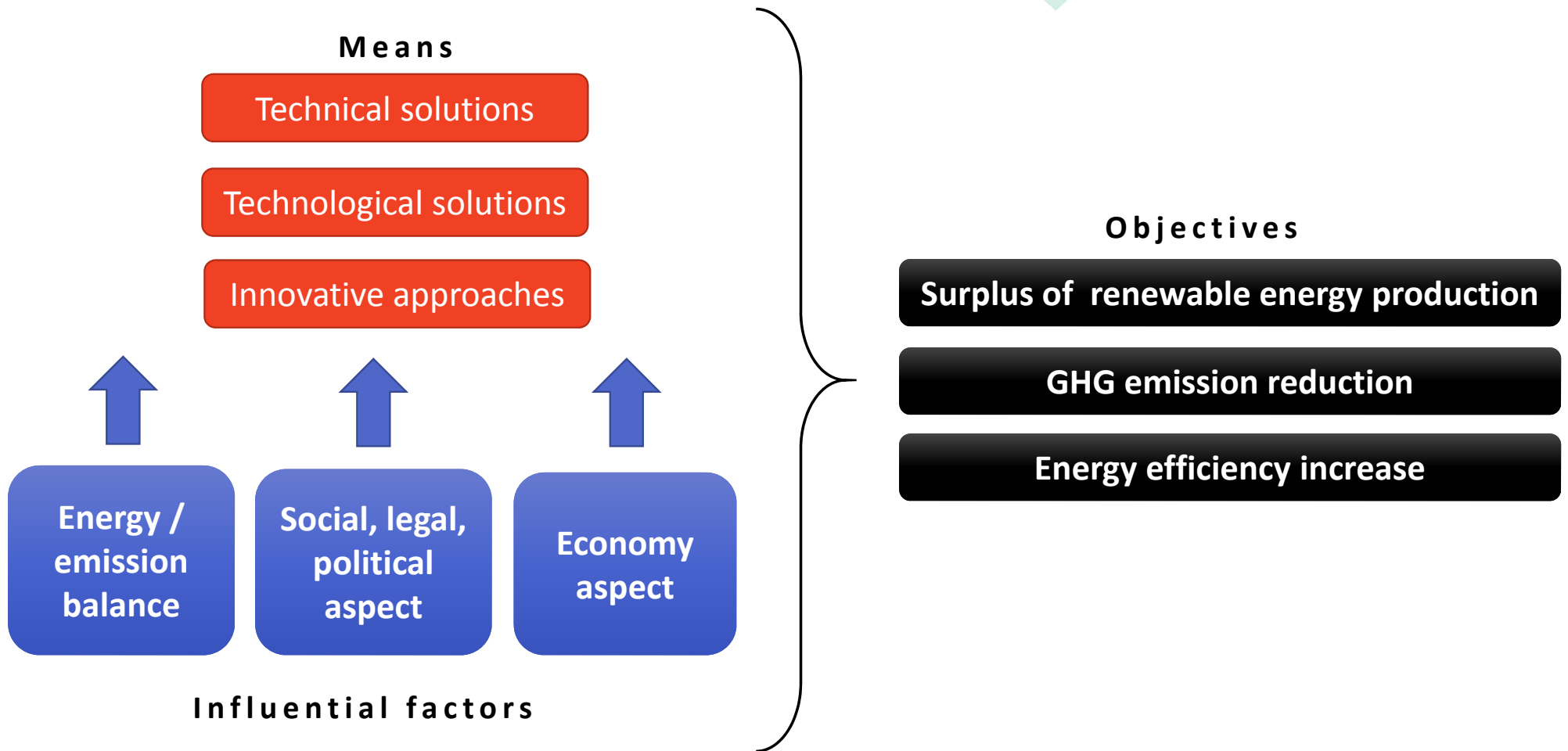

Mobility

Infrastructure

Greenery

and others…

Options available? ➔ HOLISTIC ASSESSMENT

Means

Technical solutions

Technological solutions

Innovative approaches

Influential factors

Energy / emission balance

Social, legal, political aspect

Economy aspect

Objectives

Surplus of renewable energy production

GHG emission reduction

Energy efficiency increase

Options available? ➜ HOLISTIC ASSESSMENT

Buildings (Energy Efficiency)	RES potential on-site (Energy Generation)	Energy Management (Energy Flexibility)	Transport and mobility (Energy Flexibility)
Improvement in thermal characteristics of the buildings	electricity	Demand side management	EV
Heat, cold and heated water	heating	storage systems	Decarbonised public transport
Improvement of electricity consumption	cooling	Peer 2 Peer trading	cycling
….	…	…	…

What do I need to do? ➜ MODEL, SCENARIOS

→ **Develop building models depending on specifications and structural density**
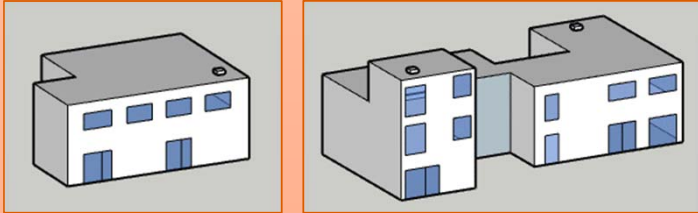
→ **Different scenarios for renewable on buildings and in the site**
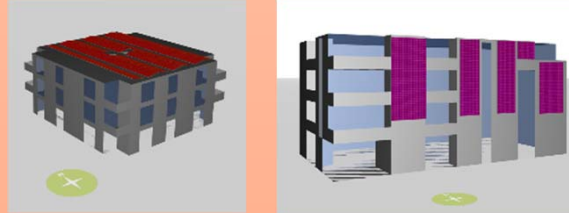
→ **Scenarios for energy demand of buildings**

- High Standards
- Passiv house

- High Standards
- Building Code
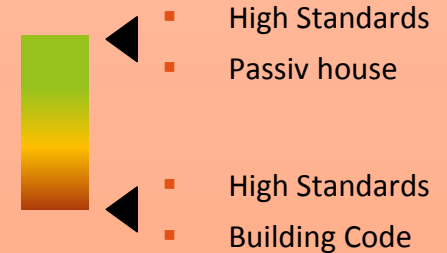
→ **Economical, social, emissions ….**

Balancing energy inputs & outputs, model different scenarios

Selection of the area? ➜ SOLUTION SELECTION

- Compare scenarios modelled to find the optimal solutions for the PED
- Multi-Criteria Decision Analysis (MCDA)

QUANTITATIVE

PED level
- Total investment cost (CAPEX)
- Investment efficiency (specific cost of saved energy and CO_2)
- Operational costs (OPEX)
- Degree of energy self-sufficiency
  - Export
  - Import
- Total energy consumption decrease
- Total GHG emissions decrease
- Total RES energy production

Individual measure level
- Total investment cost (CAPEX)
- Investment efficiency (specific cost of saved energy and CO2)
- Operational costs (OPEX)
- Energy savings (%)
- Energy savings (TJ)
- Total GHG emissions decrease

QUALITATIVE

General criteria
- Urban development
- Improving life quality
- Overall feasibility and demands of PED implementation
- Social acceptance
- Aesthetics, appearance, inclusion in the area
- Legal barriers

Economic assessment
- Payback period
- Available subsidies

Non-energy benefits
- Technical – condition of the buildings, quality, life cycle, energy security, energy independence
- Social – public health, content, contentment, labour productivity, life standard
- Environmental – local and global climate impact
- Other – urban development, public acceptance, appearance...

Finally…

Select the most suitable solution according to PED goals
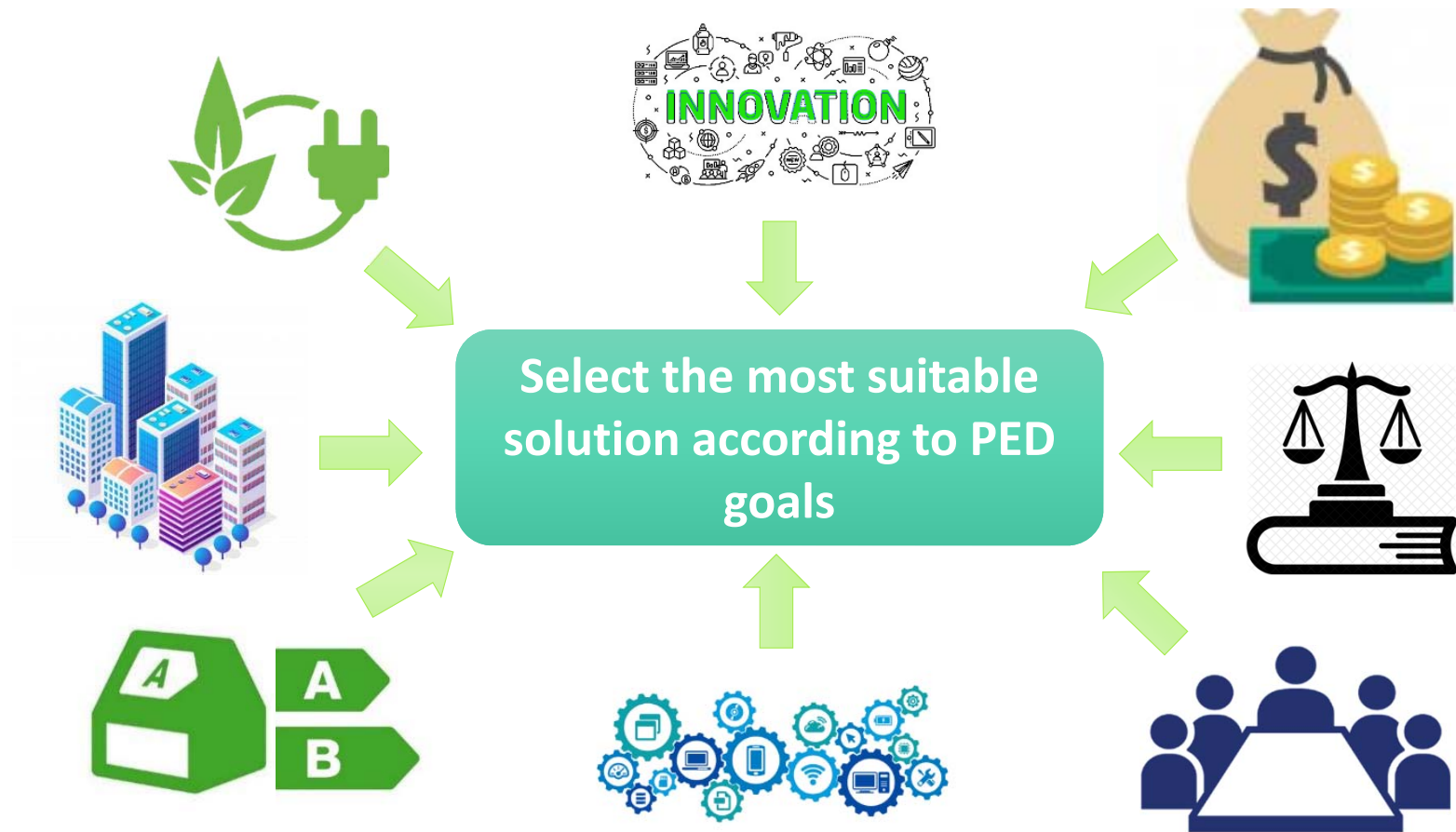
Data gathering

- *Specify the type and detail of the required data from stakeholder (prepare it based on the preliminary area analysis after the stakeholders „Commitment to PED implementation")*

- *Explains to the stakeholder what the data is needed for and what kind of outputs can be expected*
  (show examples of data processing and visualization – see level 3)
  (explanation is partly done in part 1 of this level)

- *See and check if the data are gathered*

Data gathering

Pre-selection of the area

To narrow area for data gathering.

Nevertheless, area can be expanded during the process and based on new facts...

Source: PED project in Kempelenpark in Vienna

Data gathering

Categories/types of data needed:

- Buildings   *More details in D3.1.*
- Infrastructure
- Transport and mobility
- Other municipality objects
- RES potential
- Utilization of energy recovery
- Greenery potential
- Restrictions

Visualize the data needed – show links between the data and the area
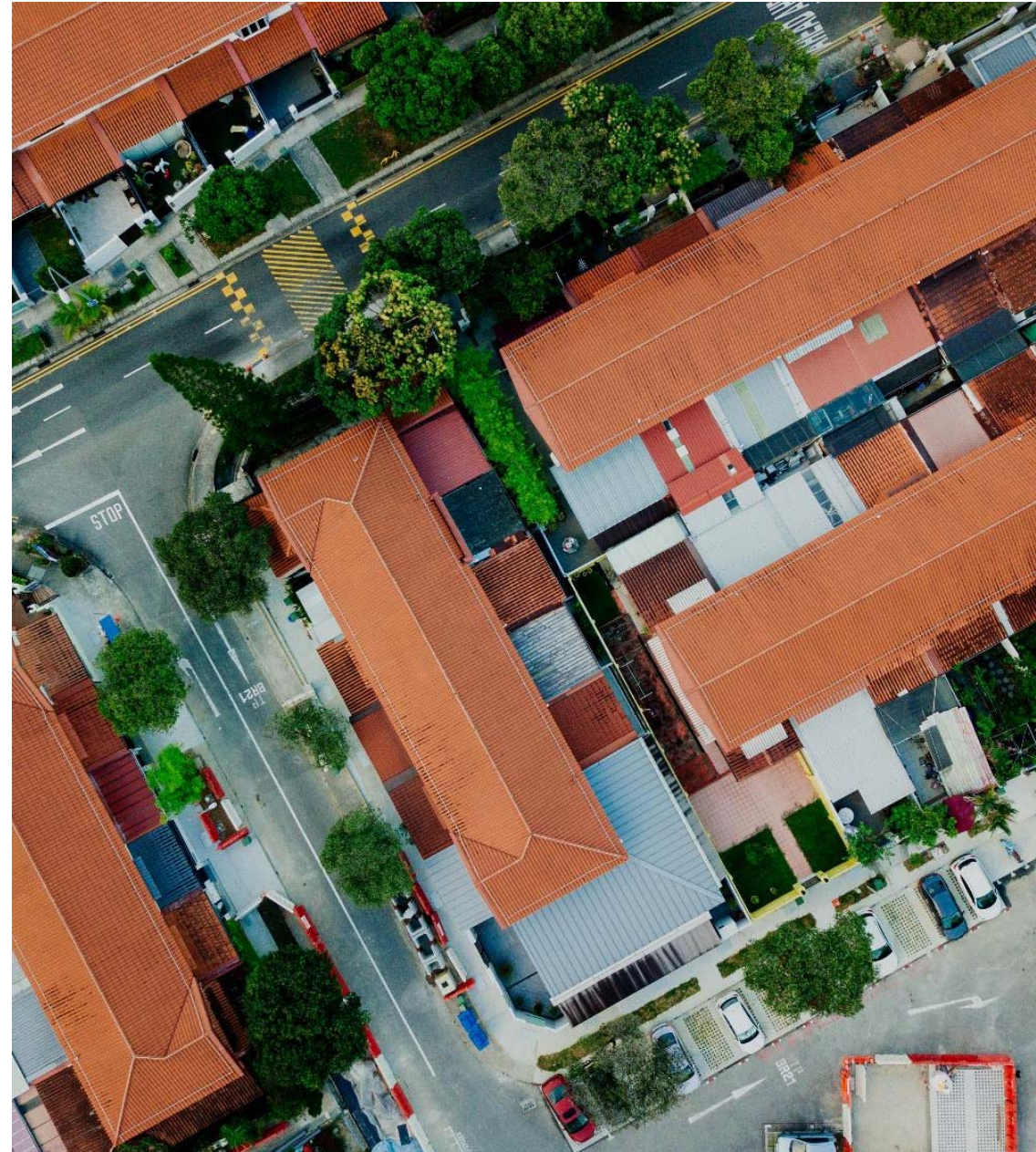
Data gathering

BUILDING USAGE

➡ *Which kind of building use is expected?*

➡ *Residential buildings*

➡ *Non-residential infrastructure of area*

  ➡ *Kindergarten*
  ➡ *Schools*
  ➡ *Nursery building*
  ➡ *Supermarket*

➡ *Which type of buildings are planned? How many floors?*

Commercial buildings

Residential buildings
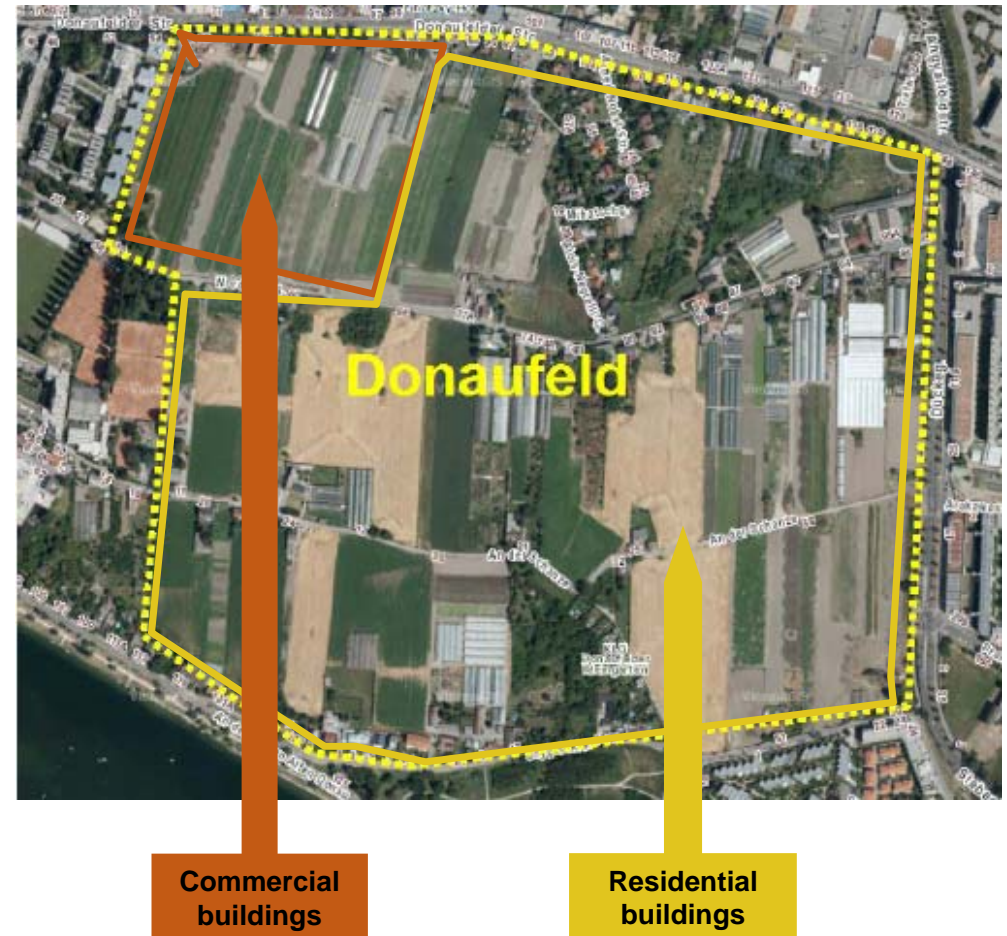
Source: basemap.at, additional illustration by e7

34

Data gathering

Use checklists for data gathering

Levels of detail of required data – explain them (higher level = higher data gathering effort, but more precise assessment and vice versa)

Basic level		Advanced level		Expert level	
Main section indicator / metrics	**Solution / data source**	**Subsection indicator / metrics**	**Solution / data source**	**Indicator / metrics**	**Solution / data source**
RES Potential – New potential production from RES					
Areas for energy sources	Summary from the advanced level				
		Water energy			
		Areas for energy sources	Map survey on the rivers, creeks, reservoirs, mere/pond, weirs, water canals, irrigation canals.		
				Flow (volume, speed), average water level during the year, water gradient	Map of water flows Hydrological data
				Reservoir / pond outflow during the year	Map of water flows Hydrological data Individual survey (object manager)

Data gathering

Level of detail of required data

Explain the purpose of data collection

Some data can be estimated – indicated them and agree with the stakeholder on the level of estimation

Expert level		Solution		Energy calculation	
Detailed information	How to solve it	Basic solution	Detailed solution	For calculation / estimation / assessment	How to solve it
Free areas for agriculture for biofuels	Map survey Individual survey			**For forests:** – annual production of wood waste – types of wood ➔ production (t) * calorific value **For farming:** – potential area X yield of potential plant ➔ tonnes / year – potential area X calorific value of potential plant X yield of potential plant ➔ potential gross energy per year (consider that combustion doesn't have 100% effectivity)	Technical information for several types of biofuels Calorific values for types of wood Farming/forestry information Technology system information (e.g. efficiency, fuel consumption,…)
Current areas with biofuels farming + their use	Map survey Individual survey				
Commercial forests + their use	Map survey Individual survey				
Wood processing – sawmills	Map survey Individual survey				

Table: Detailed Check-list and explanation of data for PED assessment

Level 3: Consultation maps

Consultation maps

Consultant have to choose appropriate data-visualization approach (GIS maps, professional spatial-energy-analytics software, ...):

o *maps, graphs, diagrams with aspects of the PED area;*

o *keep the maps simple and in a common visual style, if possible (only the information displayed should differ);*

o *provide additional important information;*

o *visualize the current state in the area – both stakeholder and consultants need to know with what they can work.*

o *Based on the consultation maps presented to stakeholders, communicate stakeholder* **preferences and constraints** ➔ *then you can proceed to scenario creation*

Consultation maps

Spatial energy analysis

o Existing structure of heating (or other energy) systems in area

- Type of energy source
- Installation year of heating system
- Construction year of building or renovation year
- Energy demand of building
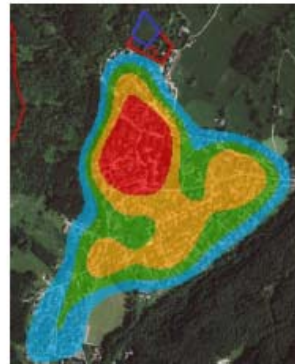
	Wärmenachfrage [MWh/a]				Diche
	Gas	Öl	Andere	SUMME	GWh/km²
Zone A	159	0	423	582	68
Zone B	1.087	0	0	1.087	84
Zone C	1.542	613	558	2.713	31
Summe	2.788	613	981	4.382	41

Figure: Heating system structure in the area

Source: Integrierter Wärmeplan Salzburg, Alexander Rehoogen
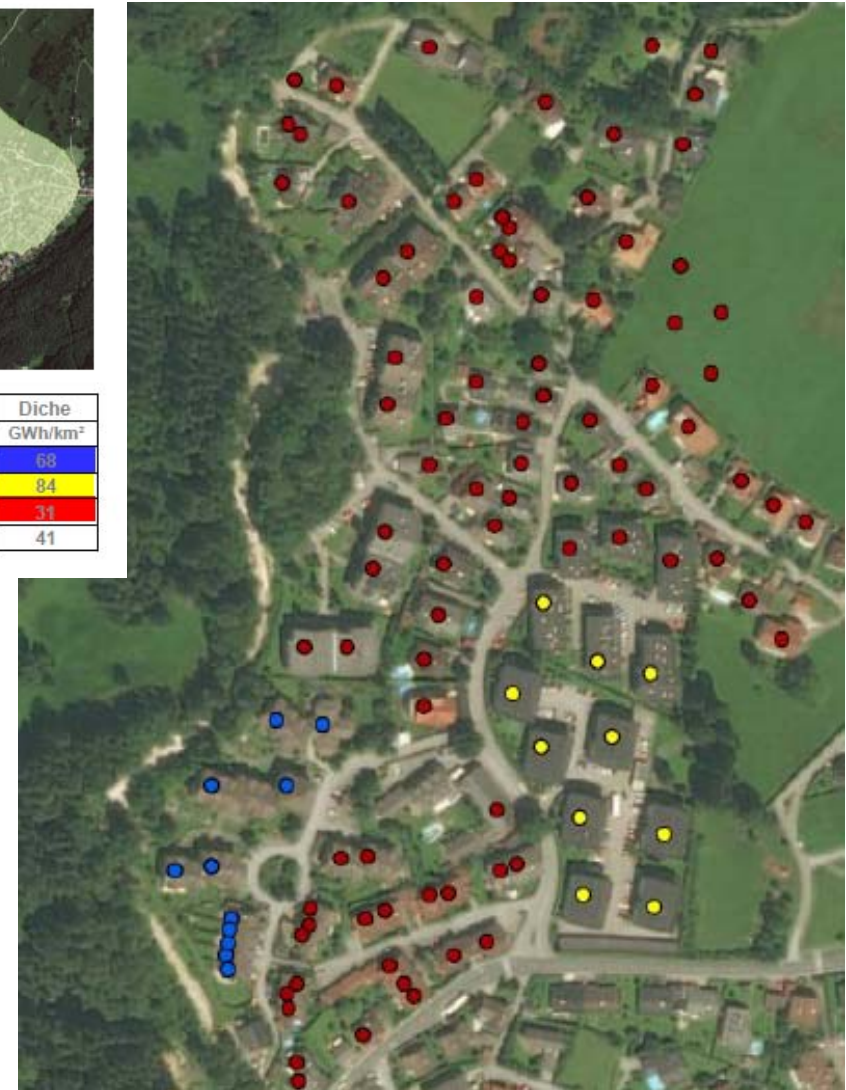
Consultation maps

Spatial energy analysis

o *Heating map*

- *to identify places with higher heat losses*

- *to identify places with higher temperature (potential areas for new greenery)*

Figure: Skopje´s thermal map

Source: Kaplan, Gordana et al. (2020). SKOPJE'S FIRST THERMAL MAP! Are Urban Heat Islands Real? SkopjeLab — City of Skopje Innovation Centre. [results of "ICT for Urban Resilience" Project]. Available from: https://www.innovationlab.mk/skopjes-first-thermal-map-are-urban-heat-islands-real/(accessed 28.3.2022).

Consultation maps

Spatial energy analysis

o *Solar potential of buildings in the areas (roofs, facades)*

o *Useful also for activities outside PED project*
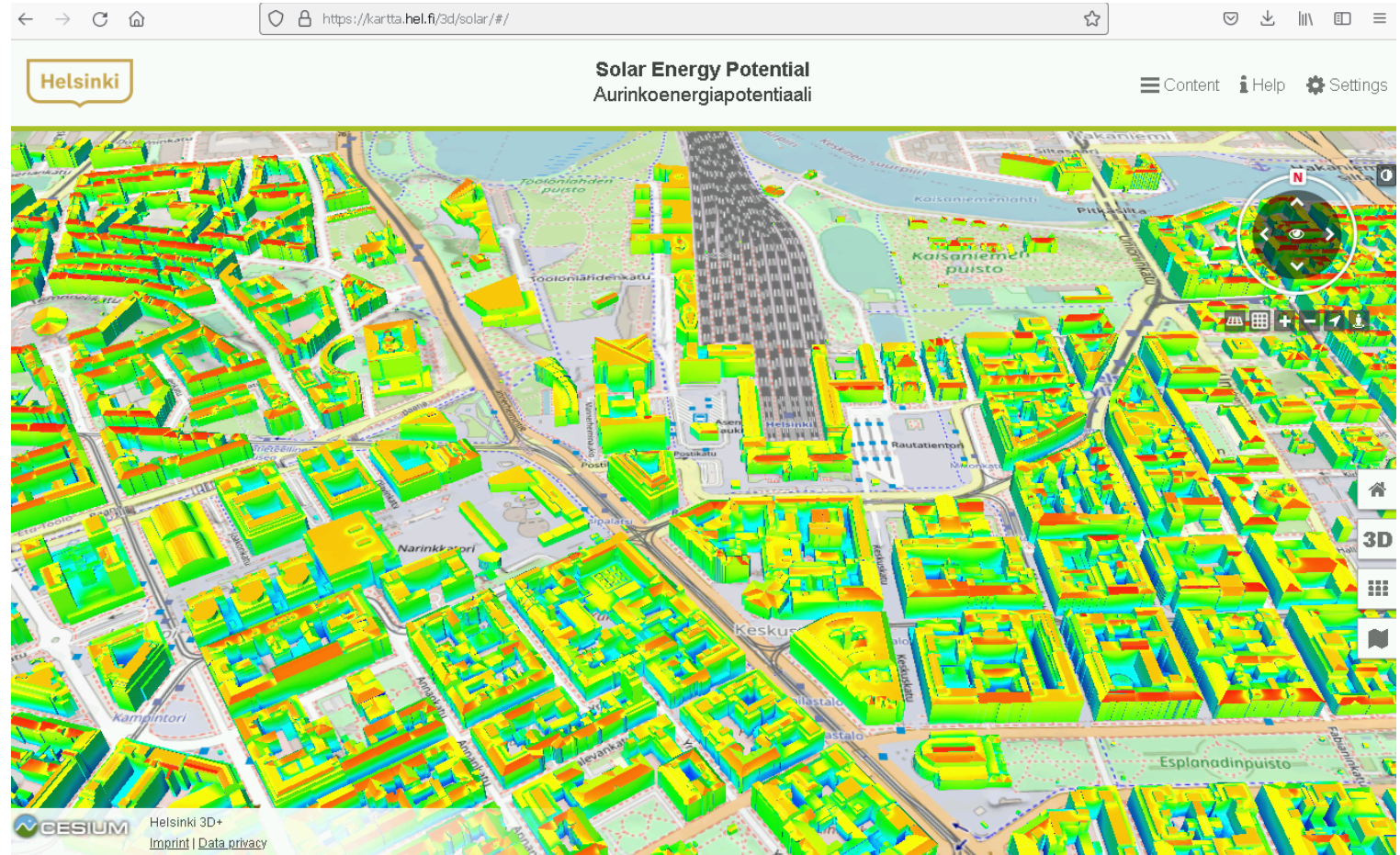
Figure: The solar potential of Helsinki city buildings (source: https://kartta.hel.fi/3d/solar/#/)

Source: City of Helsinky. 3D models of Helsinki. Available from: https://hri.fi/data/en_GB/dataset/helsingin-3d-kaupunkimalli. Licenced under CC BY 4.0

41

Consultation maps

Spatial energy analysis

o *Summary for heat potential in the area (along with solar gains)*

o *Overview energy demand of existing building*

- *Visualisation in heat map*

o *Model calculation for energy demand*
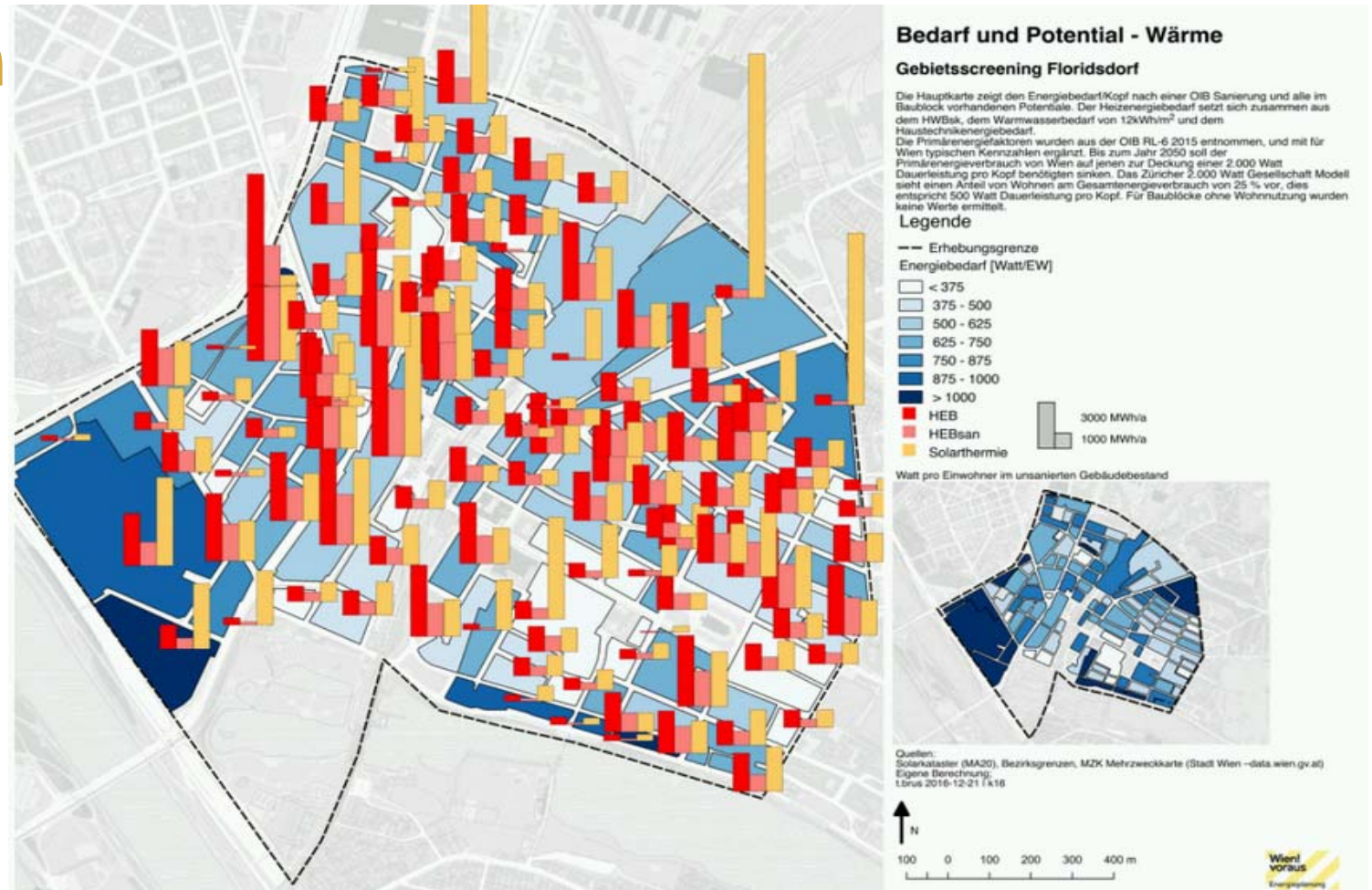
Figure: Pilot map area screening Floridsdorf

Source: project GEL SEP. Available from: https://waermeplanung.at/waermeatlas/

Other visualizations

Sankey diagrams or other specialized calculation tools (e.g., City Energy Analyst or District Energy Concept Adviser...) are useful for presentation of energy balances in the area.
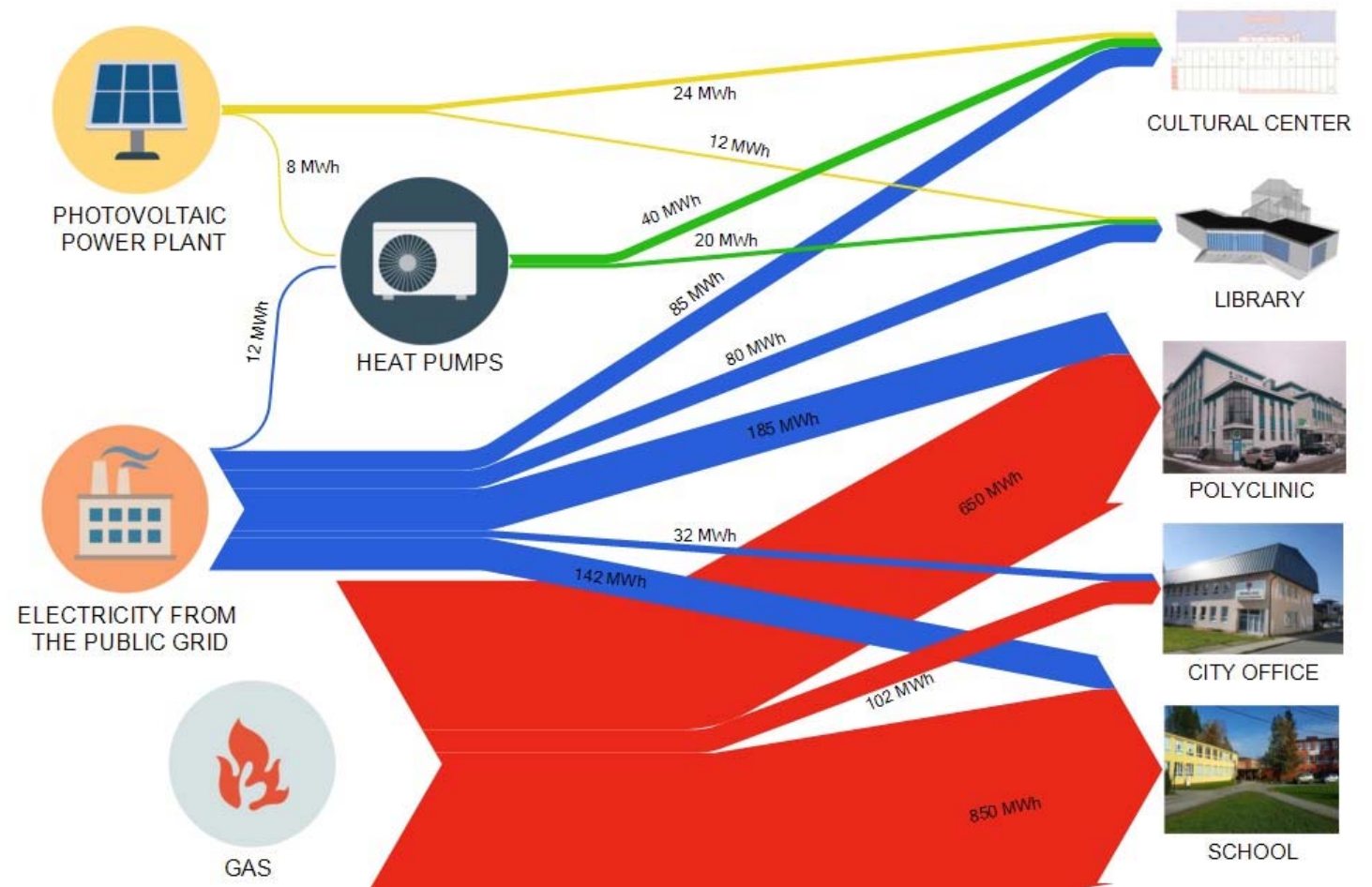
Figure: Example of energy balance of current state in the form of Sankey's diagram

Source: PED-ID project

Level 4: Scenarios

Scenarios

Presentation of feasible scenarios based on the area characteristics

o *summary maps with each aspects (and/or each assessed indicator) for each scenario;*

o *maps in the same visual form as in Level 3 Consultation maps;*

o *describe main points and their meaning.*
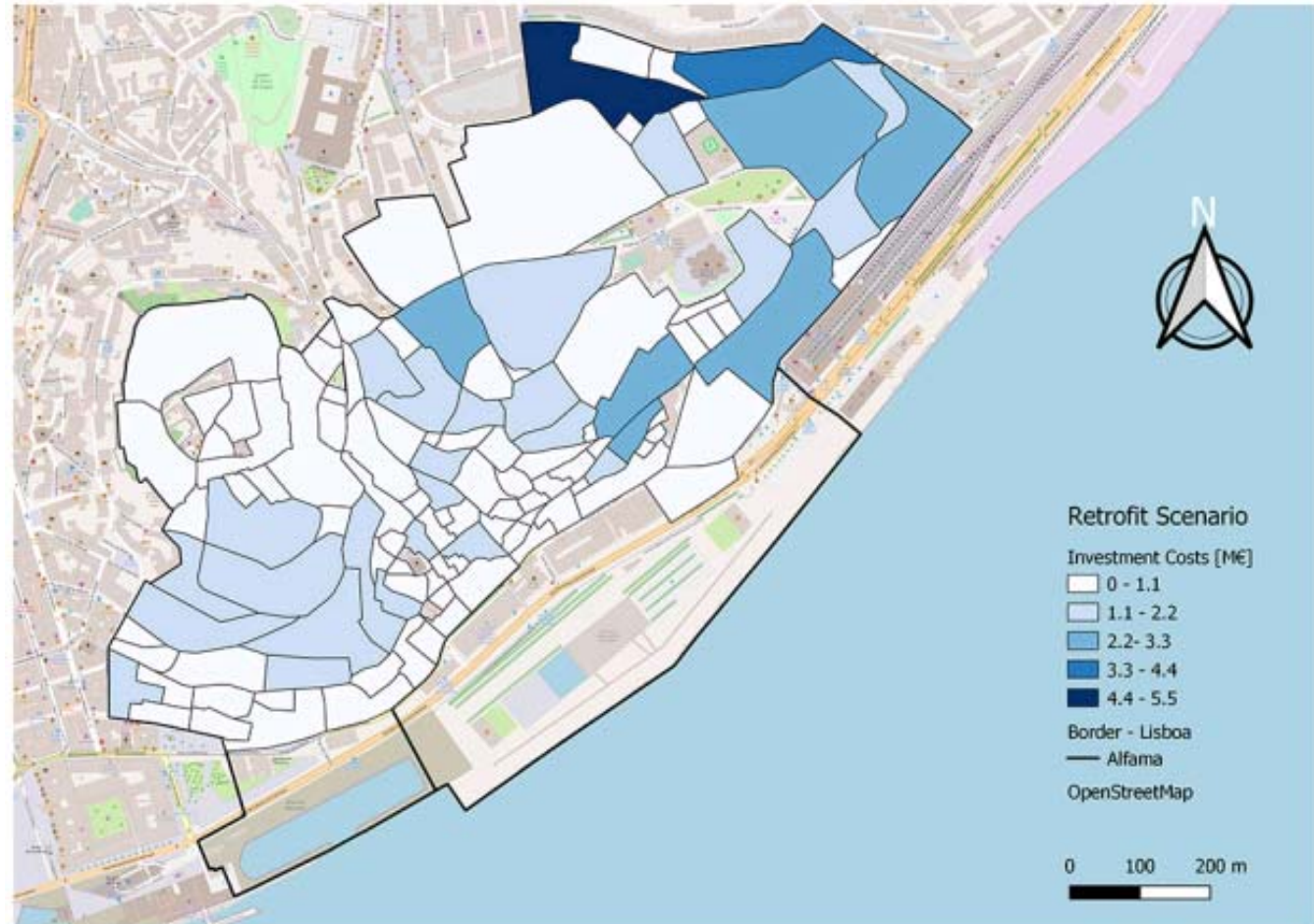
Figure: Exemplar map visualizing a selected layer of the scenario (investment costs)
Image source: Gouveia, João & Seixas, Julia & Palma, Pedro & Duarte, Henrique & Luz, Henrique & Cavadini, Giovan Battista. (2021). Positive Energy District: A Model for Historic Districts to Address Energy Poverty. Frontiers in Sustainable Cities. 3. 648473. 10.3389/frsc.2021.648473.

Scenarios

Presentation of feasible scenarios based on the area characteristics:

- *describe main aspects of the scenario;*

- *3D model is very suitable, primarily for new urban areas.*
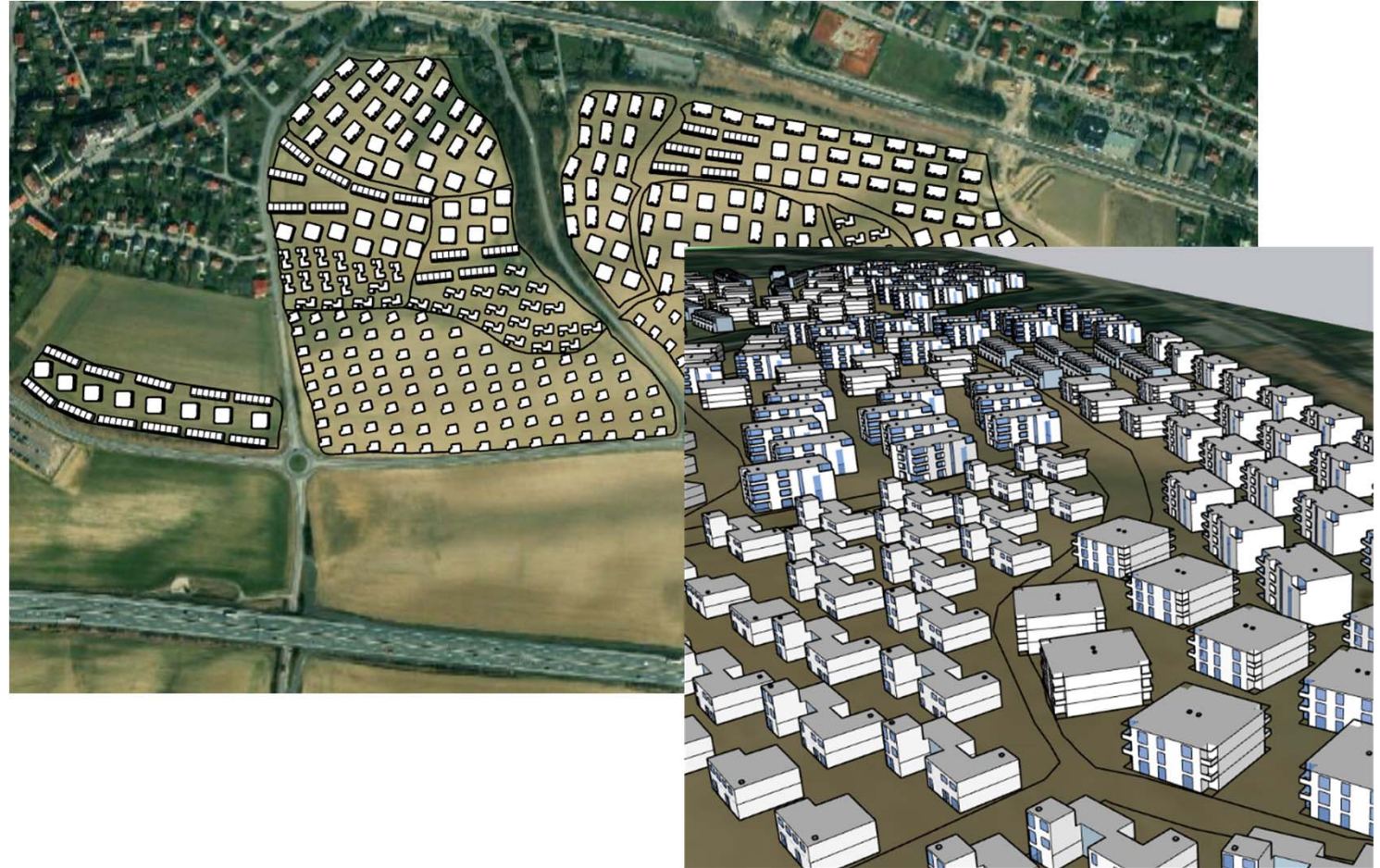
Figure: Spatial arrangement of proposed model buildings in new PED area

Scenarios

Presentation of feasible scenarios based on the area characteristics:

o *presentation is not limited only to maps.*

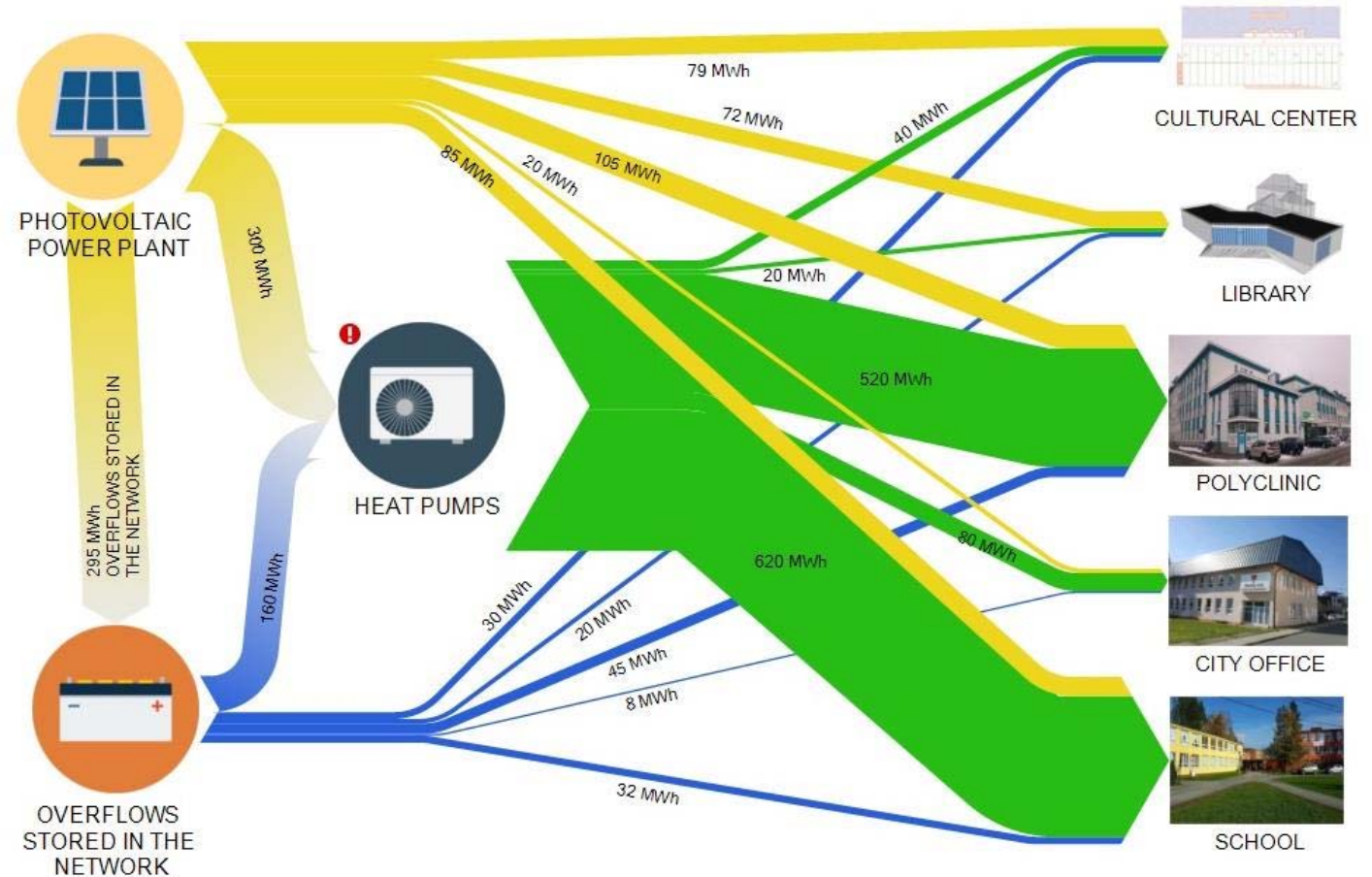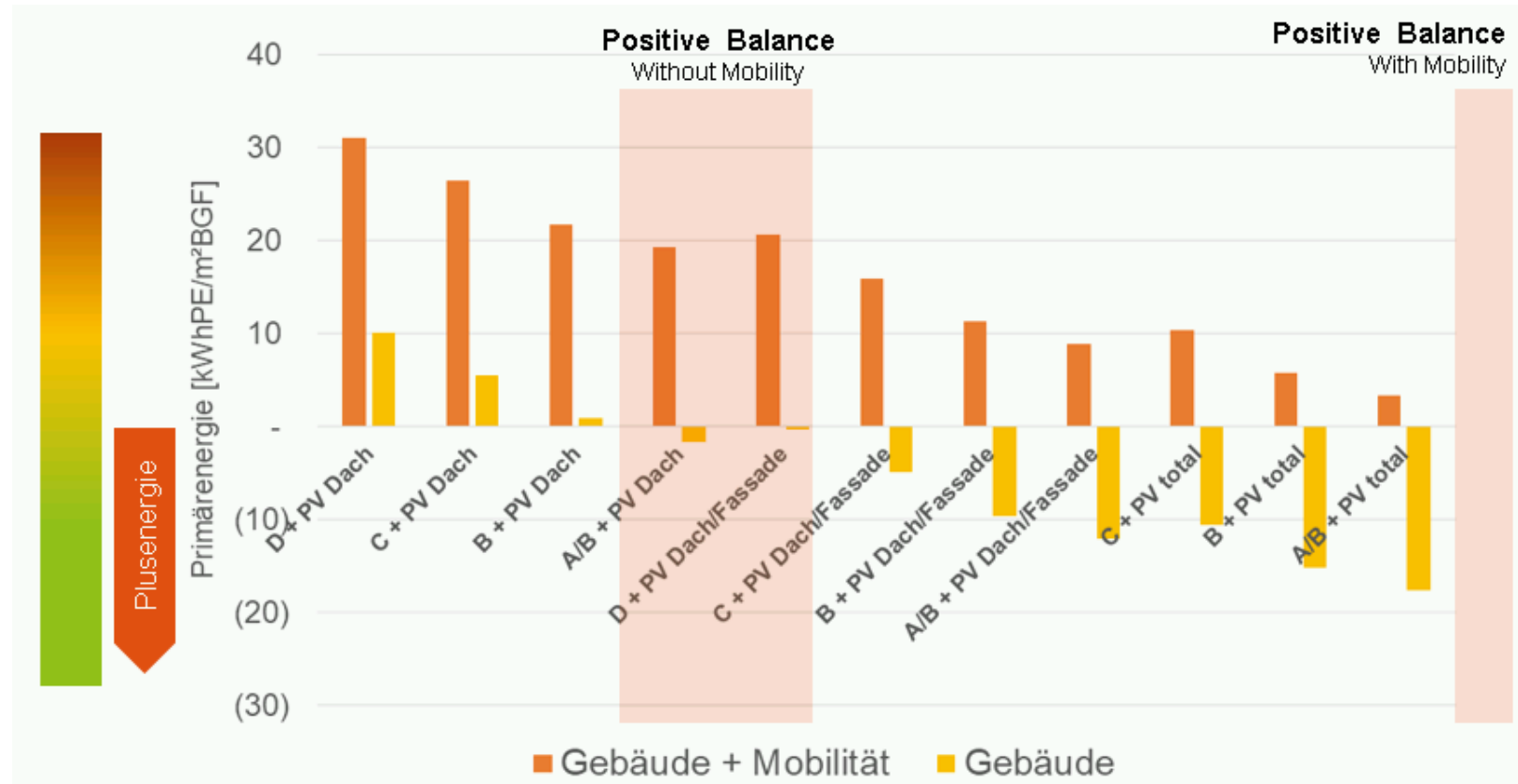➔ *use other visual tools too – graphs, diagrams, schemes etc.*

Figure: Example of energy balance of scenario in the form of Sankey's diagram

Source: PED-ID project

Scenarios

Presentation of feasible scenarios based on the area characteristics:

- *presentation is not limited only to maps.*

➜ *use other visual tools too – graphs, diagrams, schemes etc.*

Annahme: Mischung der Wärmeversorgung; 50 % mit Nahwärme, 50% Wärmepumpensysteme

Figure: Scenarios overall – Results of scenario analysis

Scenarios

Presentation of feasible scenarios based on the area characteristics

o *summary table with indicators and benchmarks agreed with stakeholders*

Quantitative criteria	Scenario 1	Scenario 2	Scenario 3
Positive energy balance reached (✓/ X)			
Total primary energy consumption (TJ)			
RES energy generation (TJ)			
Total investment costs (EUR)			
Total operational costs (EUR)			
Qualitative criteria	Scenario 1	Scenario 2	Scenario 3
Life comfort and quality improvement			
Social acceptability			
Score achieved per scenario			

Contact info

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	Sustainable Innovation AB (SUST)
	White Arkitekter AB (WHITE)

Funded by: