National Workshop: EGYPT

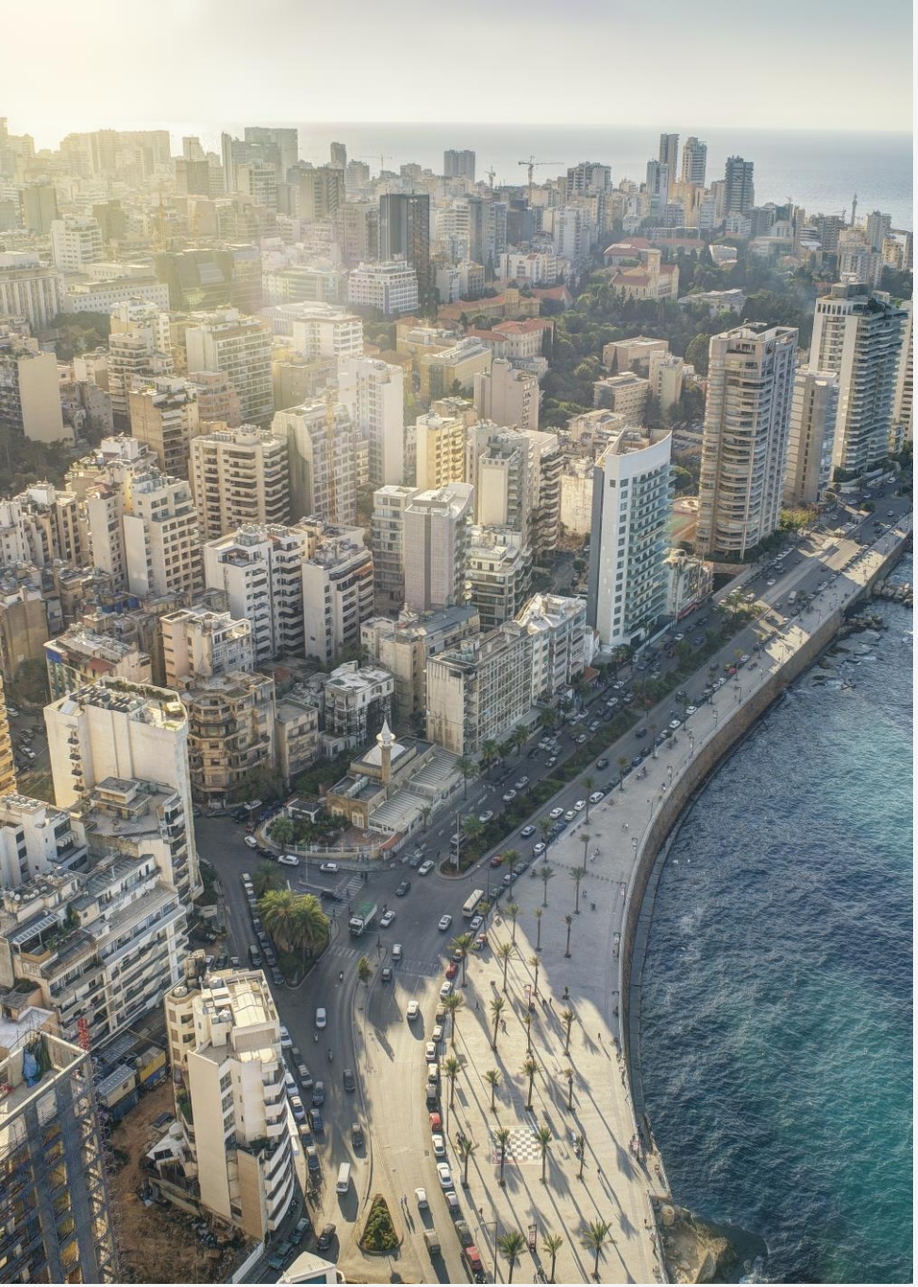
Climate-friendly buildings in the MENA region

11 March 2021

Supported by:

Federal Ministry
for the Environment, Nature Conservation
and Nuclear Safety

based on a decision of the German Bundestag



Agenda

What to expect

01	Welcome
02	BUILD_ME Update: Where do we stand after 2020?
03	BUILD_ME tools and the building sector in Egypt
04	Q&A
05	Break
06	Voluntary Energy Classification Scheme in Egypt
07	Green Building Certification, an example from Saudi Arabia
08	Pilot projects case study: Al Mansoura University
09	Diving into the demonstration project database
10	Q&A / Wrap up

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Welcome words

Dr. Ashraf Kamal, HBRC
Dr. Mohamed Salheen, IDG

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BUILD_ME Update: Where do we stand after 2020?

Riadh Bhar, Guidehouse

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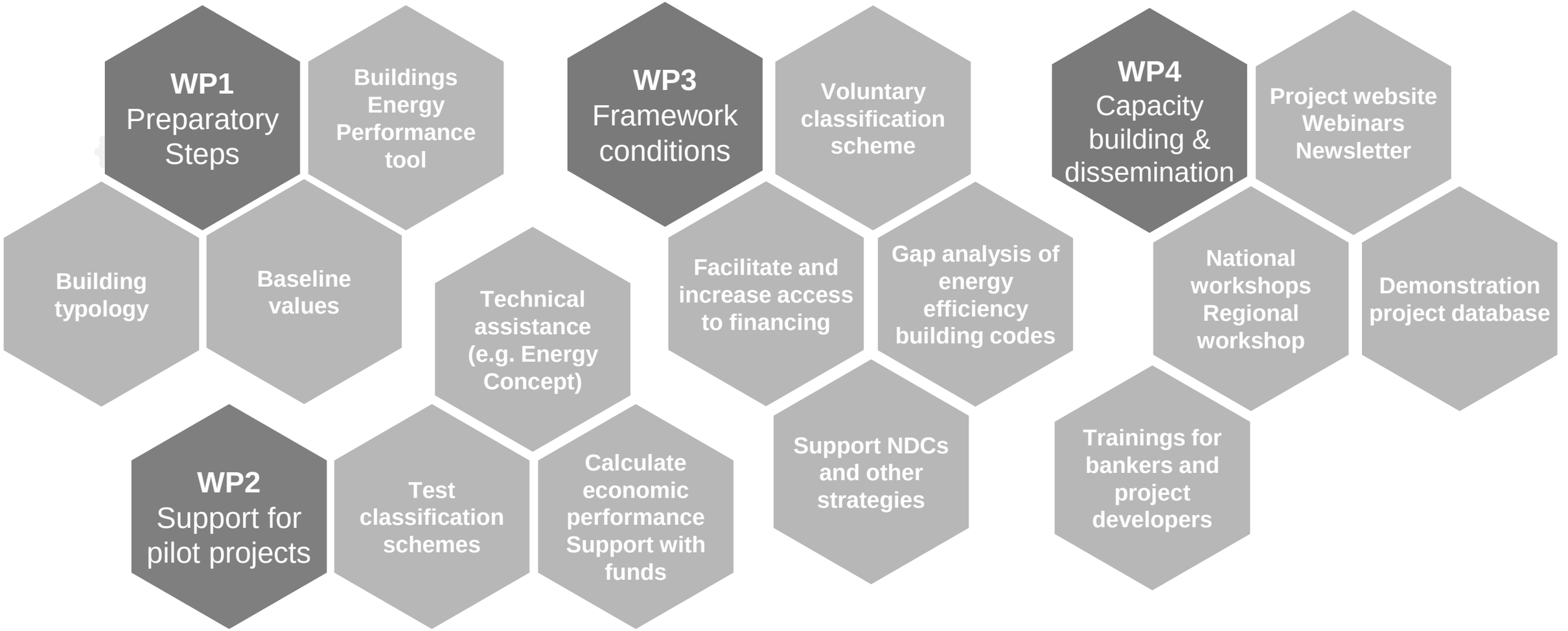
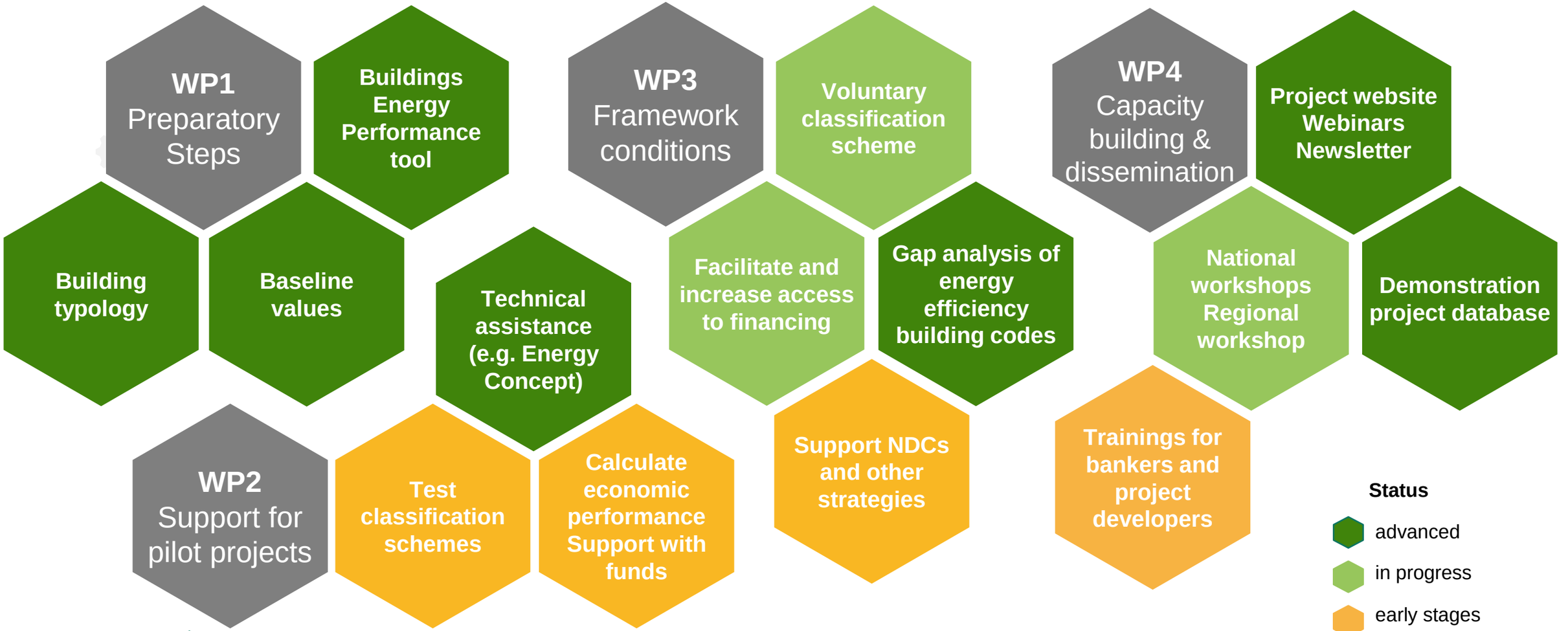
BUILD_ME Update

What are we working on?



BUILD_ME Update

Where do we stand after 2020?



BUILD_ME tools and the building sector in Egypt

Guidehouse

BUILD_ME

IDG MATRIX
Integrated Development Group

Building Energy Performance (BEP) tool

Marco Reiser, Guidehouse

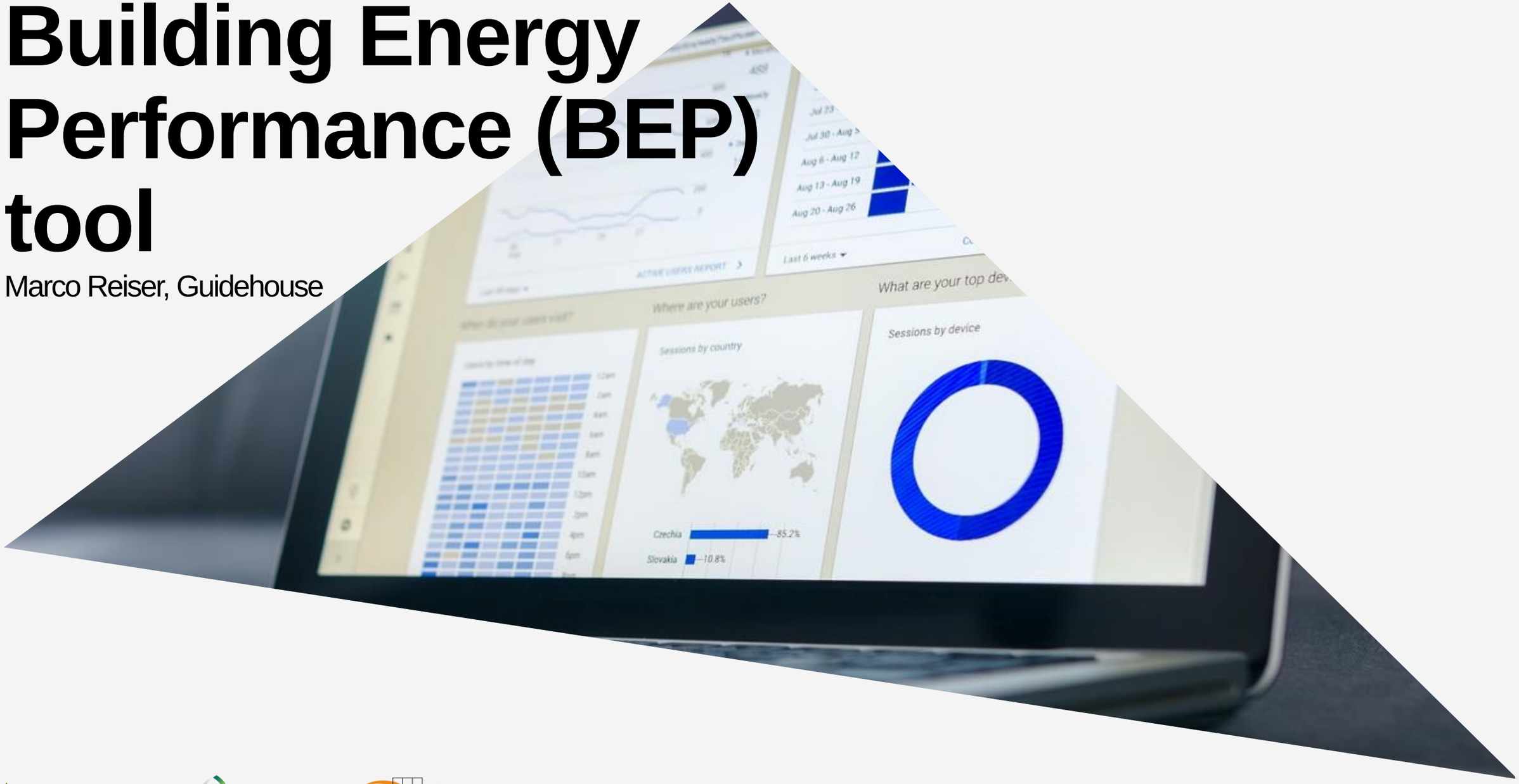


Photo by Lukas Blazek on Unsplash

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Building Energy Performance (BEP) Tool

Overview

Performance of energy efficiency measures & RE

- **Energy demand** of building
- Compare to **country's baseline**
- **Energy savings** of efficiency measures
- Use of **renewable energies**

Calculation of monetary savings

- Identify **cost savings**
- Get **cost-optimal** solutions
- **Local market data** for Egypt, Jordan and Lebanon

Free web application

- **Free to use as browser application**
- Optimized for **mobile devices**
- Provides **default input values**
- **Advanced mode** for experienced user

Proven methodology

- **International norm** (EN ISO 52016)
- Already **successfully applied** in various projects
- **Full transparency**

Icons by Eucalyp from www.flaticon.com

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BEP calculation methodology

Input

User input

Building
- Type (e.g. office)
- Geometry
- Renovation / new build
- Envelope specifications
- HVAC systems
- Renewable energies
- Operational parameters
- Location (city, country)

Internal database

Financial
- Investment cost
- Energy prices

Energy
- Baseline buildings
- User profiles
- HVAC system specification
- Climates

Calculation engine

Energy

Useful energy demand
- ISO 52016

Geometry
Envelope
OP
Climate

Sizing HVAC & RE systems
- HVAC Tool

HVAC and RE systems

Final energy demand
- HVAC Tool

Primary energy demand

GHG Emissions

Financial

Investment cost
- Envelope (e.g. insulation)
- HVAC systems
- Renewable energies

Specific cost
HVAC and RE systems
Type and age
Country

Energy cost
- Energy carrier (e.g. gas)

Energy prices

Other cost
- Inspection and maintenance
- Replacement

Output

Energy & Emission

Final & primary energy demand…
- per energy carrier (e.g. gas)
- per energy use (e.g. cooling)
- specific (kWh/m²) and total

GHG Emissions
- CO_2 equivalent

Global Cost

Global cost
- Investment
- Energy cost
- Inspection and maintenance
- Replacement

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BEP - Developed for the MENA region

Database from **local partners** & **international** calculation methodology

Baseline buildings

Local investment cost & energy prices

Tool was successfully applied in **building projects in the MENA region**

International calculation methodology: ISO 52016

Geographic focus on: **Egypt, Jordan and Lebanon**

Baseline reflects the **country-specific building** standard

BUILD_ME

Methodology is applicable worldwide

Climate data of all countries in the MENA region

Local PEF and CO_2 emission factors

All data input is collected and verified by **local partners** and project developers

The calculation standard is internationally acknowledged.

Internal market data **collected from local partners** for Egypt, Jordan and Lebanon

International energy calculation methodology

Country-specific climate data, incl. multiple climate zones within each country

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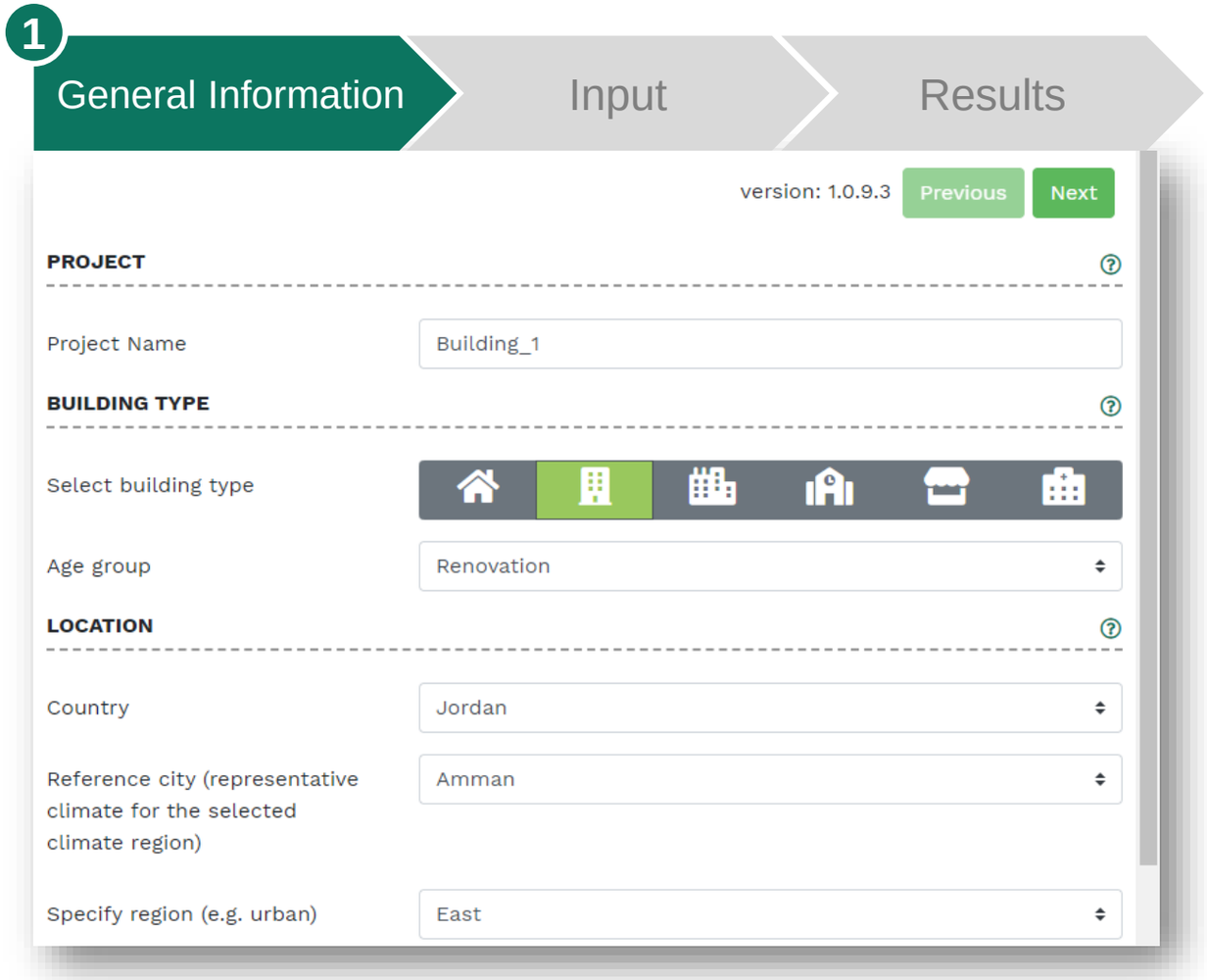
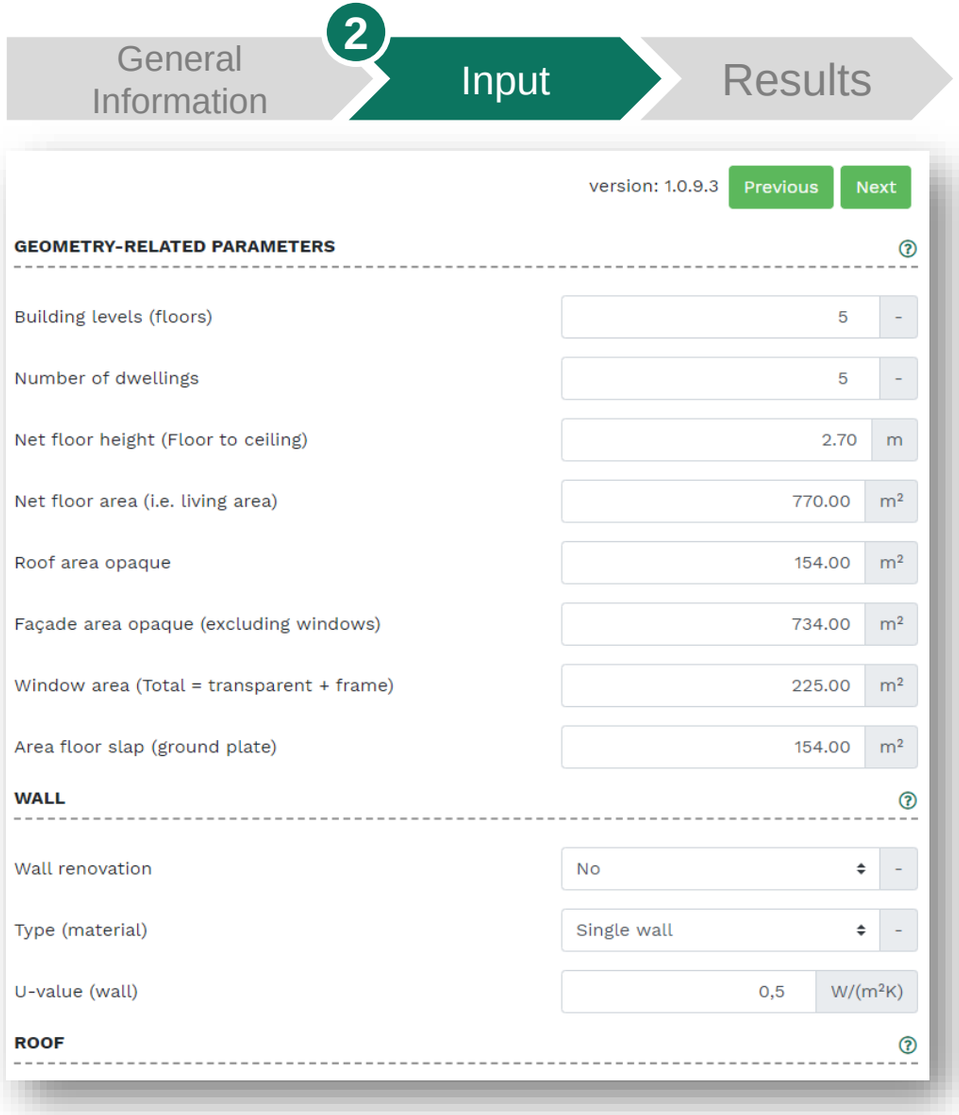
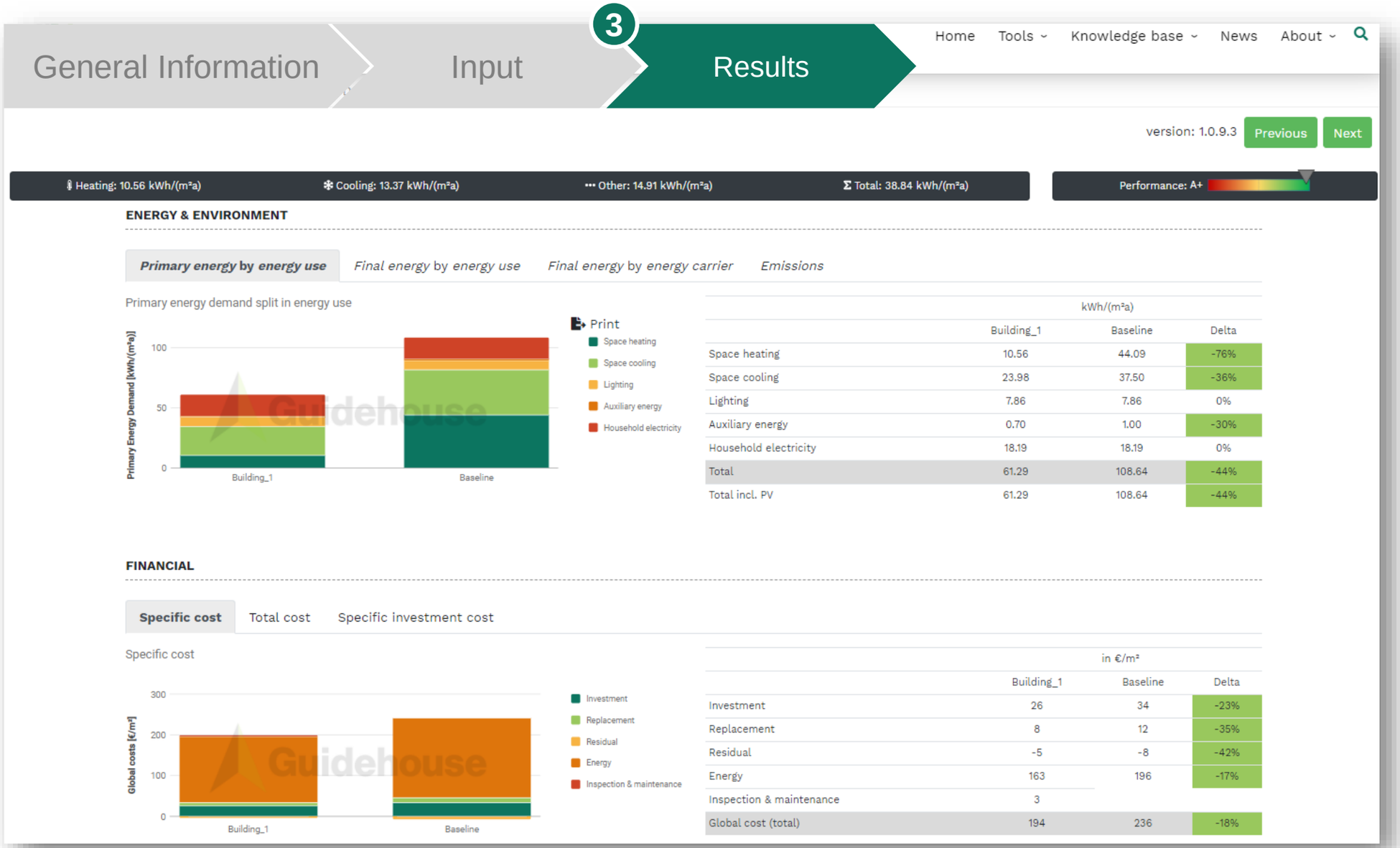
Online Tool - Input





Online Tool – Results



Online Tool – Results detail

1| Quick overview

The main facts

2| Output selection

4 tabs to select the energy performance indicator

3| Overview chart

Comparison to the baseline building

4| Results table

Detailed results in numbers

5| Baseline building

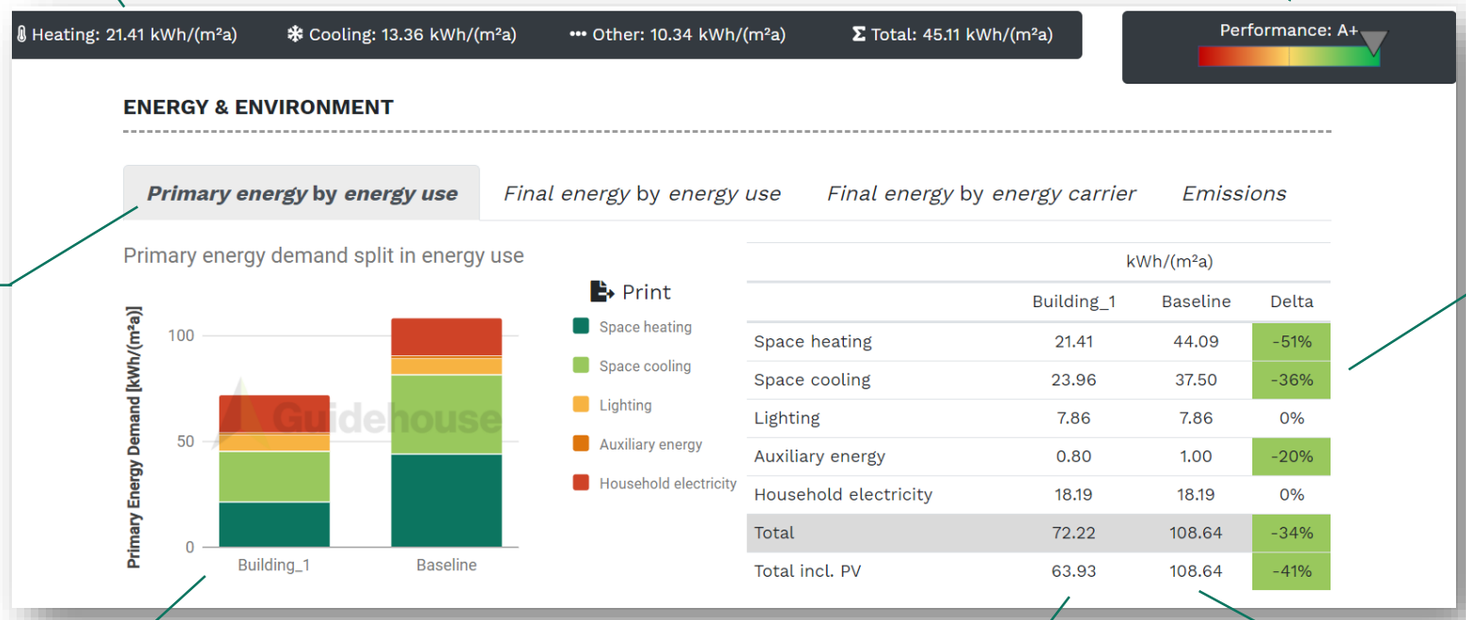
Detailed results of the baseline building

6| Comparison

Difference to the baseline buildings

7| Performance rating

C = equal to baseline



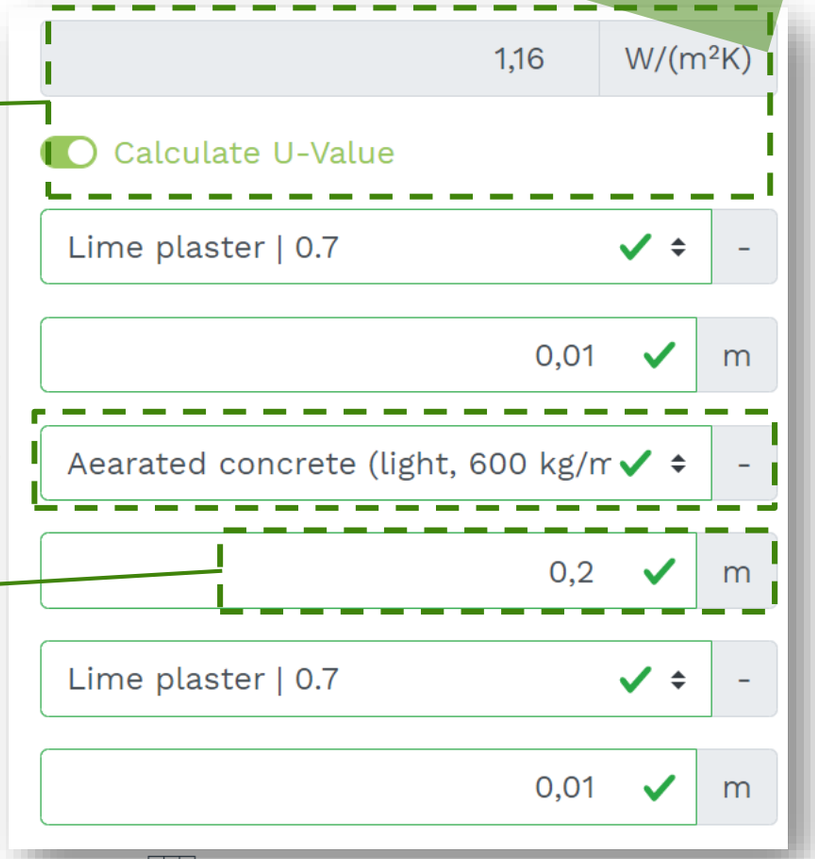
Online Tool – Two new features

Built-in U-Value calculator

3 **Get U-Value**

1 **Select building materials**

2 **Enter thickness of each material**



User-friendly CAPEX / OPEX overview

FINANCIAL - CAPEX / OPEX - OPERATIONAL in €

	Current	Baseline	Delta
Heating system	10.761	9.384	-1.377
DHW system	128	128	0
Cooling system	326	326	0
Lighting	2.700	2.700	0
PV system	-	-	-
Ventilation system	-	-	-
Shading system	12.070	12.070	0
Envelope	14.904	20.389	5.485
Energy cost	18.884	16.810	-2.074

Get cost delta of all systems and elements separately

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Building typology

Mohamed Salheen, IDG

Guidehouse BUILD_ME IDG MATRIX Integrated Development Group

Development approach of the building typology

Four main working steps

Template formulation
Prepared by Guidehouse

Data collection
National partners collect data from site visits, stakeholder interviews, literature and databases

Data validation
By Guidehouse and national partners

Reporting > upload on the website

Results and main sections of the template

A : General information

Country	Project Name	Building type	Region (specify)	Construction Period	ID	Reference ID

B: Geometries

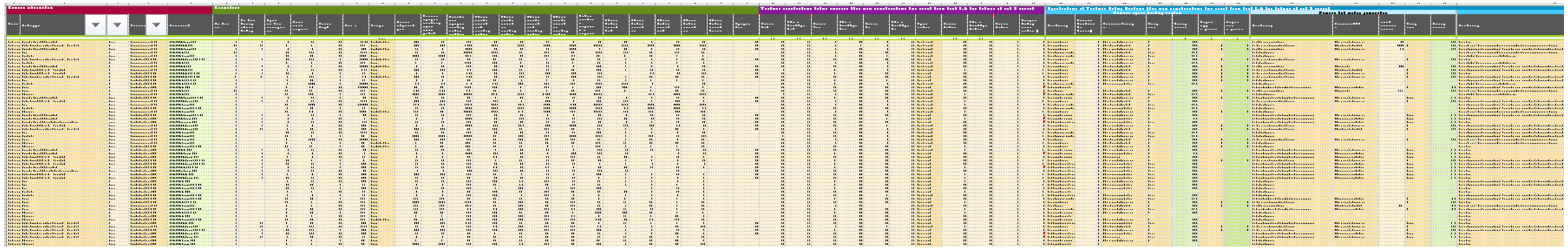
Number of stories	Number of dwellings	Typical number of occupants / users	Net floor area	Clear room height	Volume	Roof type	Area floor slab (ground plate)	Roof area opaque	Façade area opaque	Share of facade oriented north	Share of facade oriented east	Share of facade oriented south	Share of facade oriented west	Window area	Share of windows oriented north	Share of windows oriented east	Share of windows oriented south	Share of windows oriented west	Share of windows oriented horizontal	Opaque doors	Ratio Floor / Ground	Ratio Floor / Roof	Ratio Floor / Facade (excluding windows)	Ratio Floor / Facade (including windows)	A/V

C: Technical specifications building envelope

Thermal heat bridge - Slab	U-value - Roof	Thermal heat bridge - Roof	U-value - Wall	Thermal heat bridge - Wall	Type of window	U-value - Window	Thermal heat bridge - Window	G-value Windows	Avergae shading factor of windows (0-1)

D: Specifications of technical building systems

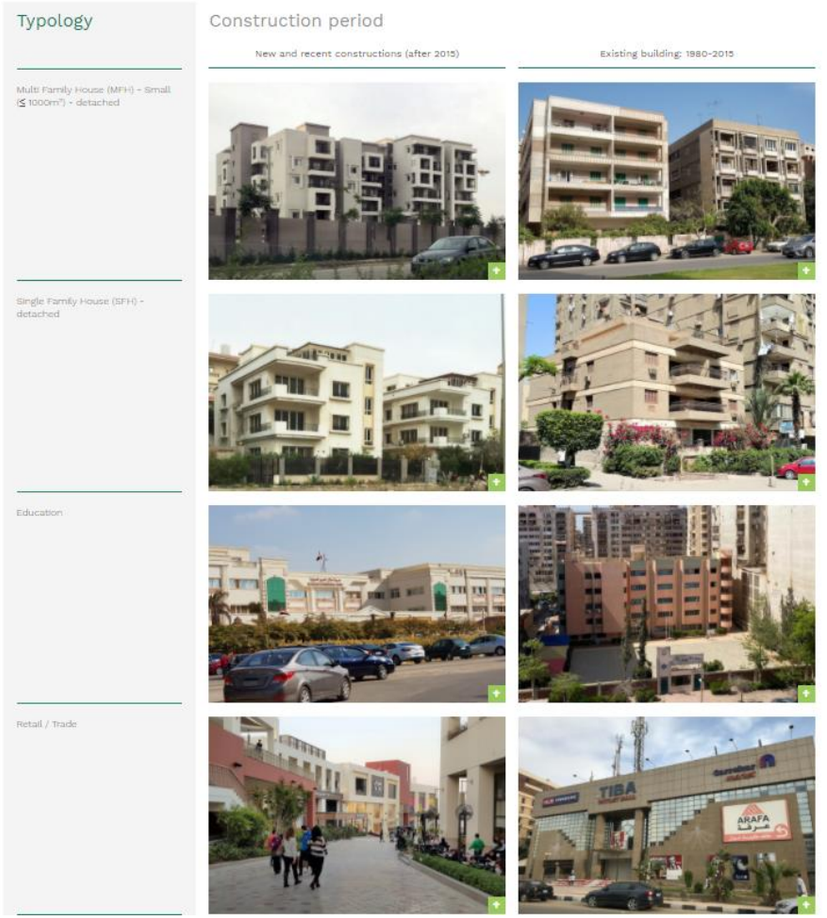
Primary space heating system	Secondary space heating system	Primary hot water generator	Secondary hot water generator	Primary space cooling system	Secondary space cooling system	Ventilation	Photovoltaics	Lighting	Temperature set-points

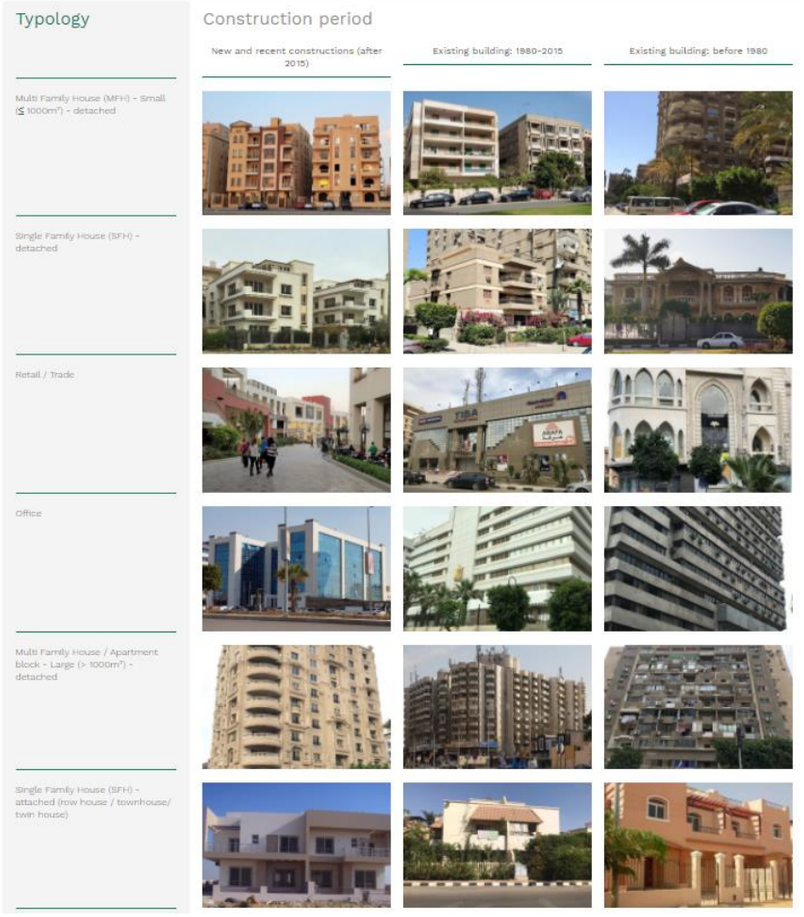


Building typology
Results

Visit: https://www.buildings-mena.com/typologies

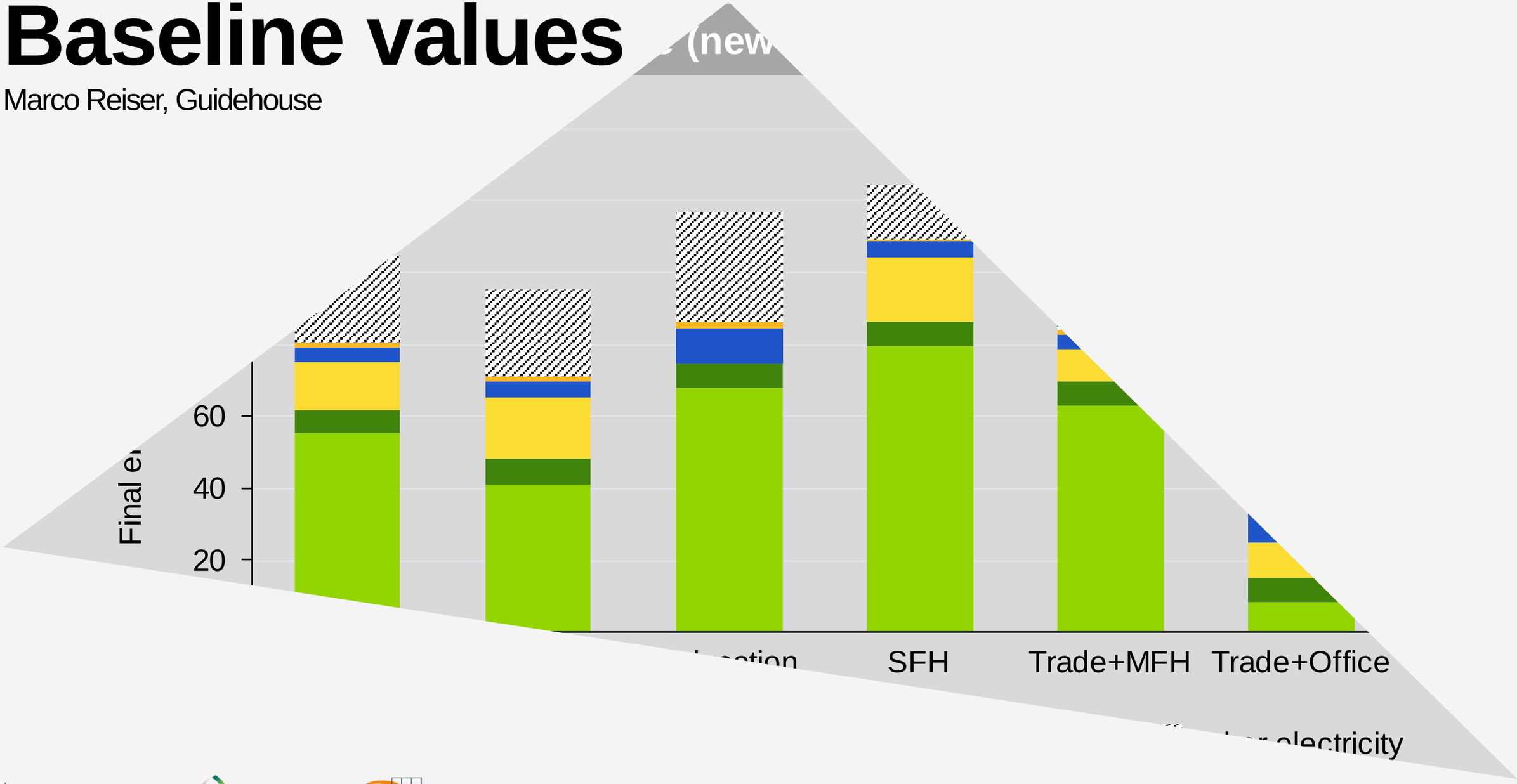
- **Main buildings types**
  - Single Family House (SFH) - detached
  - Multi Family House (MFH) - Small (≤ 1000m²) - detached
  - Education
  - Retail / Trade
  - Office
  - Mixed-Use
  - Hospital
  - Hospitality
- **Construction period**
  - Before 1980
  - 1980 – 2015
  - After 2015





Baseline values

Marco Reiser, Guidehouse



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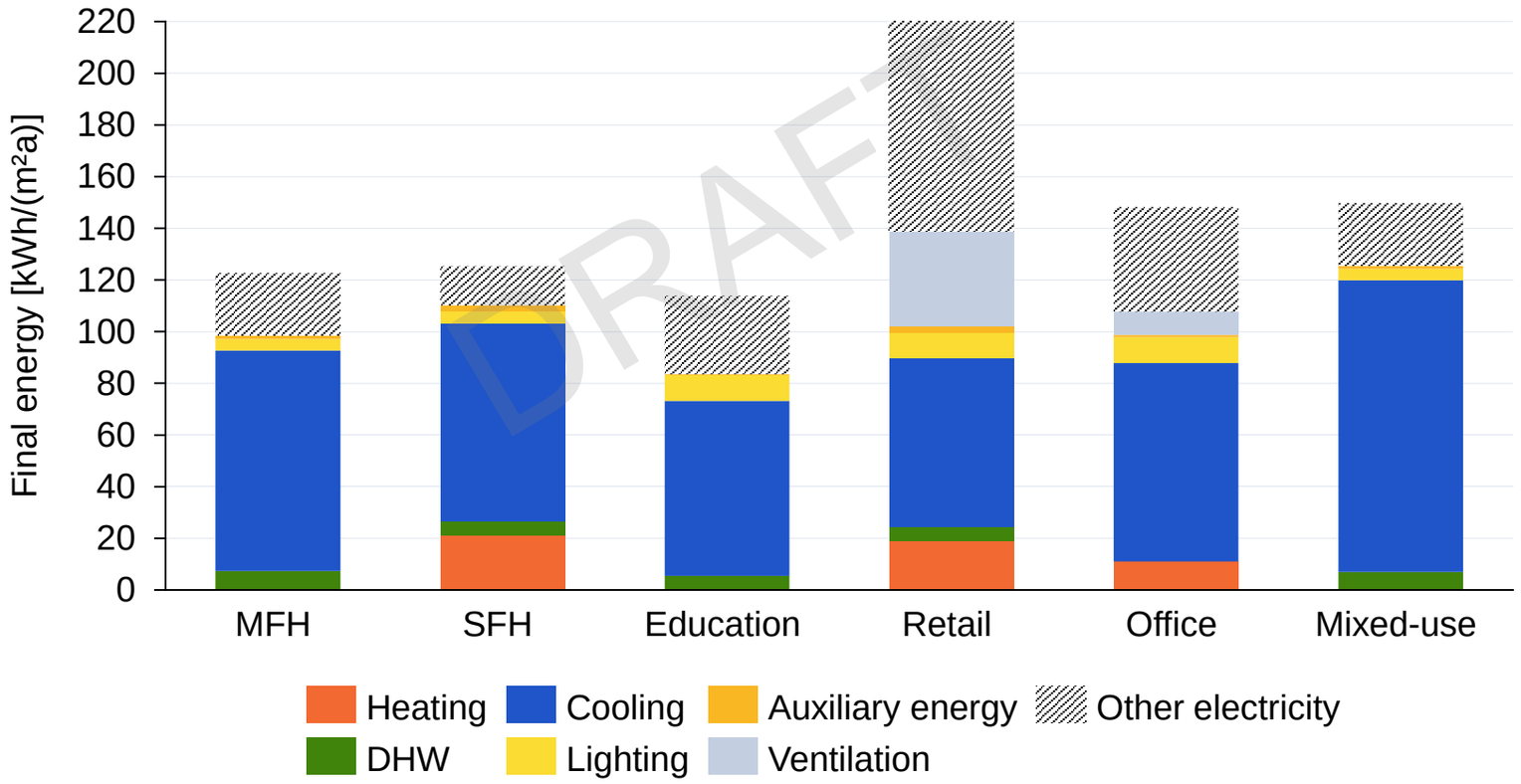
Baseline

Illustrating energy intensity of select Egyptian building types

Key takeaways

- Specific final energy demand ranges between **115 – 220 kWh/(m²a)** for buildings constructed over the past decade
- **Space cooling** accounts for largest energy demand
- **Space heating** is only installed in less than 50% of the cases
- Note: Other electricity stands for plug-loads (e.g. fridge, TV, etc.) and is informational

National baseline (new buildings, after 2015)



Baseline

Illustrating energy intensity: Single-family house

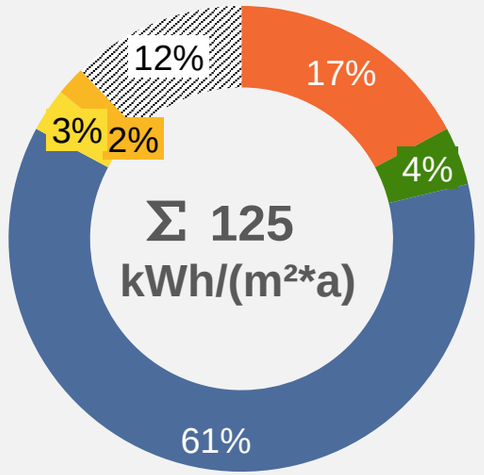
Building standard

- New buildings (constructed after 2015)
- Thermal insulation is used in roof

Energy demand

- 125 kWh/m²/a (114 kWh/m²a for HVAC and Lighting)
- Energy consumption for cooling almost 2/3 of total

Parameters	Baseline
Roof insulation (U-Value)	2.2 W/m²K
Wall insulation (U-Value)	0.56 W/m²K
Floor insulation (U-Value)	2.3 W/m²K
Windows (U-Value; G-Value)	5.7 W/m²K; 0.85
Window fraction	Ø 11%
Shading	Fixed shading
Air tightness	0.25 1/h
Heat supply	Revers. split unit (COP: 3.7)
Cold supply	Single split (EER: 3.0 – 3.9)
Hot water	Direct electric
Ventilation systems	Free ventilation
Lighting systems	LED
Renewable energy	No
Set temperature cooling/heating	23°C / 20°C



Energy cost
13.5 EUR / (m²*a)

CO2 - emission
6.9 kg / (m²*a)

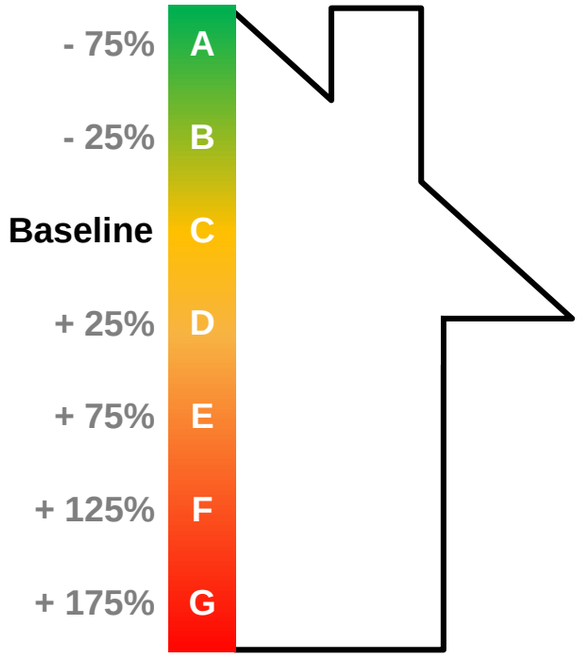
Baseline

Next steps, development of classification scheme

Rating scores for BUILD_ME building types

Class	Term	Score
A	Nearly zero energy building	<0.25
B	High performance building	0.25 - 0.75
C	Average new construction	0.76 - 1.25
D	Stock, better quality	1.26 - 1.75
E	Stock, medium quality	1.76 - 2.25
F	Stock, poor quality	2.26 - 2.75
G	Stock, urgent renovation demand	>2.75

Application of the rating score to baseline level



Methodology behind the BUILD_ME rating

- Rating logic is based on the European energy performance certificates of buildings norm [EN 15217]
- Adapted with feedback from financial institutes active in the markets and findings of the building typology
- Baseline (new buildings energy consumption) is equal to Class C (score of 1.0)

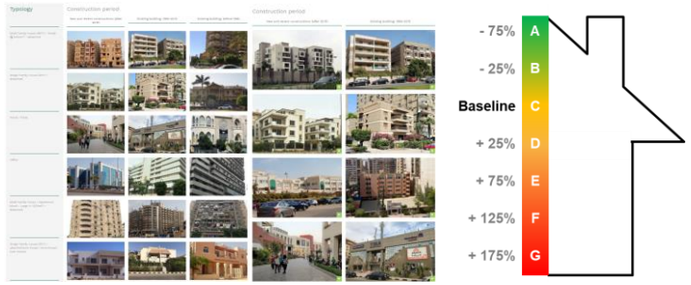
Voluntary Energy Classification Scheme in Egypt

Norhan El Dallal, IDG

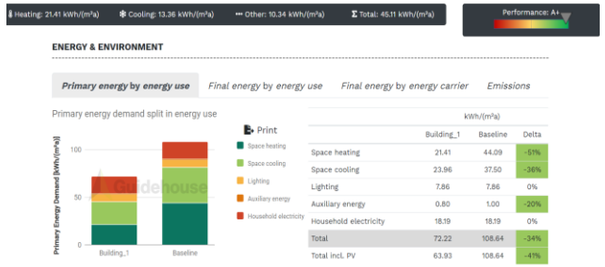
Guidehouse BUILD_ME IDG MATRIX Integrated Development Group

Voluntary Energy Classification Scheme in Egypt

Starting point and Objective



BUILD_ME Building Typology
considering the prepared typology as a baseline



Building Energy Performance Tool
(BEP) tool as a calculation method considering local market information

Systems of national institutions

Requirements local banks

Adaptability to national context
Embed into e.g. existing schemes and managerial infrastructures

Establishment of a national energy classification scheme

Ensure implementation and ownership of the scheme beyond BUILD_ME

Problem statement

How to introduce the BEP Tool in the Egyptian built environment?

Option A) Integrated

- Integrate the BEP tool in an existing scheme (e.g. GPRS)
- BEP tool as built-in module, calculating the energy performance of the GPRS energy chapter

Option B) Independent

- Develop a stand-alone scheme
- BEP tool as stand alone with a clear focus only on energy

Operation

? What is the operational framework? Certification and labelling process?

Verification

? How is verification, monitoring, surveillance and enforcement done?

Testing

? Testing and roll out? Evaluation and updates to the scheme?

Ownership

? Evaluation and ownership of updating the scheme?

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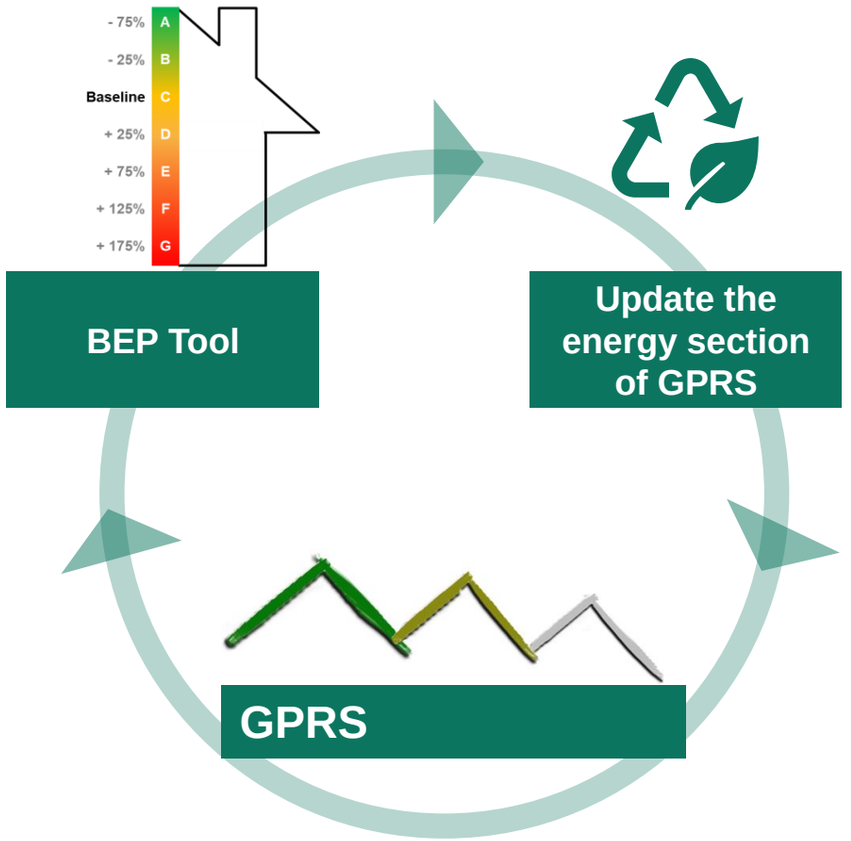
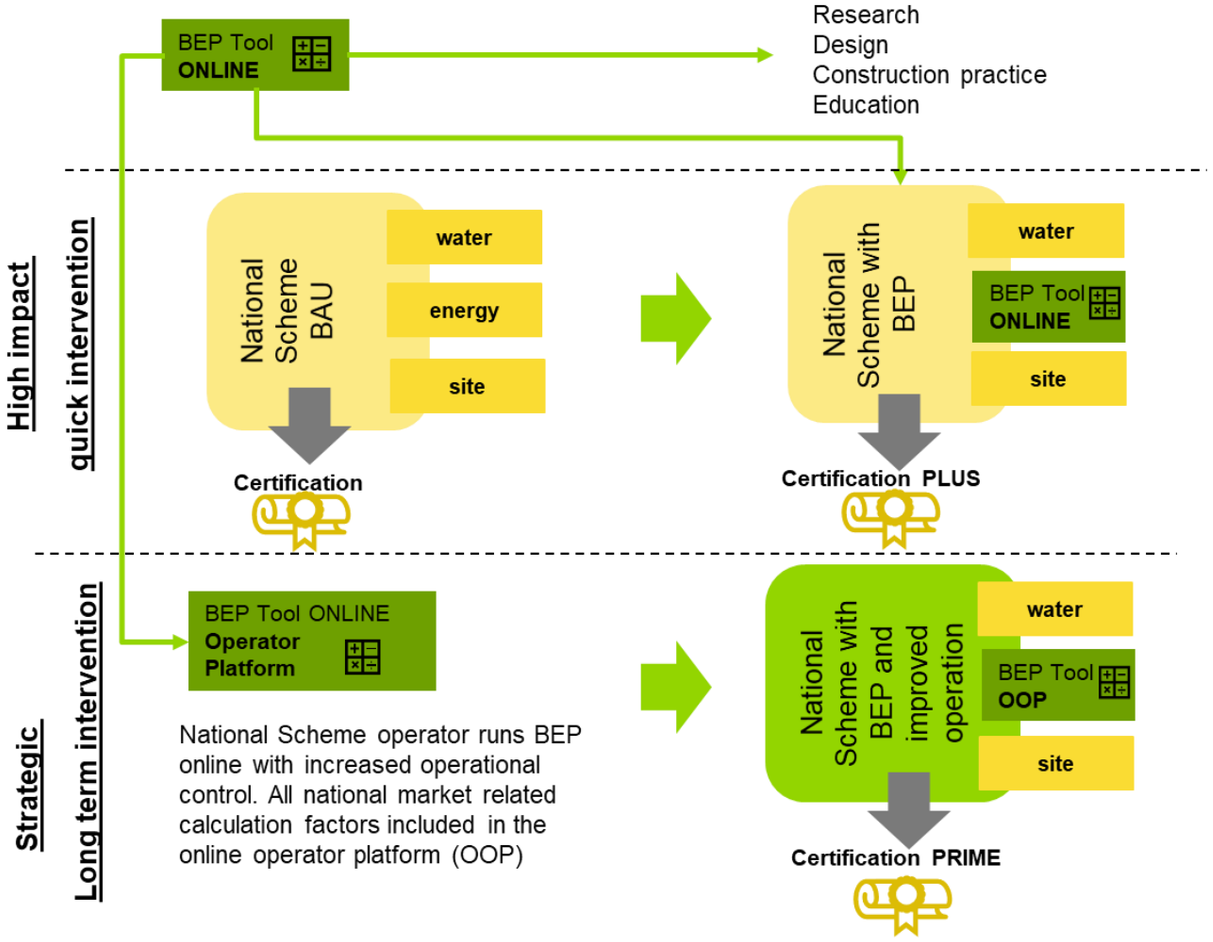
Mapping BEP tool with GPRS – Energy Chapter

GPRS	BEP Potential
Energy Performance Level	Yes
Energy Monitoring	
Ozone Depletion Potential (ODP)	
Reductions in energy consumption	Yes
Reductions in annual external heat gain\loss	Yes
Guidelines on the purchase and use of Energy Efficient Appliances	
Vertical Transportation Systems	
Peak electrical load	Yes
On-site and/or off-site renewable energy	Yes
Refrigerants (Environmental Impact)	
Operations Manual for all Mechanical, Electrical and Plumbing (MEP)	
Performance	Yes
Inventory of energy and carbon for MEP systems	Yes



Roadmap for integrating the BEP tool as energy performance calculation component into an existing scheme



BEP tool as a plug-in option to the current scheme

- Instead of using tabulated values or a list-based approach the energy performance assessment is carried out via BEP tool
- Almost nothing apart from the energy module is changed
- Can be achieved in a relatively short time frame

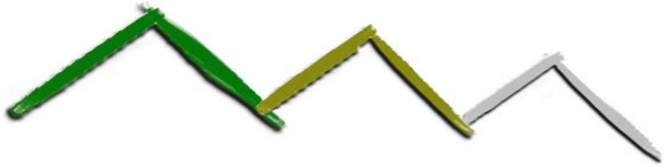
National certification scheme is updated in depth using the BEP tool

- Access to an extended operator platform
- National scheme operators can update certain parameters of the calculation themselves
- Providing support on items such as audit process, certification validity, quality control.

Summary: How to merge the BEP tool with GPRS

Three-step approach

Step 1. Mapping BEP Tool with GPRS



GPRS

Site	Water	Martials	Environm.
Energy		Manage.	Innovation

BEP Tool

- Final and primary energy demand
- Space heating
- Domestic hot water
- Space cooling
- Mechanical ventilation
- Photovoltaic
- Lighting
- GHG CO2 emissions.

Step 2. Integration of BEP Tool with GPRS (within BUILD_ME II)

BEP Integrated within GPRS

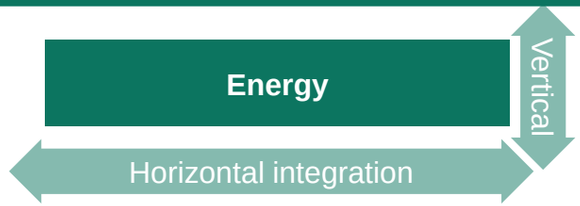
- Energy performance level
- Reductions in energy consumption
- Reduction in annual external heat gains
- Peak electrical load
- On-sit and/or off site RE
- Performance
- Inventory of energy and carbon for MEP

Remaining Attributes GPRS

- Availability of energy sub-meters
- Ozone depletion potential
- Guidelines on EE appliances
- Vertical transportation systems
- Refrigerants
- Operations manual for all mechanical, electrical and plumbing (MEP)

Next Phase

Step 3. Full Integration of BEP Tool with GPRS



Site	Water	Martials	Interal Environment	Management	Innovation

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Voluntary Energy Classification Scheme

Main conclusion and expected impacts

Market uptake

Boosting market uptake for GPRS classification system.

Balance

Reaching required balance between technical complexity and accessibility of certification system.

Accessibility

Supporting GPRS to be more practical, accessible and upscale its implementation

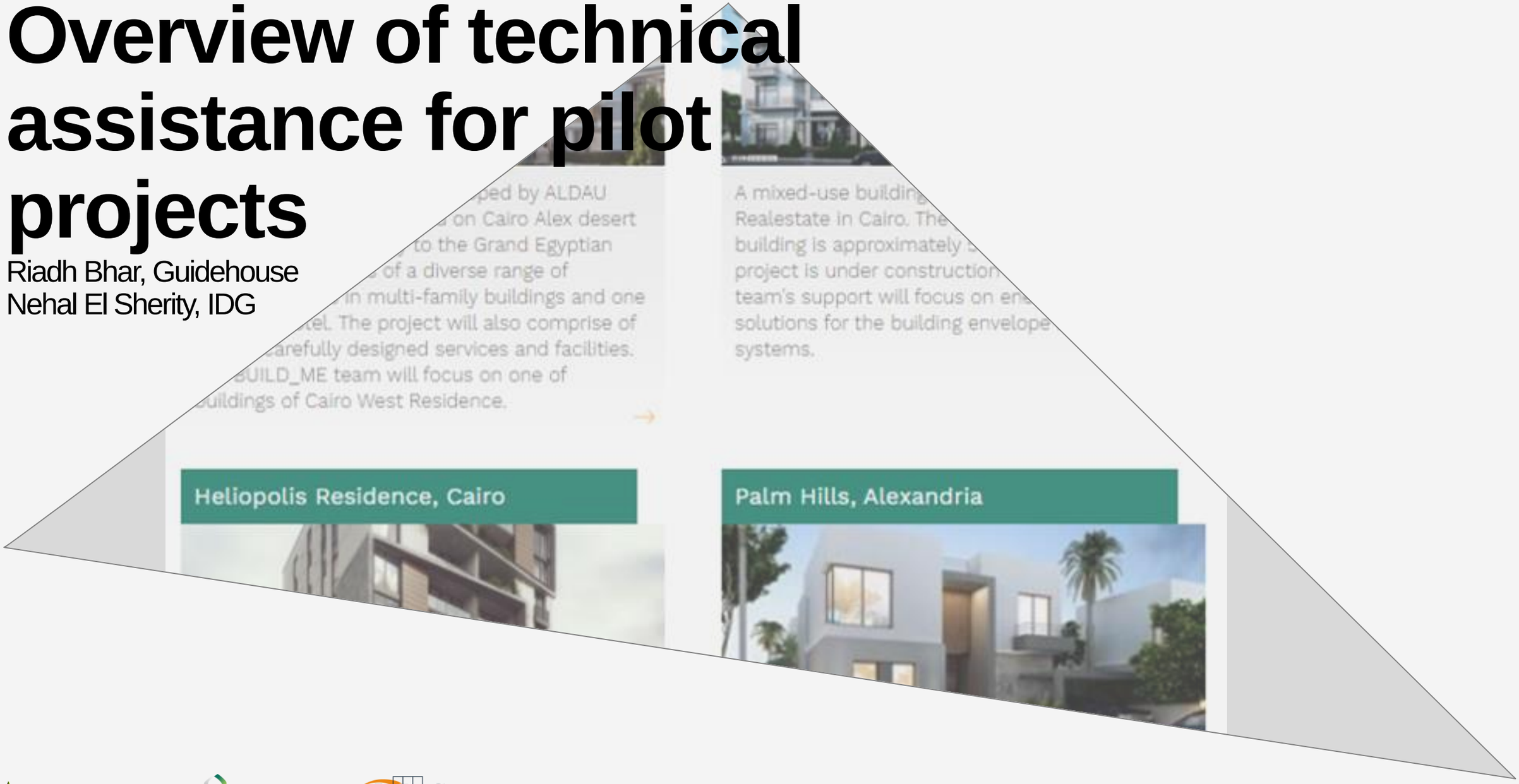
Certification along the “value chain” to support the acceleration of Green Buildings: the Saudi Arabian example

Dr. Faisal Al Fadl

Guidehouse BUILD_ME IDG MATRIX Integrated Development Group

Overview of technical assistance for pilot projects

Riadh Bhar, Guidehouse
Nehal El Sherity, IDG



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Selection process for pilot projects

Total numbers of all countries

Project Developer Information	
Developer Name	Palm Hills Developments http://www.palmhilldevelopments.com/
Projects	24 including 12 delivered projects
Hindquarters Address	Palm Hills Building, Smart Village, Cairo-Alexandria Desert Road
Contact Person	Ahmed Alalla
Contact information	Senior Vice President
Pilot Project Alternatives	
Alternative 1	
Project Name	BADYA
Project Type	Residential (Villas & Multifamily house), office parks, commercial, retail, hotels, educational, health care, & mixed-use
Location	Sixth of Octobar City
Ownership	Private with revenue sharing with Ministry of Housing
Project Status	Detailed conceptual & illustrative master plan for the entire project, detailed design for Phase 1; construction initiated on site September 2019
Total Project Area	12.6 Million M2
No. of buildings and floors	Various: G+1 to G+10 in addition to several high-rise buildings under study
Conditioned floor area	7.2 Million M2 with up to 10 Million M2 allowed of residential floor area and up to 1.5 Million M2 of commercial, retail, educational, hospitality & other specialty services
Areas of units (residential)	Phase 1: 720,000 M2 of residential floor area in Phase 1A
Finishing level	Will this project be sold as fully or semi-finished? Partially fully finished and partially core & shell
Operation	Will the developer be responsible for operating the project? Developer responsible for operation including maintenance, metering, billing and full services management

General information	Number of pilot project
	Description of building
	Location
	Status of construction phase
Prerequisites - GCF Safeguards (Social, Environmental)	PS 2 – Labor and Working Conditions
	PS 3 – Resource Efficiency and Pollution Prevention
	PS 4 – Community Health, Safety, and Security
	PS 5 – Land Acquisition and Involuntary Resettlement
	PS 6 – Biodiversity Conservation and Sustainable Management
	PS 7 – Indigenous Peoples
	PS 8 – Cultural Heritage
Prerequisites - Eligibility for financial funds	Nature of company
	ESCo
	ESHS
	Financially viable and bankable
	No combination of grants
Scoring	1 Influence / consideration of EE/RE infrastructure
	2 Developer will build and operate the project
	3 Chance of implementation (till Dec 2021)
	4 Diversity of projects
	5 Replicability
	6 Importance, size and scalability
	7 Track record of project developer
	8 Ease of cooperation with project developer
	9 Architectural esthetics

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or other negligent act in performing the consulting services or resulting from the consulting services.

This MoU does not implicate any direct or indirect financial support or request.

Signed for and on behalf of Navigant Energy Germany GmbH, A Guidehouse company

Signed on behalf of ALDAU EVELOPMENT"

Carsten Petersdorff, Director

Cologne, 21.02.2020

Dr. Tarek Elgharraway, General Manager

Egypt, Date: 1st

Outreach
to developers and architects

WS
invitation to limited number

Key data
of interested developers

Evaluation
of the relevant projects

Selection
of the top ranked projects

MoUs

150+

50+

45+

35+

17

15

Technical Assistance to pilot projects

Projects supported in Egypt

Lebanon

Frames / Baasir

Extension of Collège Notre Dame De Nazareth

Arcade Suites II

KLEOS / Ashrafieh Appartments

Kye Beachfront Resort

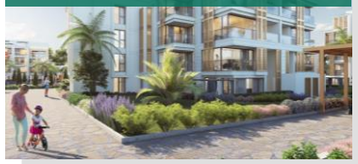
City Towers Project

Egypt

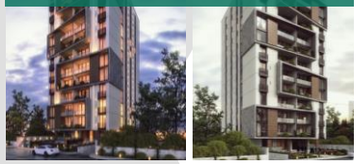
New Mansoura university

Beverly Hills - 229

Cairo West Residence

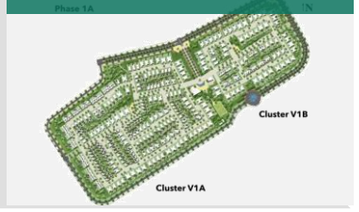


Misr Alghad



Palm Hills, Alexanderia

Palm Hills, Badya



Amman

KONN Modular Houses

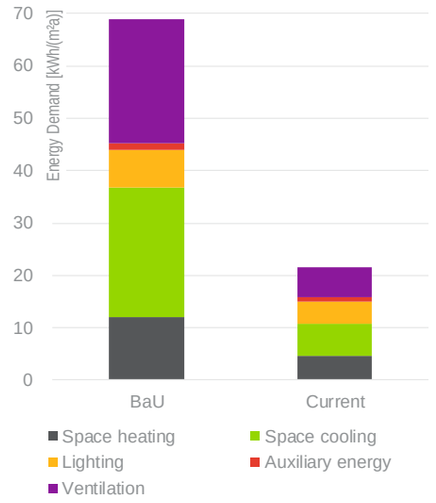
Private Residence

Dar Al-Oquod

Approach and methodology

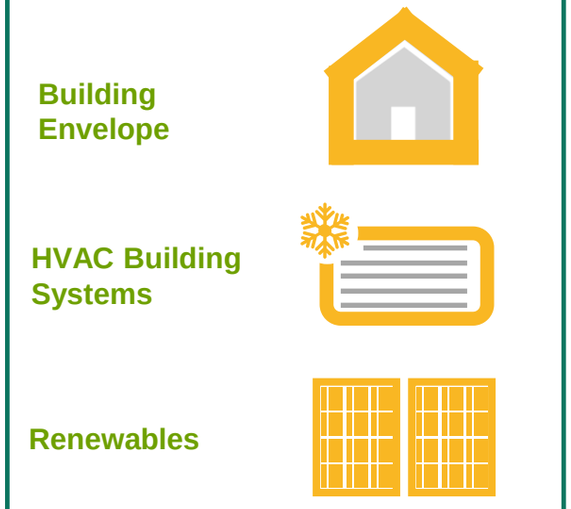
Steps towards a low energy building

1 Comparison with baseline



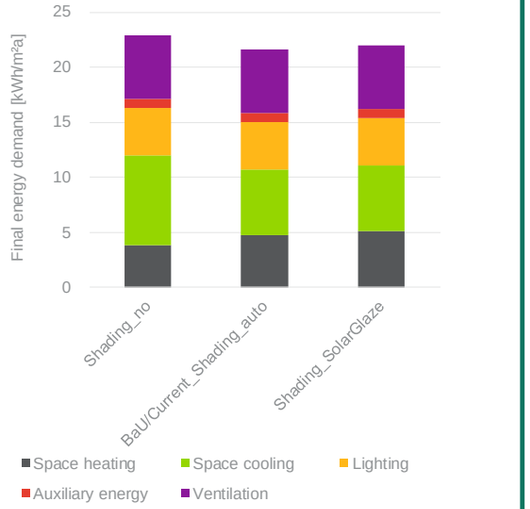
- Estimate the baseline consumption
- Estimate the consumption of current design
- Comparison

2 Energy efficiency recommendations



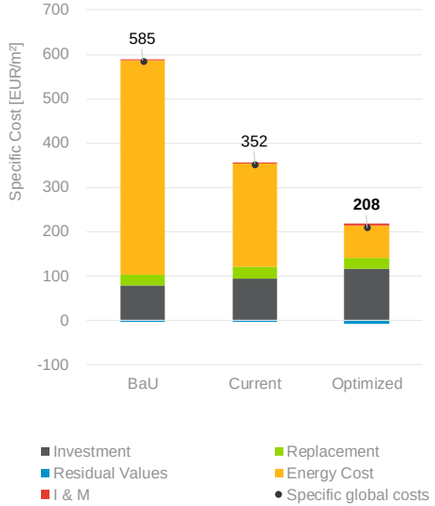
- Building envelope
- HVAC I efficiencies
- Renewables
- Other measures

3 Development



- Optimized as result
- Discussion with developers
- Local and market inputs
- Costs and ROI

4 Final recommendations



- Final loop discussing feasibility of measures
- Adapt selected measures and finalize calculation including payback, investment and lifetime

Case study: Central Library

IDG Matrix,
Nehal El Sherity

No. of Levels
Varies from 3 to 4 levels according to Architectural masses

Architectural Style
Fusion between contemporary Classic Architecture & Modern minimalism Architecture

Building Footprint
Nearly 4,469 sqm.

Total Built UP Area
Nearly 15,790 sqm.

New Mansoura University:

Project Background

- One of the first Egyptian universities following the presidential direction in collaboration with top international universities.
- The campus consists of nine faculties.
- Main administrative building including a conference center
- Campus includes a central library, sports center, mosque, dental hospital, educational hospital & students' dorms.

- **Project Name:** New Mansoura University for Science & Technology
- **Client:** New Urban Communities Authority (NUCA)
- **Area:** 410, 842 m^2
- **Structure System:** Flat Slab
- **Cost:** Varies

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- Aims to provide an excellent working environment to encourage high quality research, teaching and learning.
- The Central Library is considered as the main iconic building in the project.
- A focal point for students & scientific researchers.

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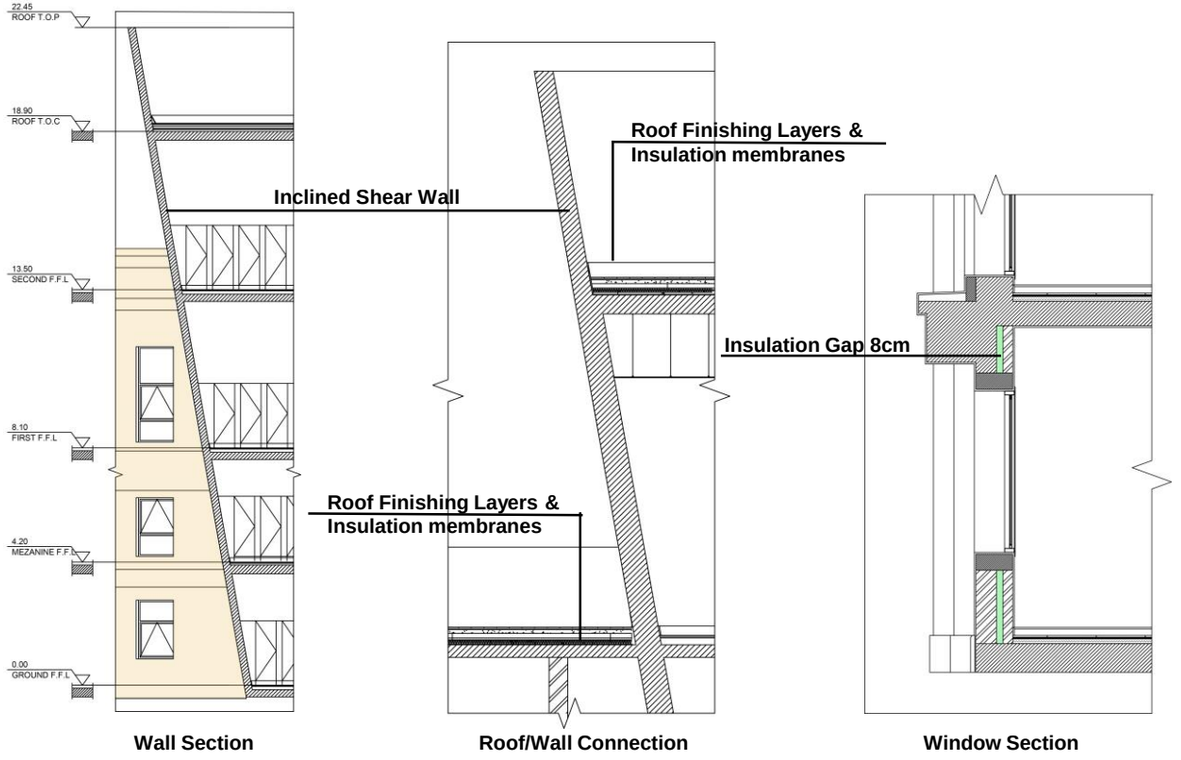
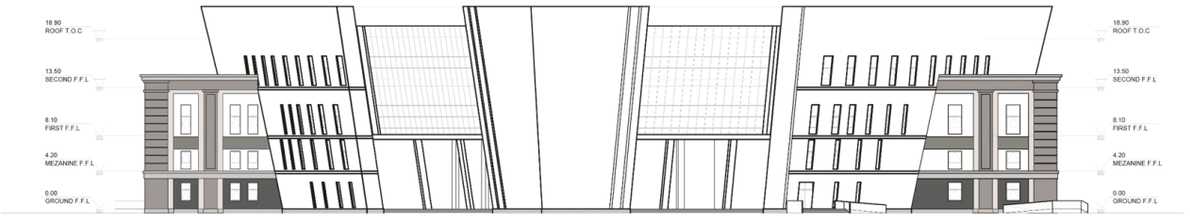
Building Envelope

Building Element	U-Value (Baseline)	U-Value (Current)	U-Value (Optimized)
Exterior walls	2.1 W/m^{2}K	2.1 W/m^{2}K	0.43 W/m^{2}K
Roof	0.6 W/m^{2}K	0.36 W/m^{2}K	Current plan is already cost effective
Windows	Single glazing (5.7W/m^{2}K)	Single glazing (5.7W/m2K	Double glazing Low E Glazing (1.3W/m^{2}K)



Wall Section | Roof/Wall Connection | Window Section



MAIN ELEVATION

SECTION

Building Systems

M.E.P Systems

Cooling / Heating systems

Central cooling VRF system with a change set temperature from Cooling 23°C to Cooling 26°C.

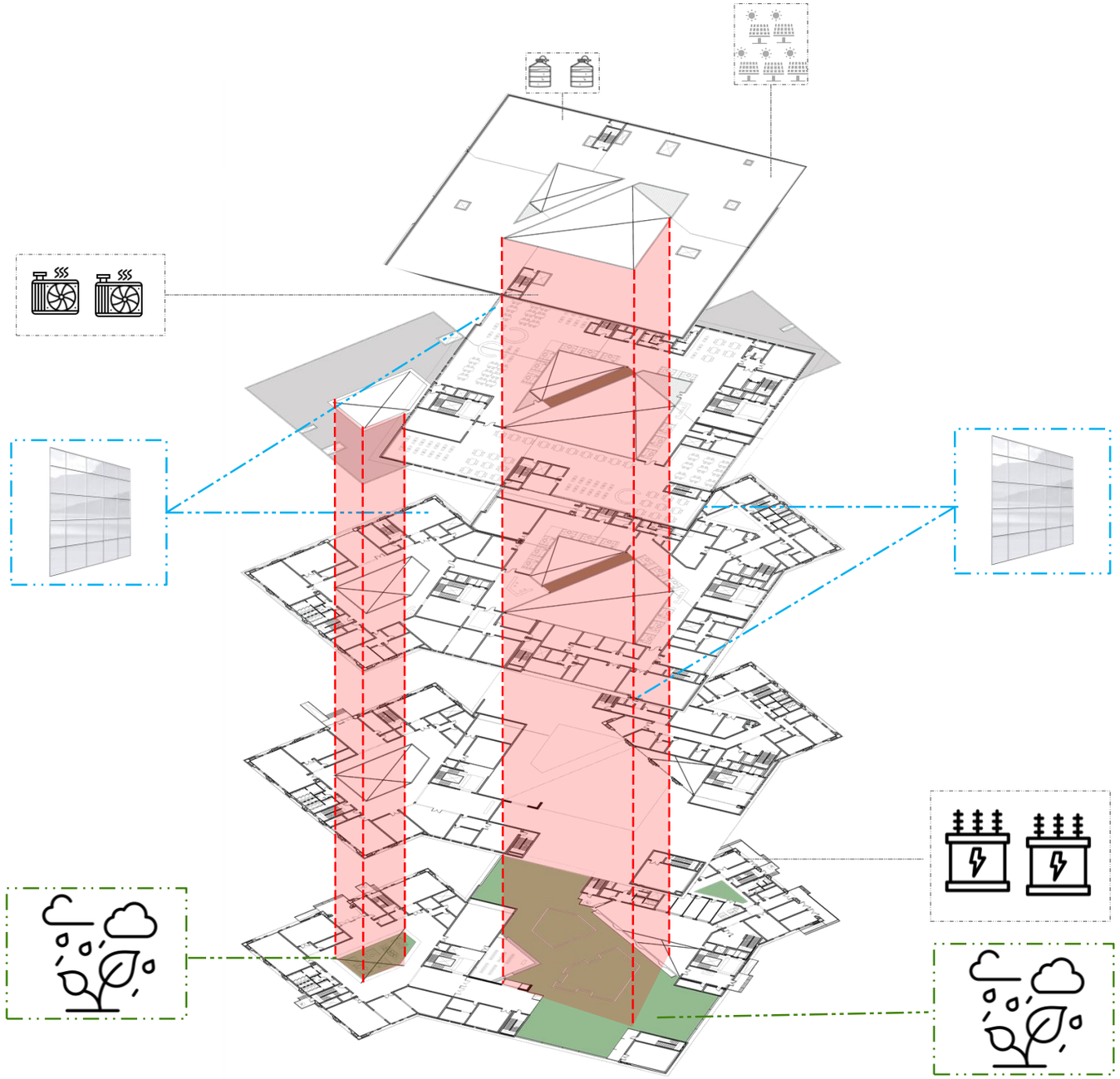
Lighting systems

LED lamp with a color temperature of 3500K

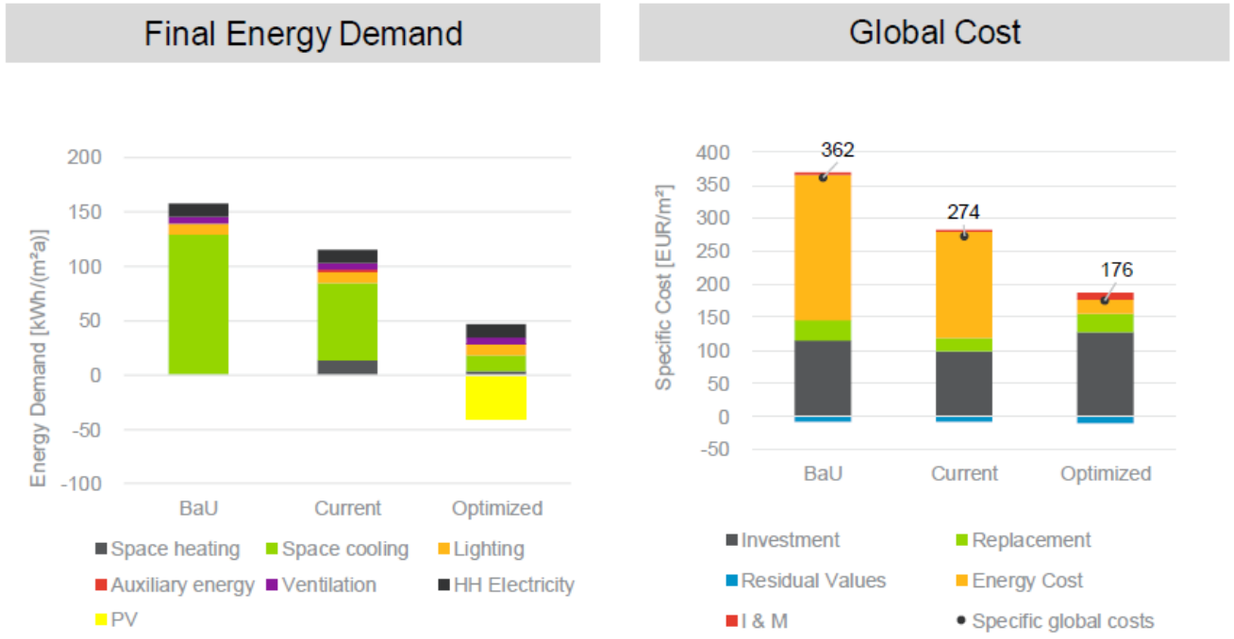
Renewable energy

Photovoltaic cells

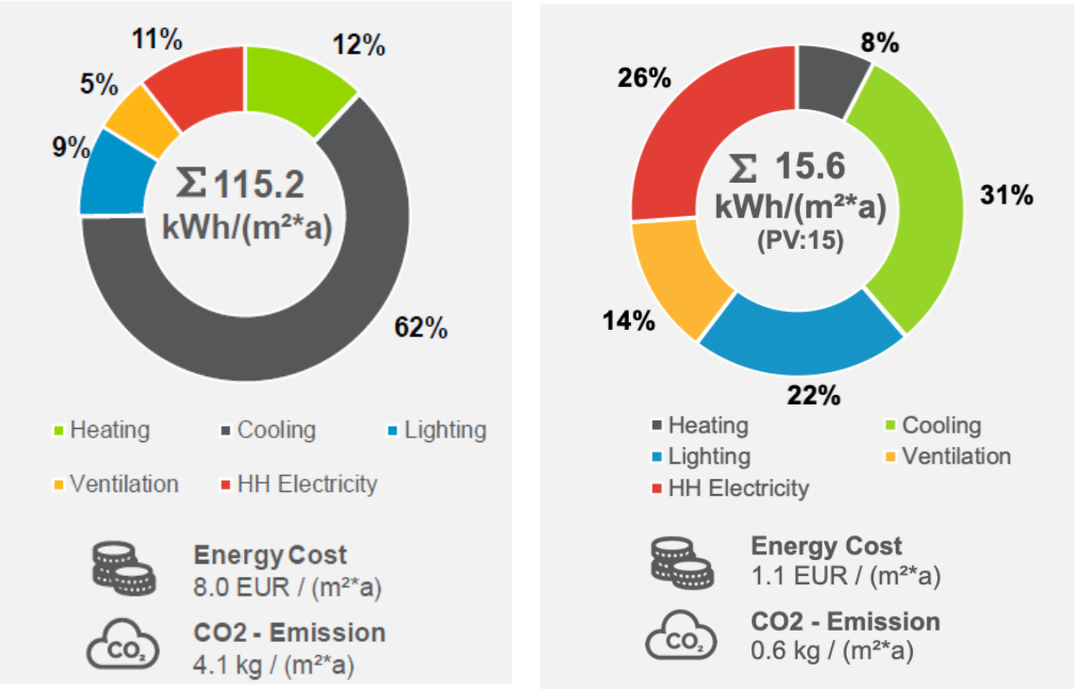
Supposed to be allocated on the upper roof.



Building Energy Performance Tool by Guidehouse



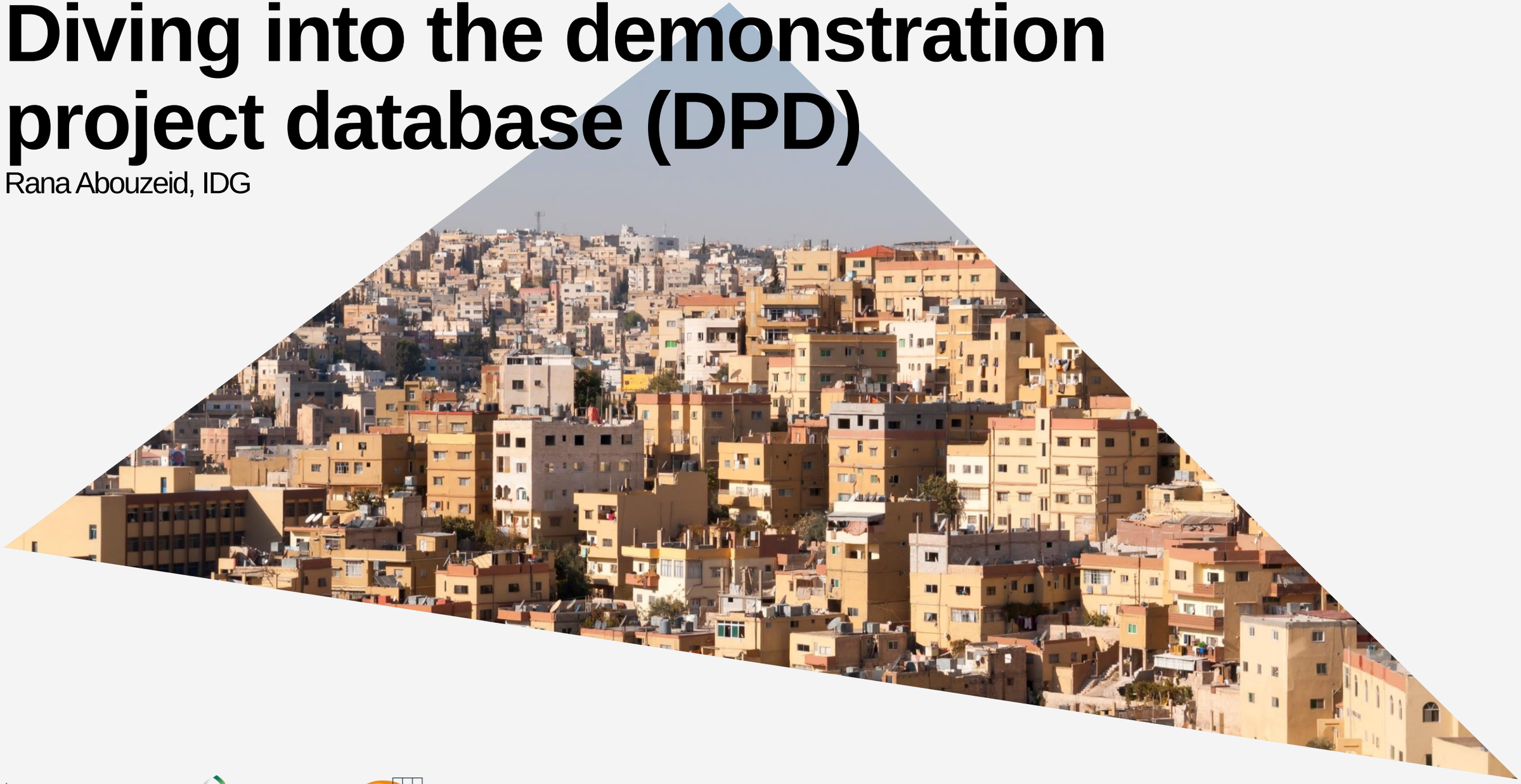
BaU vs. Current vs. Optimized



Building Demand

Diving into the demonstration project database (DPD)

Rana Abouzeid, IDG



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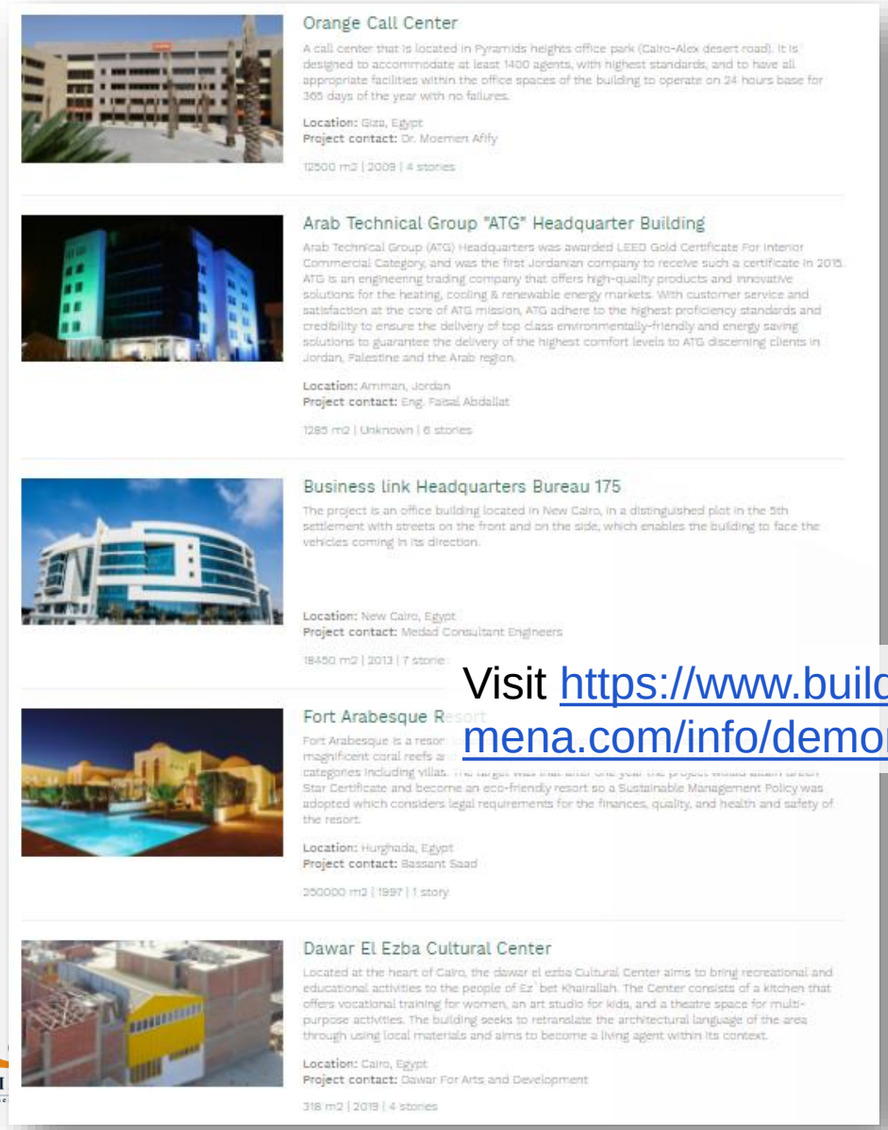
Demonstration project database

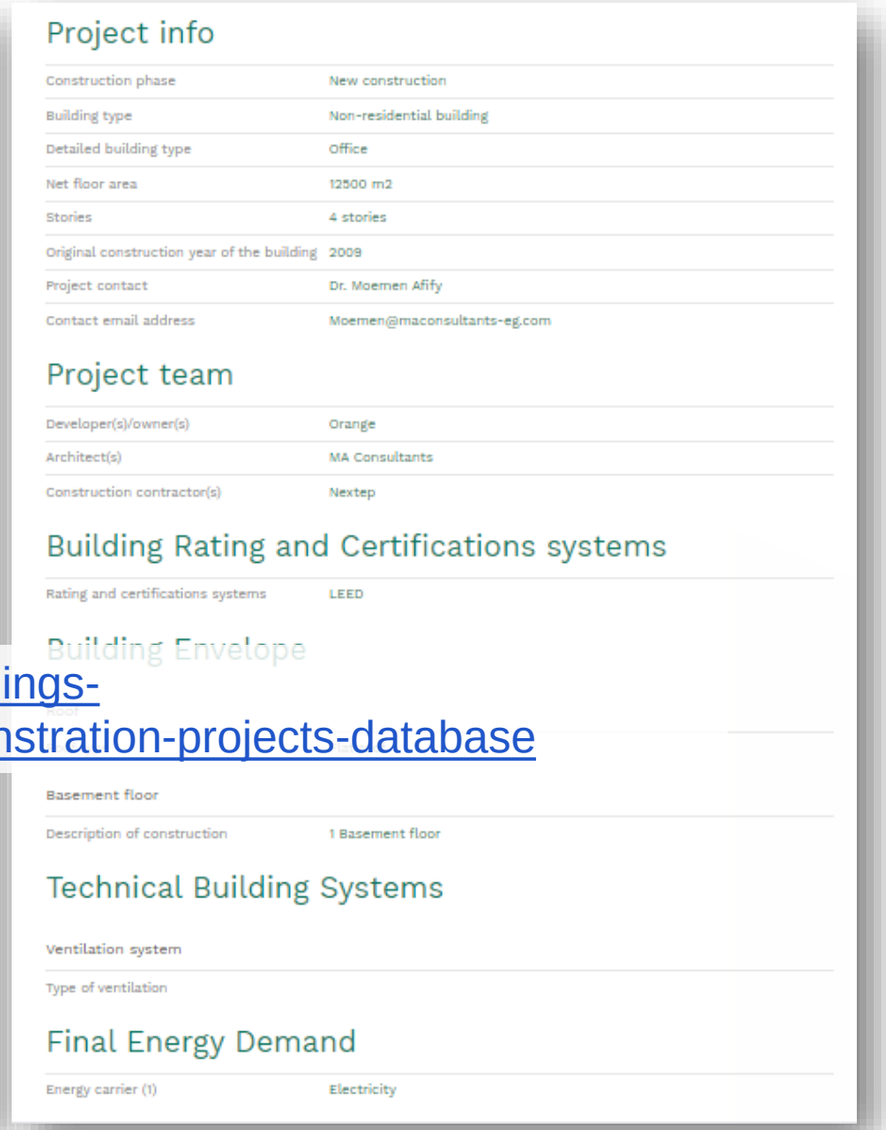
Crowd-sourced examples from the region

Register and add a project

ADD NOW!

- Searchable database of practical inspiration
- Welcome input from project developers, architects or contractors from across the region
- Currently approx. 50 examples





Visit https://www.buildings-mena.com/info/demonstration-projects-database

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Wrap up and outlook

Photo by Martin Adams on Unsplash

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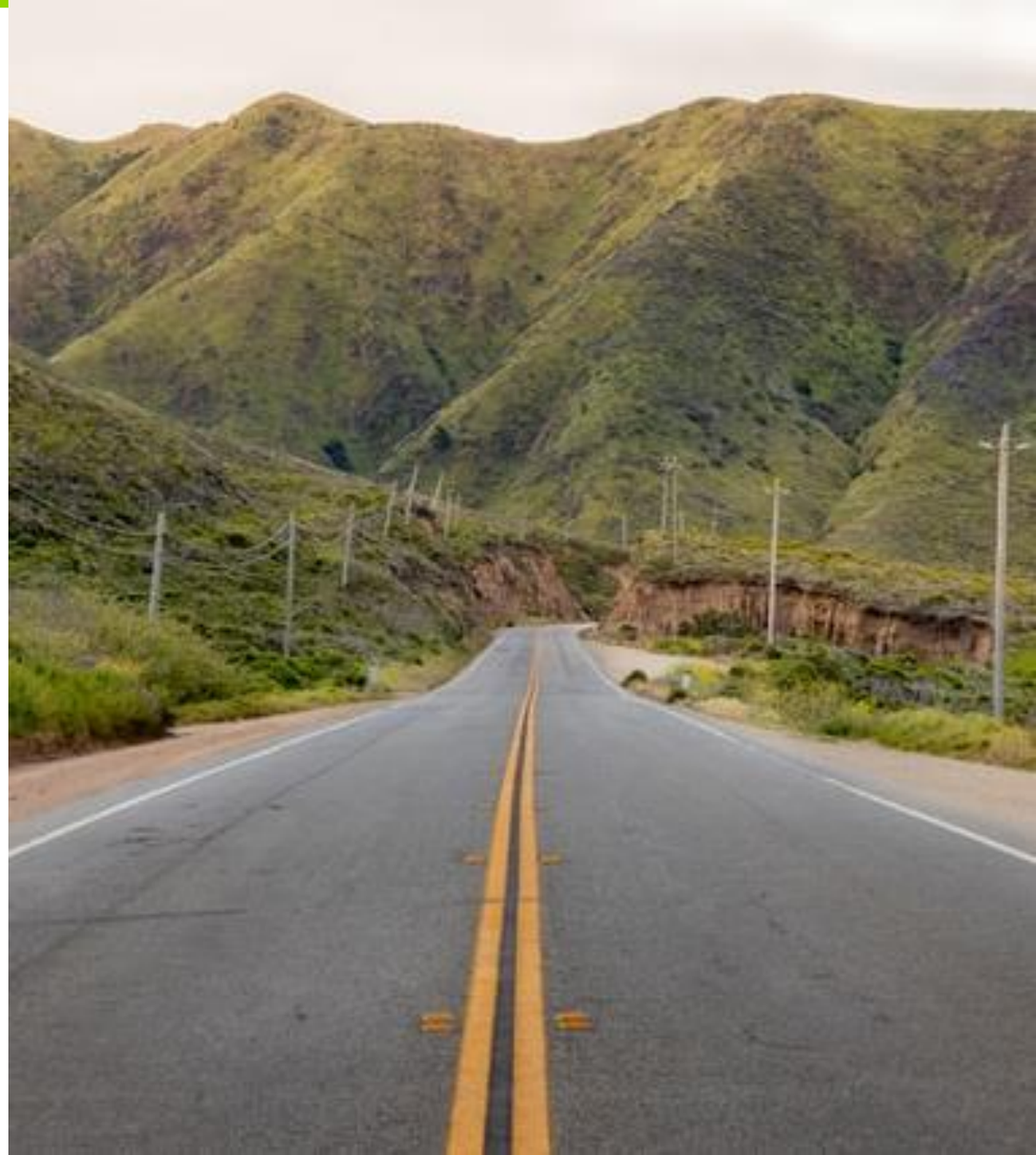
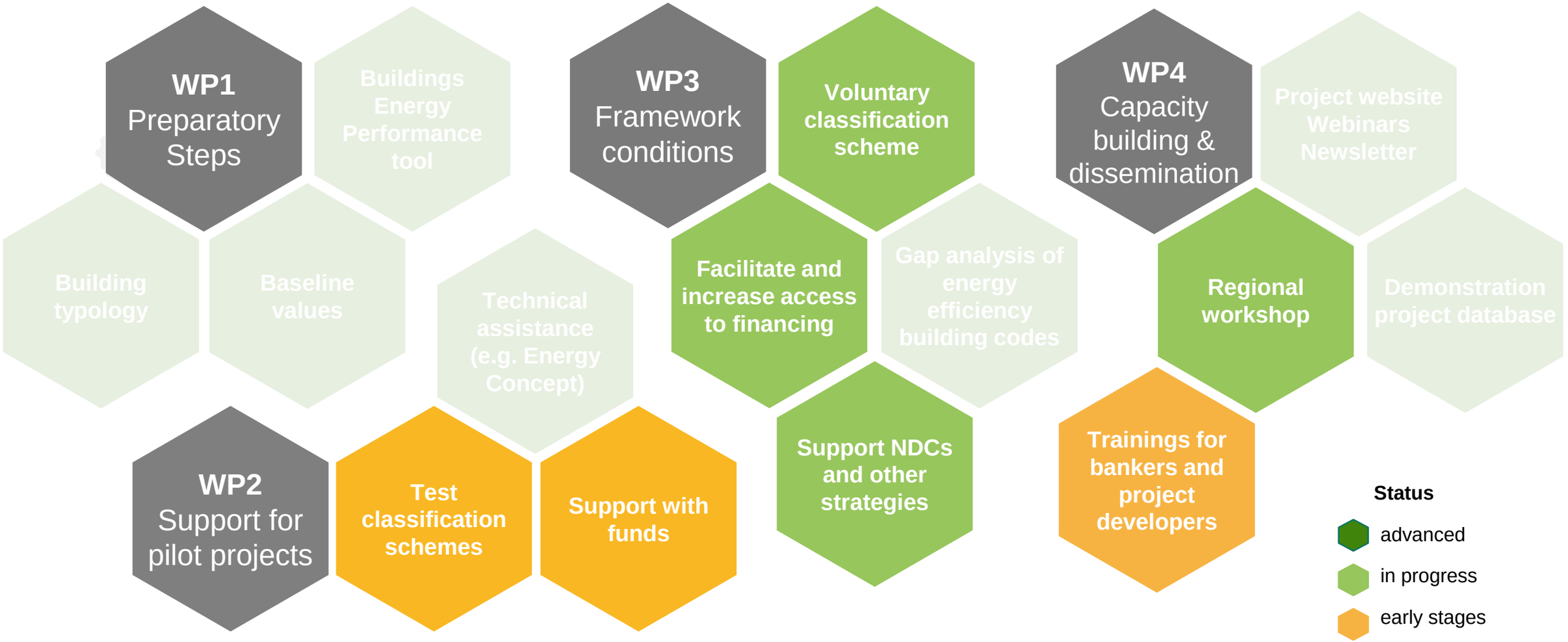
Wrap up

- Baseline and Building typology
- Voluntary classification scheme
- Buildings Energy Performance tool
- Pilot projects
- Demonstration project database



Outlook

Where we're headed



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THANK YOU

FOR YOUR PARTICIPATION

This project is part of the International Climate Initiative (IKI). The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) supports this initiative on the basis of a decision adopted by the German Bundestag.

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