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LEBANESE REPUBLIC
MINISTRY OF ENERGY AND WATER

# Accelerating 0-emission building sector ambitions in the MENA region Project

**National Workshop**

**Phase III- Kick Off**

By Dr. Sorina Mortada

Thursday, 2 March 2023

The SmallVille Hotel

# BUILD_ME

## IKI Project Accelerating 0-emission building sector ambitions in the MENA region

# Partners

## Introduction to the BUILD_ME Project

# Objectives of Phase II of the BUILD_ME project

## Objectives and goals

- **Facilitate & increase access to financing** & funding opportunities for EE building projects
- Support the **reform & transitions of political frameworks** towards improving energy efficiency in the building sector
- On the ground learning from energy efficiency measures in **pilot projects**

### WP1 Preparatory steps

- Software tool: energy performance & cost-effectiveness
- Building typology
- Buildings specifications & reference values

### WP2 Support pilot projects

- Technical support
- Testing EE labelling scheme
- Support financing applications
- Collect insights on the ground as input for WP3

### WP3 Framework conditions

- Voluntary EE classification scheme
- Facilitate & increase access to financing
- Building codes
- National strategies (NEEAPs & NDCs)

### WP4 Capacity building and dissemination

- Website, workshops, trainings, database for best practice buildings, webinars, newsletters, brochures, etc.

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# BUILD_ME Integrated Solution

Define own baselines and develop tailored energy labelling scheme for new buildings

- Data from real constructions not older than 3 years
- At least 5 cases per building type covered in each country building typology
- Data from subsidy programs, literature, interviews with relevant stakeholders, permits documents etc.

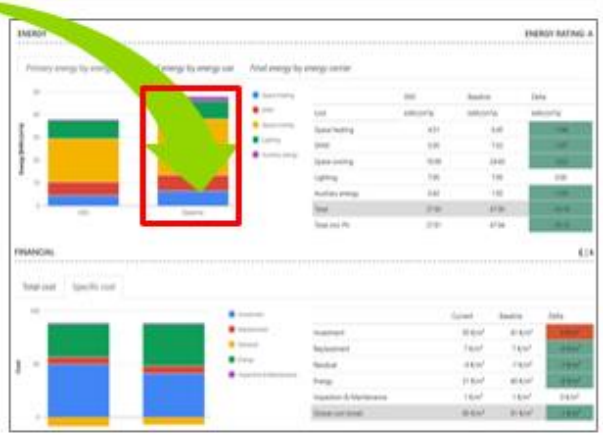
- BEP tool based on ISO 52016, fed with local data used as calculation engine.

- Researched buildings in building typology represents baseline, which is shown in the BEP Tool as default value.

**Reference Buildings and Building Typology**


**BUILD_ME Building Energy Performance Calculation tool**

**Classification of buildings compared to baseline**



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# Building Typology In Lebanon

- Based on the analysis of the data collected and the analysis of the building stock in Lebanon, several building types have been considered and analyzed in Lebanon.
- This includes the following building types:
  - detached SFH;
  - small (less than or equal to 1000 m²) detached MFH;
  - large (greater than 1000 m²) detached MFH;
  - offices;
  - schools;
  - retail or trade;
  - Hospital
- The construction sector in Lebanon can be divided into three phases:
  - Phase 1 covers before 1980 until the construction was stopped by the civil war;
  - Phase 2 covers the period between 1980 and 2015, where the reconstruction took place at fast rates;
  - Phase 3 covers the period after 2015, where construction practices have changed and improved in terms of integrating sustainable design elements.
- Building typology differentiates between three main regions:
  - City: more than 40,000 inhabitants representing a dense and large urban environment;
  - Town: a population ranging between 4,000 and 40,000—larger than a village and smaller than a city;
  - Village: a population smaller than 4,000 inhabitants in rural areas

# Building typology database

Country: Lebanon

Region: Village

- Village
- City
- Town

*This buildings typology database depicts representative reference buildings in Egypt, Jorda[illegible]s in the building stock (new and existing buildings) that represent a specific building type (e.g. free-standing single-family house) and reflect the region's typical architecture and technical building systems. The photos shown are generic photos for that category and the technical specifications that can be found when clicking on some of the photos are also general for that category, meaning they do not correspond exactly to the specific buildings in the photos.*

## Typology

## Construction period

| Typology | New and recent constructions (after 2015) | Existing building: 1980-2015 | Existing building: before 1980 |
|---|---|---|---|
| Multi Family House (MFH) - Small (≤ 1000m²) - detached |  |  |  |
| Single Family House (SFH) - detached |  |  |  |

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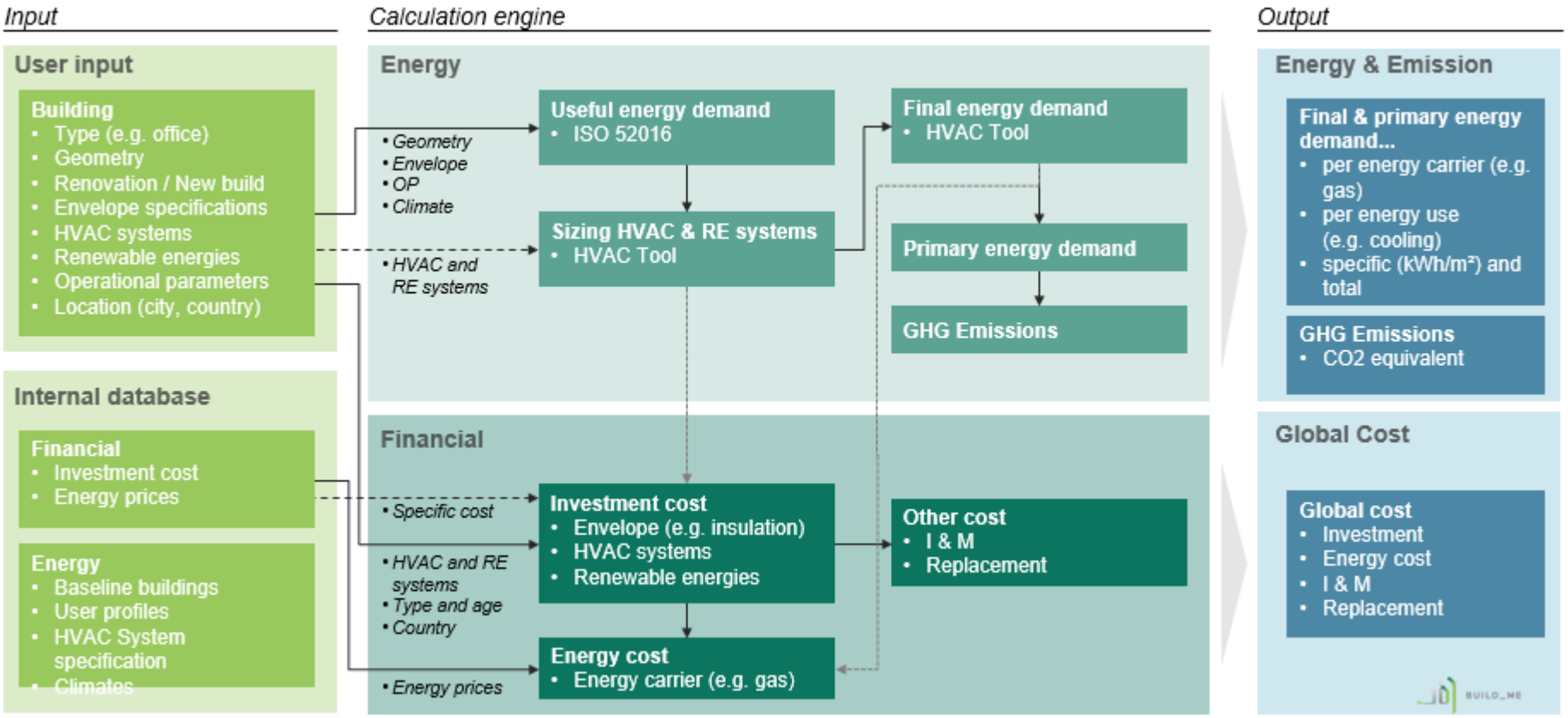
https://www.buildings-mena.com/typologies

# Building Energy Performance (BEP) Tool




https://globco.buildings-mena.com/#step-1

# Quick use in three steps

## Getting started

- Visit the website **globco.buildings-mena.com**
- **Enter basic input**, e.g. project name, location, building type, used HVAC systems

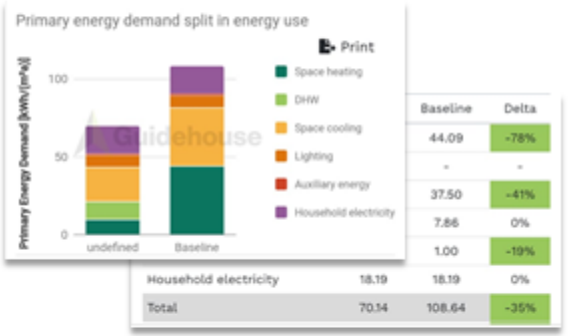

- By clicking “next” on the bottom of the page you proceed to the next tab
- the inputs are **always saved**

## Detailed Input

- **Specify the building project** in detail
  - Geometry, envelope quality, HVAC systems and efficiency, operational parameters
- All inputs have **default values**, which reflect the **reference building** of the selected region and building type


## Results

- Final and primary **energy demand** according to the energy use (cooling, heating, etc.) or the energy carrier (electricity, gas, etc.) can be displayed as chart
- The exact numbers are listed in the table




- **Global cost** are displayed similar, split up in Investment, energy, etc.
- The entered project is automatically **compared to the baseline building** for the selected region/building type

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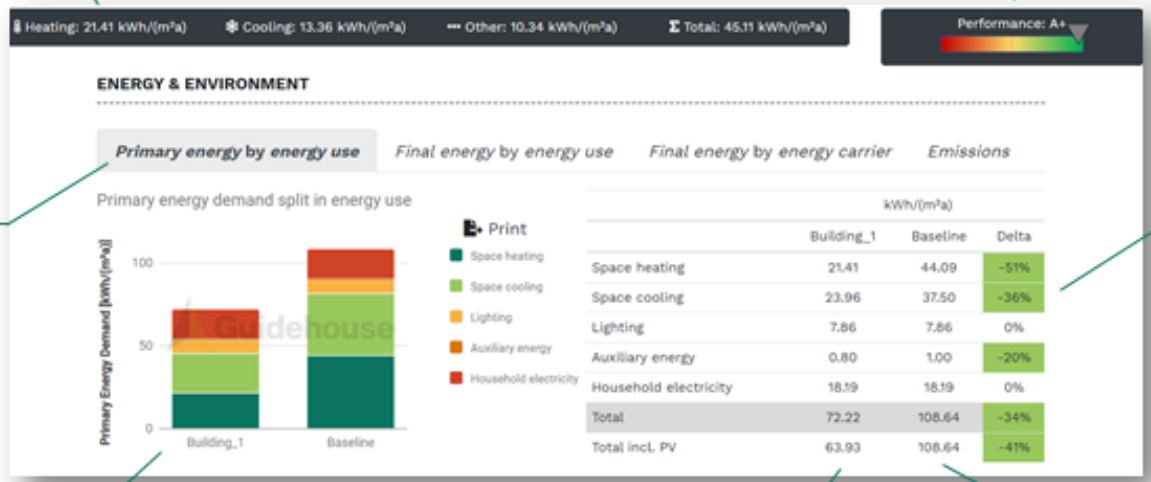
# Results of Energy Calculation

## Performance rating

*Energy performance compared to baseline building.*
*C = equal to baseline*

## Quick overview

*The main facts of the currently entered building.*




## Output selection

*4 tabs to select the energy performance indicator displayed in the graph and table or the resulting CO2equivalent-emissions.*

## Comparison

*Difference between the baseline buildings energy demand and the entered project building.*

## Overview chart

*Energy performance of the building compared to the baseline building, according to the selection in the tabs above.*

## Results

*Detailed results of the entered project. Values are displayed according to the tab selected above.*

## Baseline building

*Detailed results of the baseline building. Values are displayed according to the tab selected above.*

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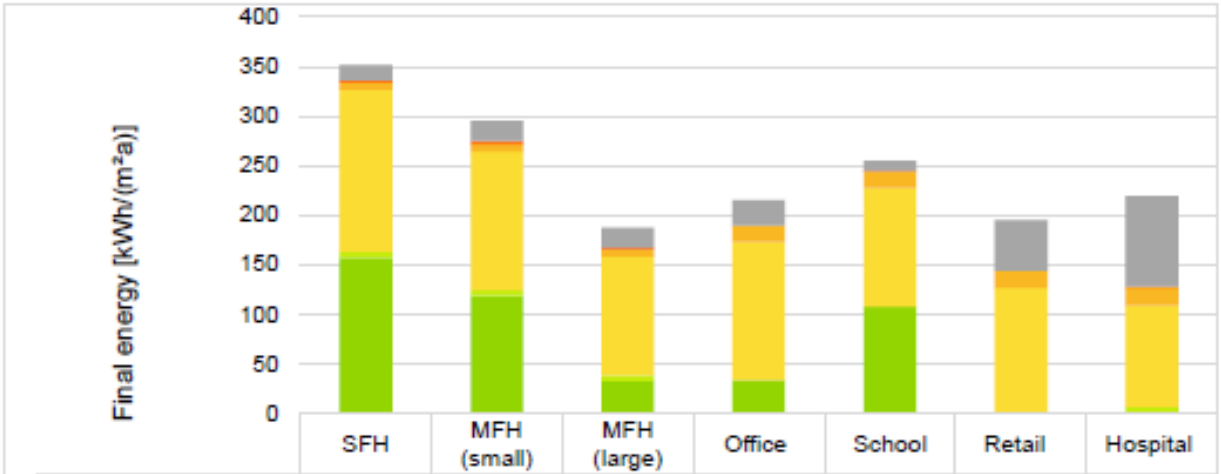
# Benchmark for energy consumption for buildings

- The energy demand of reference for existing buildings that were built **before 1980 in a village.**
- The highest contributor to the energy demand for all cases is space cooling while the lowest is auxiliary energy




| | SFH | MFH (small) | MFH (large) | Office | School | Retail | Hospital |
|---|---|---|---|---|---|---|---|
| Other electricity | 15,2 | 20,3 | 20,3 | 25,3 | 10,1 | 50,7 | 91,2 |
| Ventilation | - | - | - | - | - | - | - |
| Auxiliary energy | 2,4 | 3,5 | 1,5 | - | 0,1 | - | 1,7 |
| Lighting | 7,3 | 7,3 | 7,3 | 16,7 | 17,3 | 17,3 | 17,3 |
| Space cooling | 164,0 | 140,3 | 120,1 | 139,9 | 120,2 | 126,3 | 102,9 |
| DHW | 5,7 | 5,7 | 5,7 | - | - | - | 5,7 |
| Total space heating | 156,6 | 118,2 | 31,9 | 32,7 | 107,0 | - | - |

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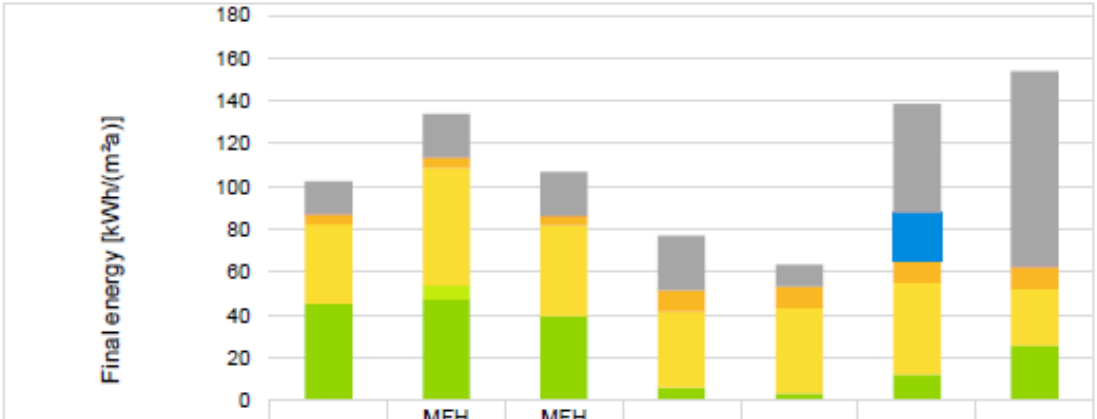
# Benchmark for energy consumption for buildings

- Final energy demand of reference for new buildings that were **built after 2015 in a city.**
- Energy demand for mechanical ventilation is only relevant in retail buildings.
- Other electricity uses have the highest portion of energy demand in hospitals and retail buildings while space cooling has the highest impact for the other reference buildings.




| | SFH | MFH (small) | MFH (large) | Office | Education | Retail | Hospital |
|---|---|---|---|---|---|---|---|
| Other electricity | 15,2 | 20,3 | 20,3 | 25,3 | 10,1 | 50,7 | 91,2 |
| Ventilation | - | - | - | - | - | 22,7 | - |
| Auxiliary energy | 0,3 | 0,3 | 0,1 | - | - | - | 0,4 |
| Lighting | 4,4 | 4,4 | 4,4 | 10,0 | 10,0 | 10,0 | 10,0 |
| Space cooling | 37,1 | 55,1 | 42,4 | 35,5 | 39,9 | 42,8 | 26,4 |
| DHW | - | 6,5 | 0,1 | - | - | - | 0,0 |
| Total space heating | 45,3 | 47,4 | 39,5 | 6,2 | 3,4 | 12,4 | 25,8 |

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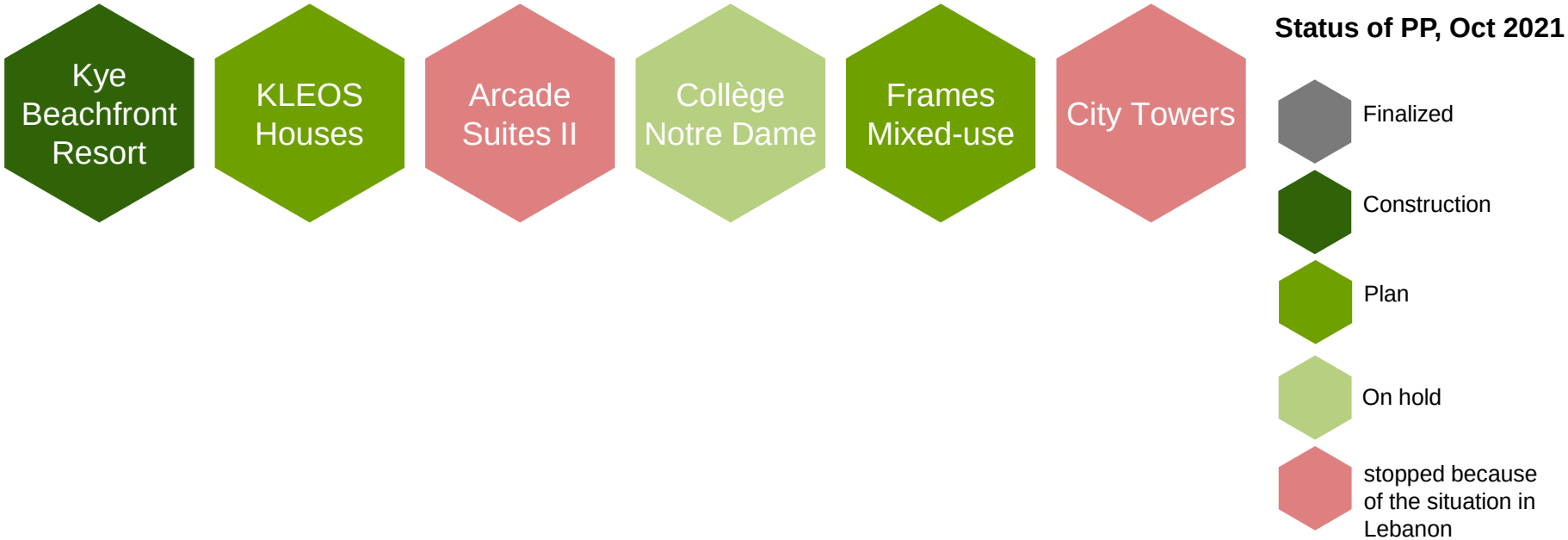
# Lessons Learnt of technical assistance offered to Pilot Projects

- Overview of selected pilot projects

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# Overview of Measures utilized in the optimized solutions

- Scope of Measures

| Envelope | Systems | Renewable |
|---|---|---|
|  |  |  |
| Roof insulation | Heating | PVs, Solar Thermal |
| External wall insulation | Cooling | Solar water heaters |
| Low-E glass windows | Hot water supply | |
| Shading | Ventilation systems | |
| Air tightness | Lighting systems | |

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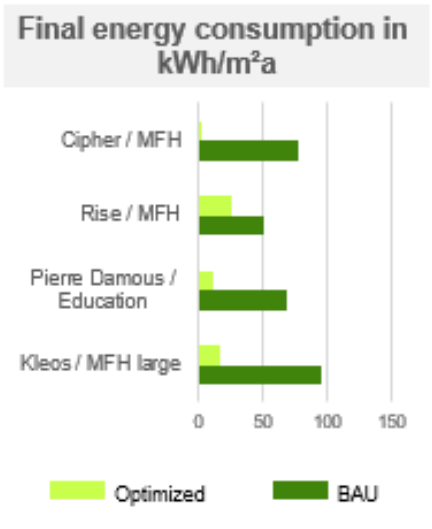
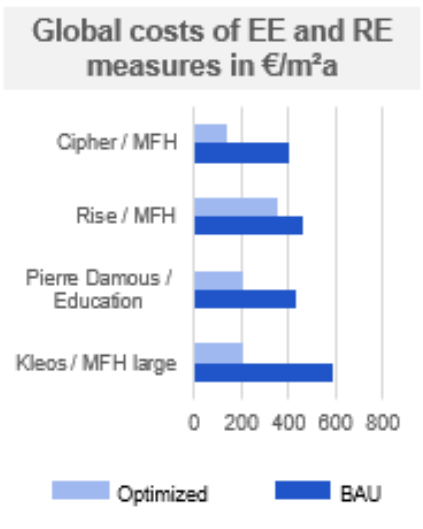
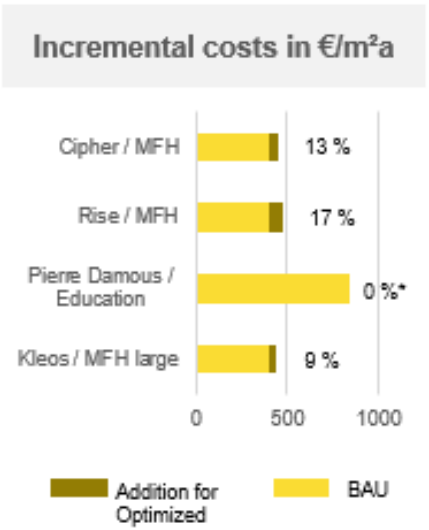
# Savings of the Optimized vs Baseline in Lebanon




**Savings 50 - 95%**

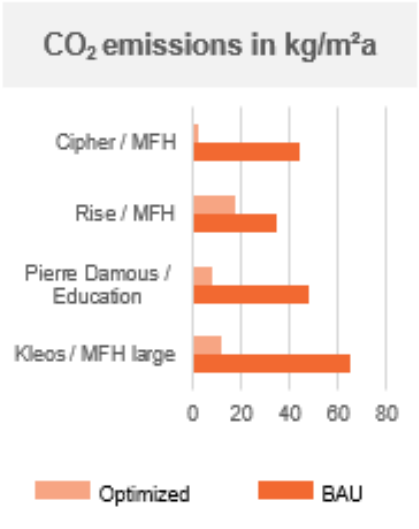



**Savings 35 - 65%**




**Additional 9 - 17%**

* Huge savings on Capex side as reduction of window fraction was recommended




**Reduction 50 – 95 %**

**Incremental Costs:** Additional costs for EE / RE measures related to the BaU costs related to Built Up Area in €/m².

**Global Costs:** All cost elements are considered: Operational and investment cost incurred over a relevant time period. The different types of costs incurred each year, respectively, are summed by using the NPV methodology, in order to express them in terms of value in the first year.

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# Exemplary technical recommendation for MFH, Lebanon

- Cost optimal ranges of ecological and economic attractive measures

| Measure | Target Specs. | Energy Savings | Global cost savings |
|---|---|---|---|
| Reduction window fraction | From 40% to 20% | 20-25% | 25-30% |
| External wall insulation | 0.4 W/m²K = 6 cm insulation + cladding | 5-10% | 0-5% |
| Roof insulation | 0.30 W/m²K = 12 cm insulation | 0-5% | 0-5% |
| EE Windows | 0.9 W/m²K -> Triple Glazing | 5-10% | 5-10% |
| EE Cooling | SEER=5 ->Top performer | 25-30% | 25-30% |
| Photovoltaic | Exploit max. available roof surface | 20-25% | 10-15% |

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# Summary of Surveys with PPs Developers in Lebanon

## Financial Aspects

**Financial crisis stopped all EE financing schemes.**

- NEEREA was successful in supporting many EE building projects. However, it stopped because the ongoing financial crisis in Lebanon.
- The process of applying for funds or incentives is (was) complex and time consuming.
- Lebanon implements a tax-reduction for EE products and systems, but the current financial crisis hinders benefiting from such incentive.

## Regulatory and Policy

**Weak or no regulative framework for EE/RE**

- There is a lack of awareness about the EE standards.
- The EE standards are not included in the building permits process.
- Lack of standards related to material thermal performance

## Technical Aspects

**Energy Efficient systems are available in the market as they are mainly imported the price tripled because of the current crisis**

- Market is not well regulated in terms of supply and demand of PV.
- EE solutions and technologies are available in the market. However, they are mostly imported and due to the financial crisis, it becomes more challenging to import all necessary systems in apropriate timing and coping with the increased currency exchange rates .

## Capacity Building Aspects

**Skilled architects and engineers exist, they focus rather on large projects. While for "standard projects" an increasing of awareness is needed.**

- The technical capacity of workers to implement EE is limited.
- Generally, not all architects and teams have experiences with EE but for the large and important projects, the teams are well informed about EE with sufficient experiences.
- At the municipality level, the awareness about EE and RE is not sufficiently raised.

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# Opportunities for EE in the Lebanese building sector

## A list of actions and recommendations to overcome the barriers

- How to overcome the fact that end-user doesn´t have access to hard currency
  - Project developer replaces the bank (that is not able/willing to give a credit) and sells the units using a "lease format" similar to a loan mechanism but through the developer himself
- Opportunity for enforcing energy performance contracts (EPCs) through the ESCOs
- Approval of the Energy Conservation law by the Lebanese CoM and transferring it to the parliament
- Restructuring electricity tariffs as per the policy paper and the shortages in fuel imports leading to high energy bills would motivate the end-users to implement EE measures despite the economic crisis
- Local authorities have more chances to access international funds which could be used for EE and RE on a local level (municipalities, villages)

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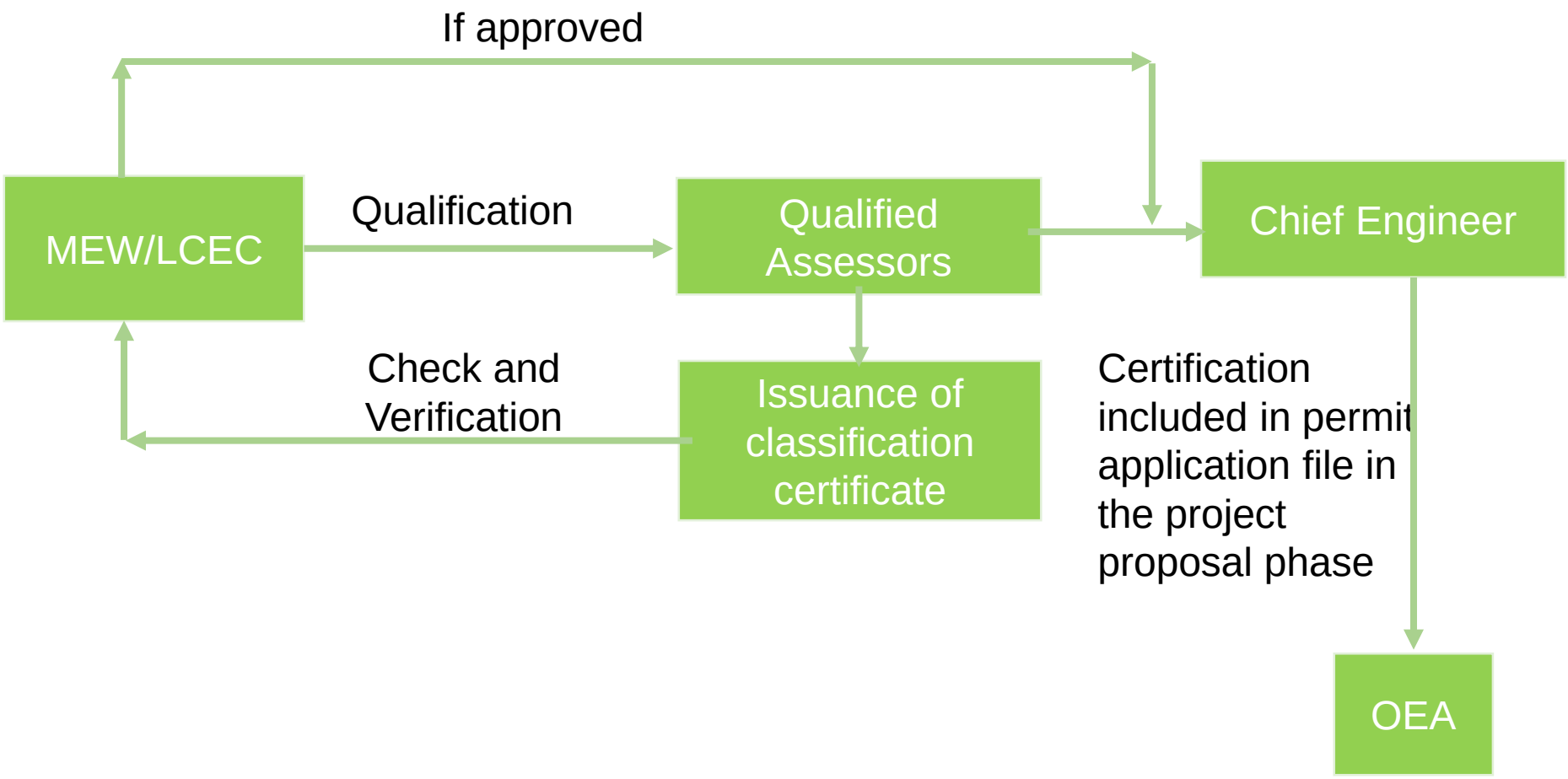
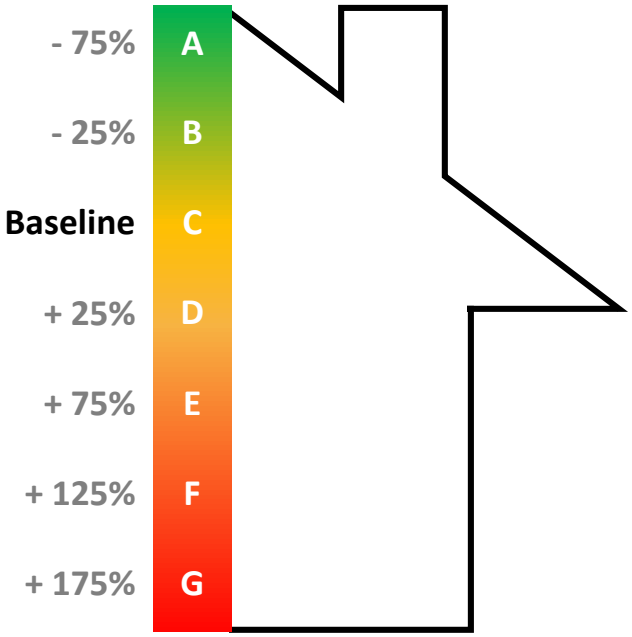
# Voluntary Energy Efficiency Classification Scheme Proposal



# Qualification Criteria

- The evaluation criteria could be based on the following subsections with different assigned weights:
  - Section 1: Company's General Information;
  - Section 2: Qualification of Employees;
  - Section 3: Company's Experience in the Sector;
  - Section 4: Services Provided by the Company (implementation services);
  - Section 5: Financial Revenues of the Company;
  - Section 6: Clients' Reviews;
  - Section 7: Company's Exposure;
  - Section 8: World Energy Council Member.

# Energy Performance Label

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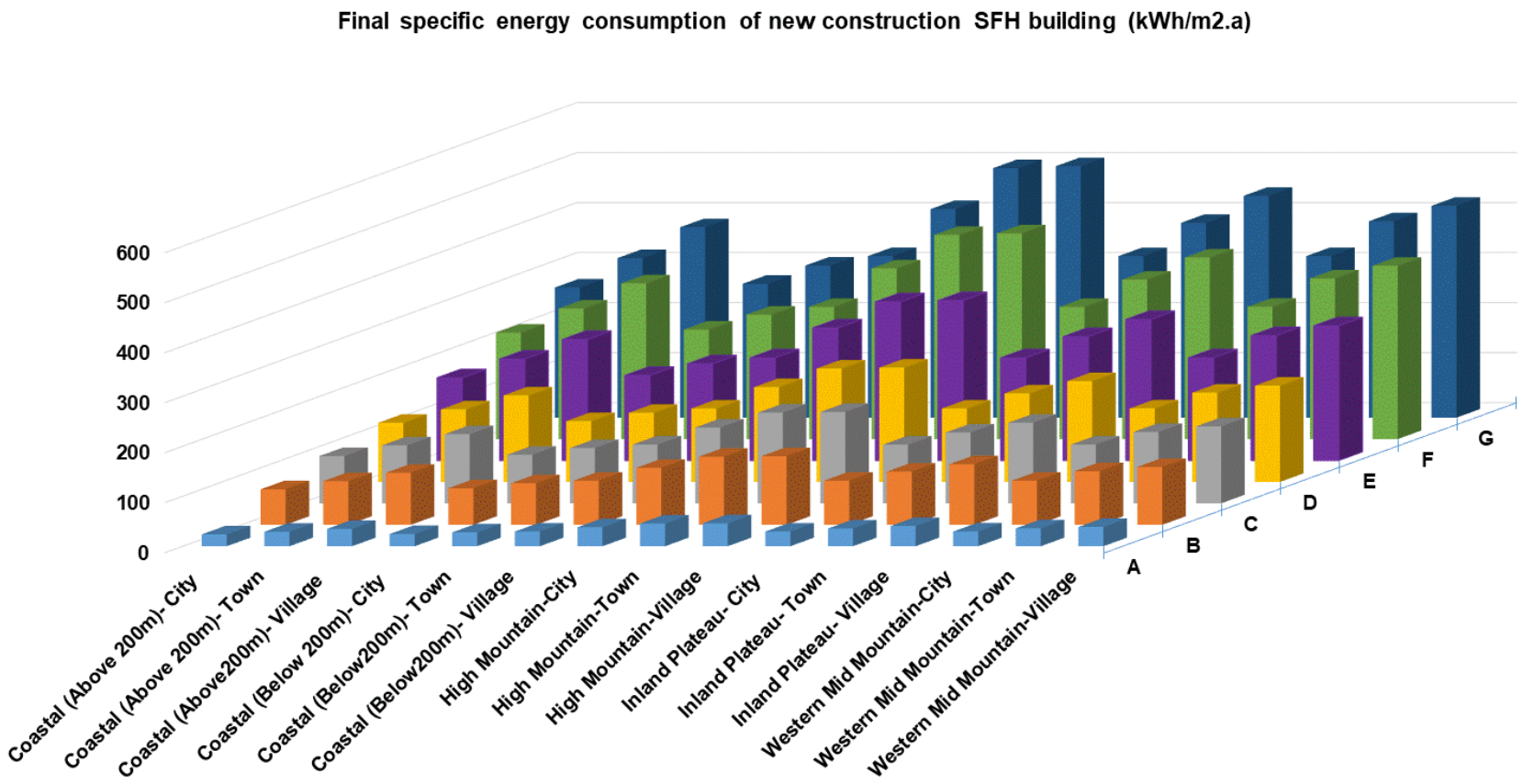
# Example of Labeling




**To be developed and tested in PHASE III**

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# Thank you

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