Africa Energy Efficiency Policy in Emerging Economies Training Week

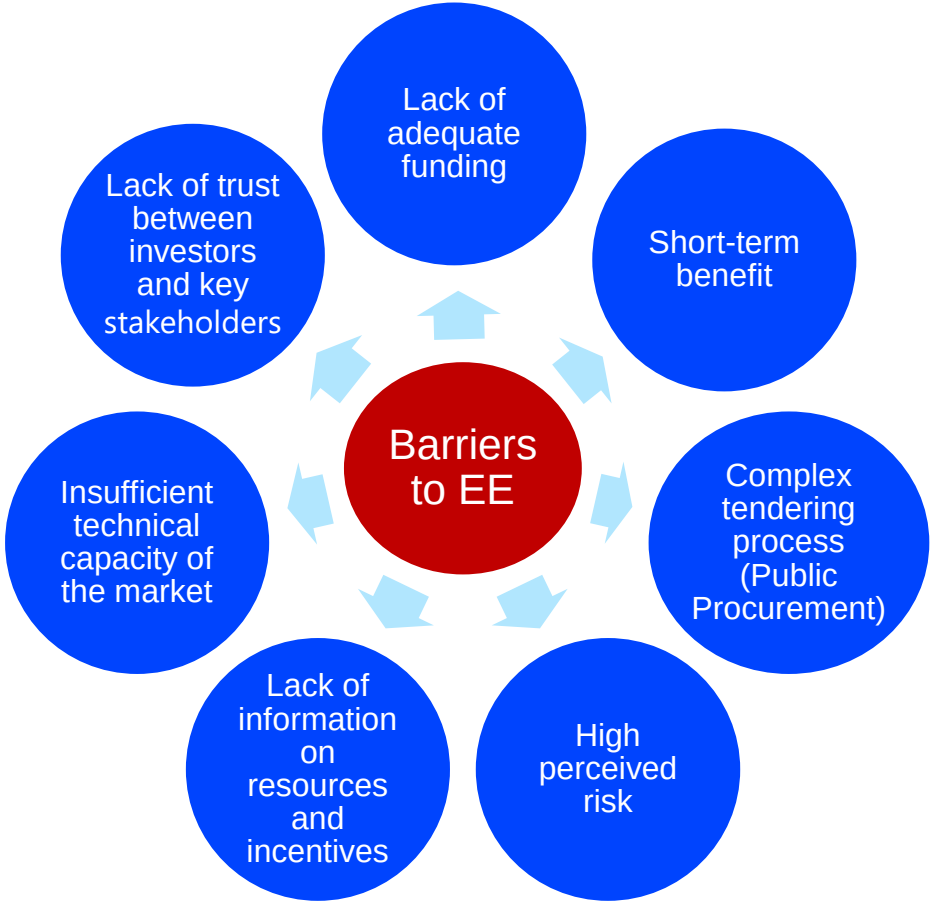
The Role of SUPER ESCO in Africa

Jalel Chabchoub, AfDB

Nairobi

18-22 March 2024

Main Barriers for Energy Efficiency



IEA 2024. CC BY 4.0.

Super ESCO: Leading by Example

- To increase awareness
- To initiate/drive/organize the “EE stream”
- To put in place an “enabling environment”
- To provide “useful capacity building”
- To put in place “seed financing” as catalyst for “appropriate financing mechanisms”
    - Dedicated fund for government facilities
    - ESCO specific fund
    - ESCO Guarantee Fund
    - ESCO EPCs Insurance scheme
    - Etc….

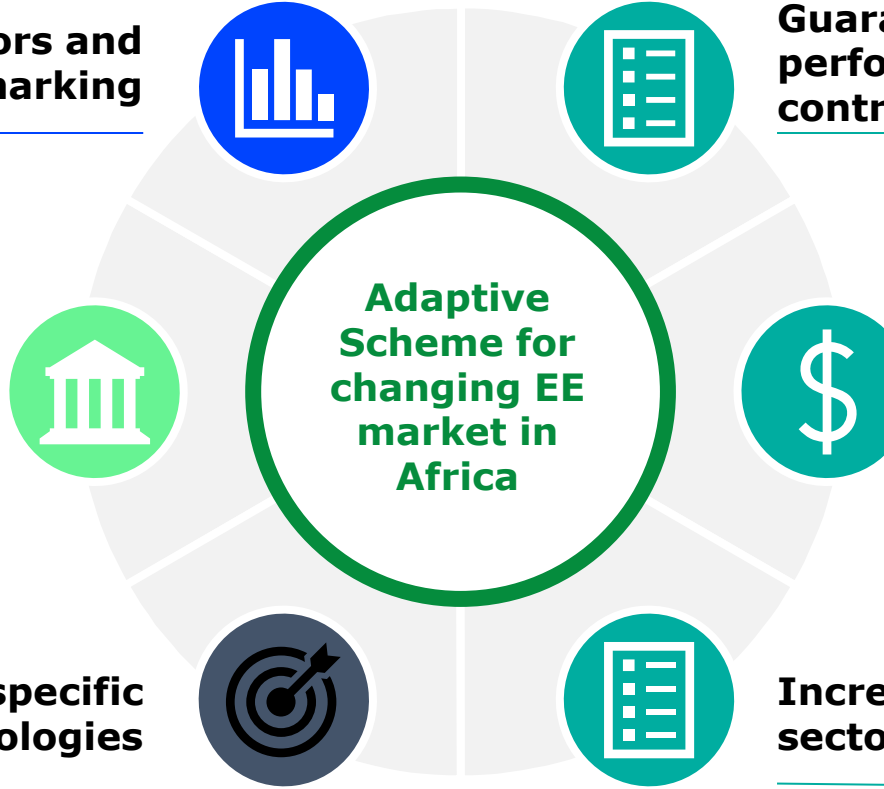
IEA 2024. CC BY 4.0.

Super ESCO: Flexible Scheme

Real efficiency indicators and benchmarking

Guaranteed project performance and flexible contracts

Different SUPER ESCO structures



Adapted financing schemes

Targeting specific facilities/technologies

Increasing pipeline and sectors

IEA 2024. CC BY 4.0.

Super ESCO: Model for sustainability and performance

- ***Sustainability:***

- Benchmark for government facilities
- Continuous M&V and savings persistence
- Establishment of Energy Management activities and systems

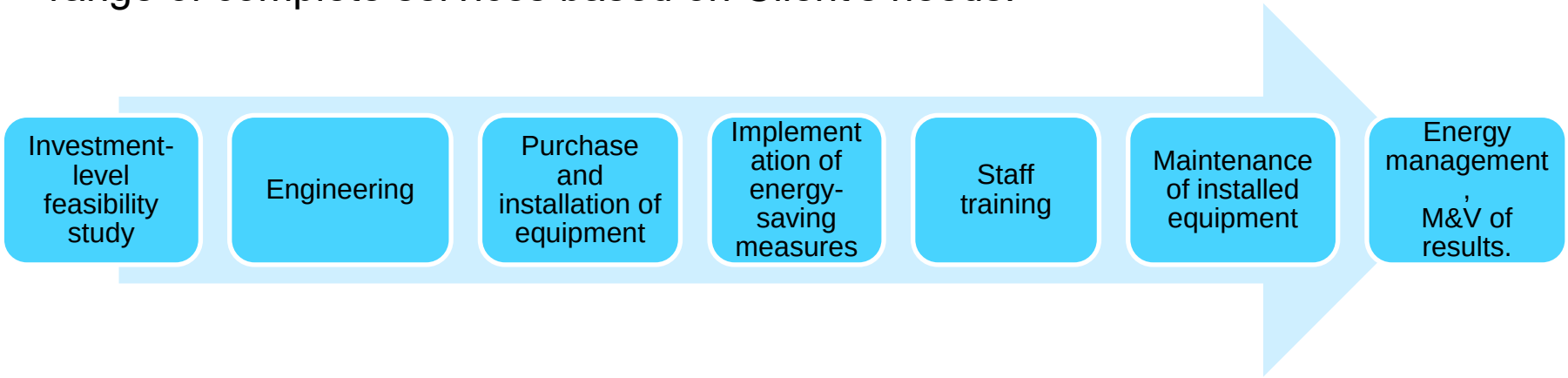
- ***Performance:***

- Best project viability
- New technologies, operation optimization and digitalization
- Guaranteed results and performance
- Implementation by private sector: ESCOs

IEA 2024. CC BY 4.0.

ESCO: Full and flexible services

- ESCO is a company offering Energy Performance Contract (EnPC) scheme
- ESCO is responsible for the complete implementation of the project providing a range of complete services based on Client's needs:



The ESCO guarantees the performance of the project and could arrange project financing

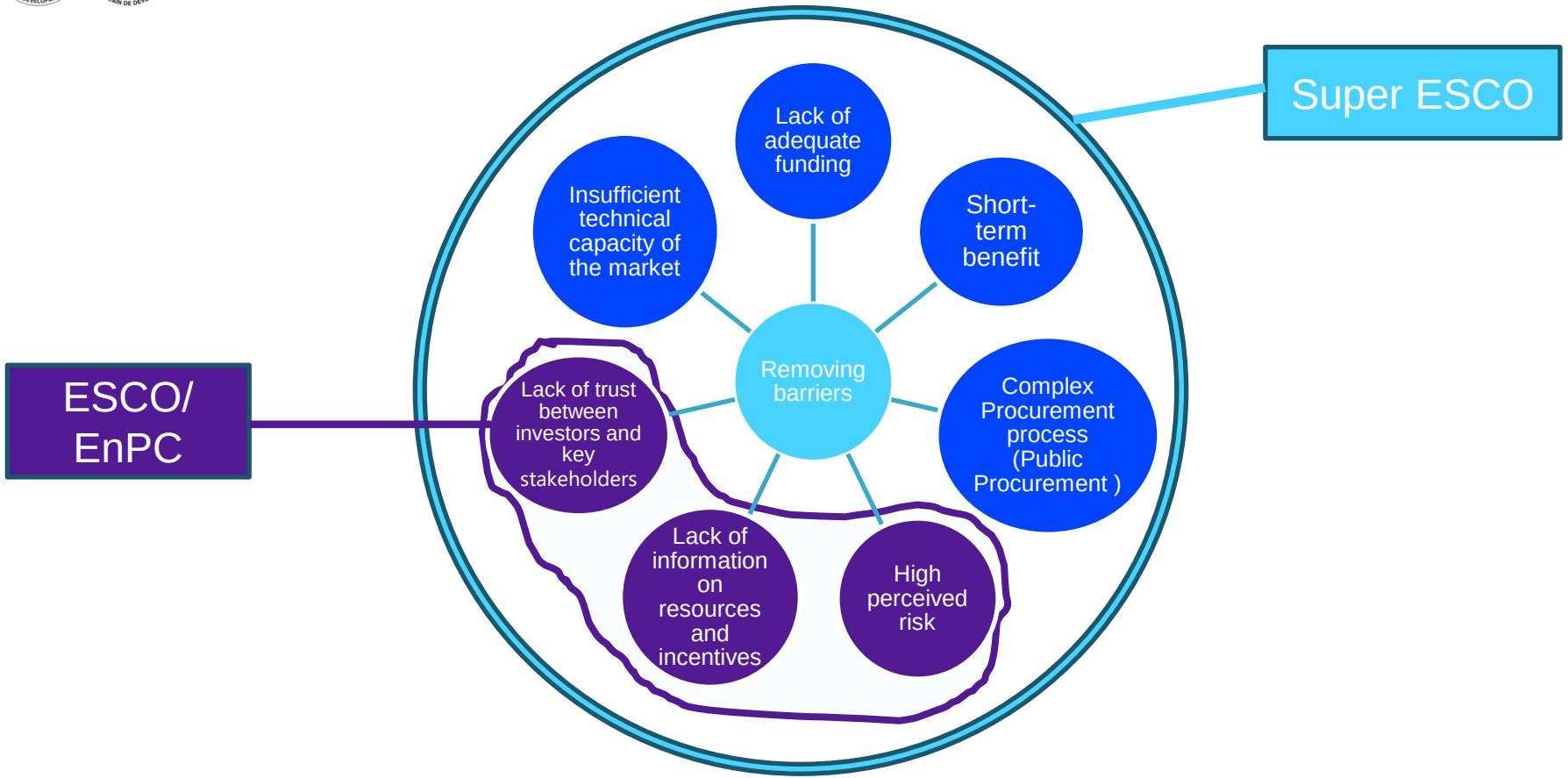
IEA 2024. CC BY 4.0.

Super ESCO & ESCOs: A good fit

- ESCOs through EnPCs has contributed to eliminate barriers to energy efficiency such as lack of technical capacity, perception of high risk, lack of trust between investors and stakeholders.
- Super ESCOs overcomes residual barriers that ESCOs and EnPCs have not been able to eliminate, such as: small projects size through bundling; lack of capacity and interest of ESCOs to get involved in project financing; inadequacy of governments procurement systems for EnPCs, the search for short-term benefits, etc.
- Super ESCO: bring huge pipeline, financing, initial assessment opportunities, project development, facilitators, catalyst role, etc.
- ESCOs and EnPCs have contributed to scaling up EE projects

IEA 2024. CC BY 4.0.

Super ESCO & ESCOs: A good fit



IEA 2024. CC BY 4.0.

Super ESCO & ESCOs: A good fit

Credibility

- Engagement with key stakeholders and investors helps build the initiative's credibility with potential customers

Impartiality

- Impartiality to technologies, suppliers or ESCOs.
- The selection criteria is based on the performance of the proposed technophiles and packages.

Attractiveness

- A global offer that allow clients to be in contact with a single entity: one stop shop for technical, financial contractual and performance services

Complementarity

- Use of all market enablers (available subsidies, best market technical expertise, financing facilities, performance guarantee, etc.) to structure the most viable project.

IEA 2024. CC BY 4.0.

Africa Super ESCO Acceleration Program (ASAP)

- **AFRICA SUPER ESCO ACCELERATION PROGRAM (ASAP):**

- Approved in February 2023 with an overall dedicated envelop of 5 M USD

- The Africa Super ESCO Acceleration Program (ASAP) is a TA program with the overarching objective of catalyzing private sector investments in EE

- The first phase : Three countries Rwanda, Senegal, and South Africa

- In the process of assessing opportunities for Super ESCO Implementation in Burkina Faso and Cote d'Ivoire

IEA 2024. CC BY 4.0.

- **AFRICA SUPER ESCO ACCELERATION PROGRAM (ASAP):**

- Main Objectives:

  i. Pillar 1: Creating and operationalizing Super ESCOs in the selected countries;

  ii. Pillar 2: Developing harmonized regional certification schemes for ESCOs; and

  iii. Pillar 3: Program management

IEA 2024. CC BY 4.0.

Africa Super ESCO Acceleration Program (ASAP)

- **Pillar 1: Creating and operationalizing Super ESCOs in the selected countries**;
  - Activity 1: Enabling environment for the development and operationalization of the Super ESCO
    - Business Plan development
    - Hands-on Capacity Building
    - Organize fundamental training for the Super ESCO, private ESCOs, financial intermediaries and other key actors
    - Set up internal processes and procedures and develop planning and management tool
    - Promote the establishment of Super ESCO and EE projects

IEA 2024. CC BY 4.0.

Africa Super ESCO Acceleration Program (ASAP)

- **Pillar 1: Creating and operationalizing Super ESCOs in the selected countries**;
  - Activity 2: Developing an initial pipeline of EE investment projects
    - Conduct energy audits
    - Develop innovative and viable business models for the implementation of EE projects
    - Support the competitive procurement process for at least two project

IEA 2024. CC BY 4.0.

Africa Super ESCO Acceleration Program (ASAP)

- **Pillar 2: Developing harmonized regional certification schemes for Energy Service Companies(ESCOs) and individual professionals**

Activity 1: Development of a framework and process for a harmonized regional certification scheme for ESCOs and EE professionals

- Activity 2: Development of tools for the operationalization of the harmonized regional certification scheme

- Activity 3: Communication and Awareness Raising

- **Pillar 3: Program Management**

IEA 2024. CC BY 4.0.

THANK YOU

j.chabchoub@afdb.org

African Development Bank Group
Avenue Joseph Anoma
01 B.P. 1387 Abidjan 01
Côte d’Ivoire
www.afdb.org

IEA 2024. CC BY 4.0.

Africa Energy Efficiency Policy in Emerging Economies Training Week

Buildings

Nairobi

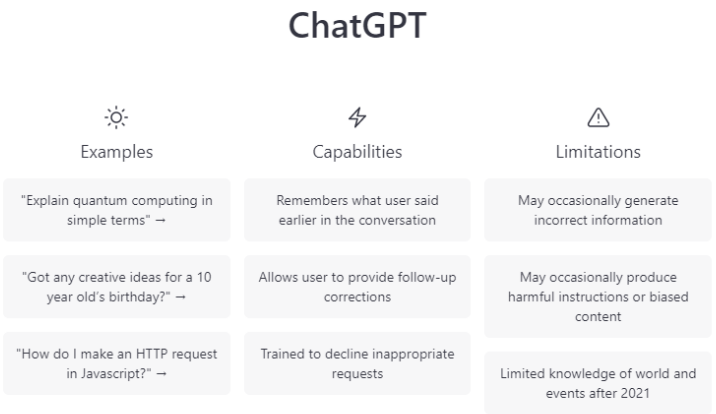
18-22 March 2024

https://www.iea-events.org/energy-efficiency-training-week-nairobi

Poem Competition

Create a poem or song about the use of energy efficient and digital technologies using ChatGPT or your own talent

https://chat.openai.com/

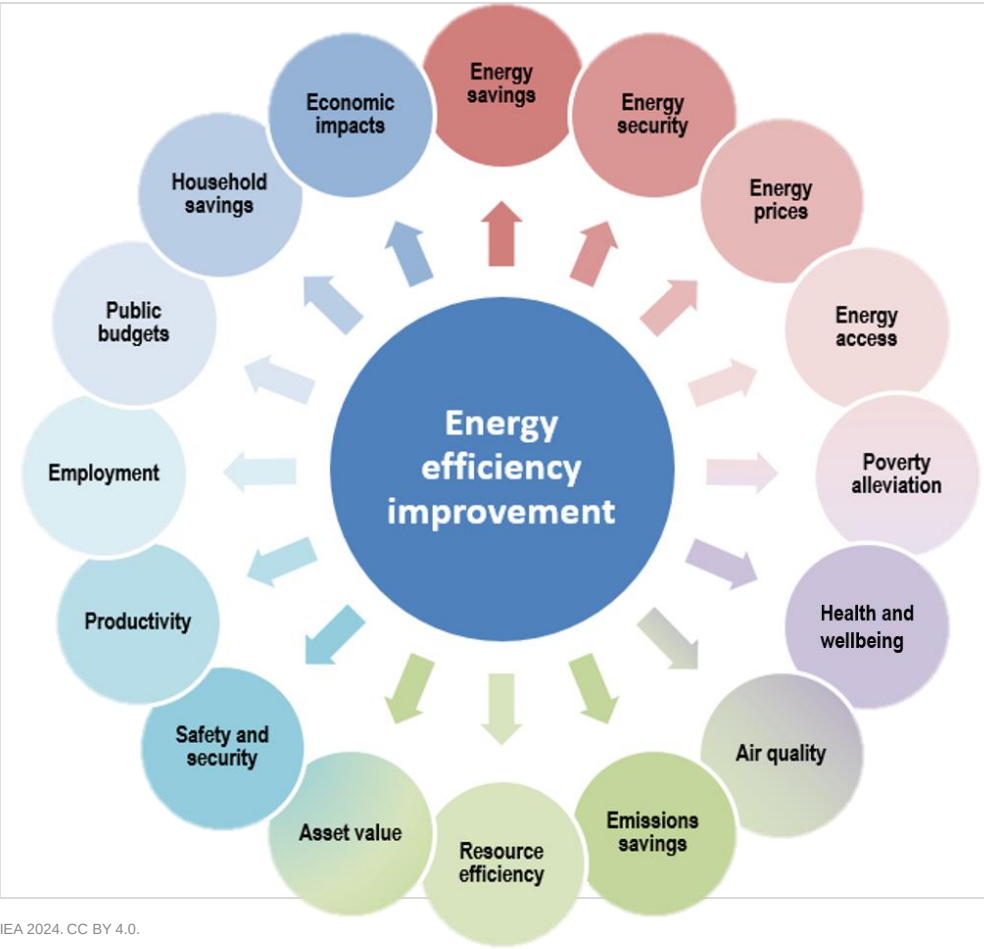


IEA 2024. CC BY 4.0.

International Energy Agency

Energy Efficiency Training Week – Buildings – Day 3: 13. Multiple benefits of energy efficiency

Energy efficiency delivers many benefits

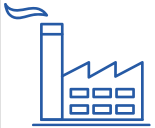


Supporting various policy priorities

IEA 2024. CC BY 4.0.

Benefits of energy efficiency in buildings – important perspectives

Individual – building occupant, operator, owner



Industry –commercial, industrial and energy utility sectors

Public sector – national and sub-national

Societal – benefits accrue across society and the economy

Policymakers must keep in mind these various perspectives in aligning policies and programmes with objectives

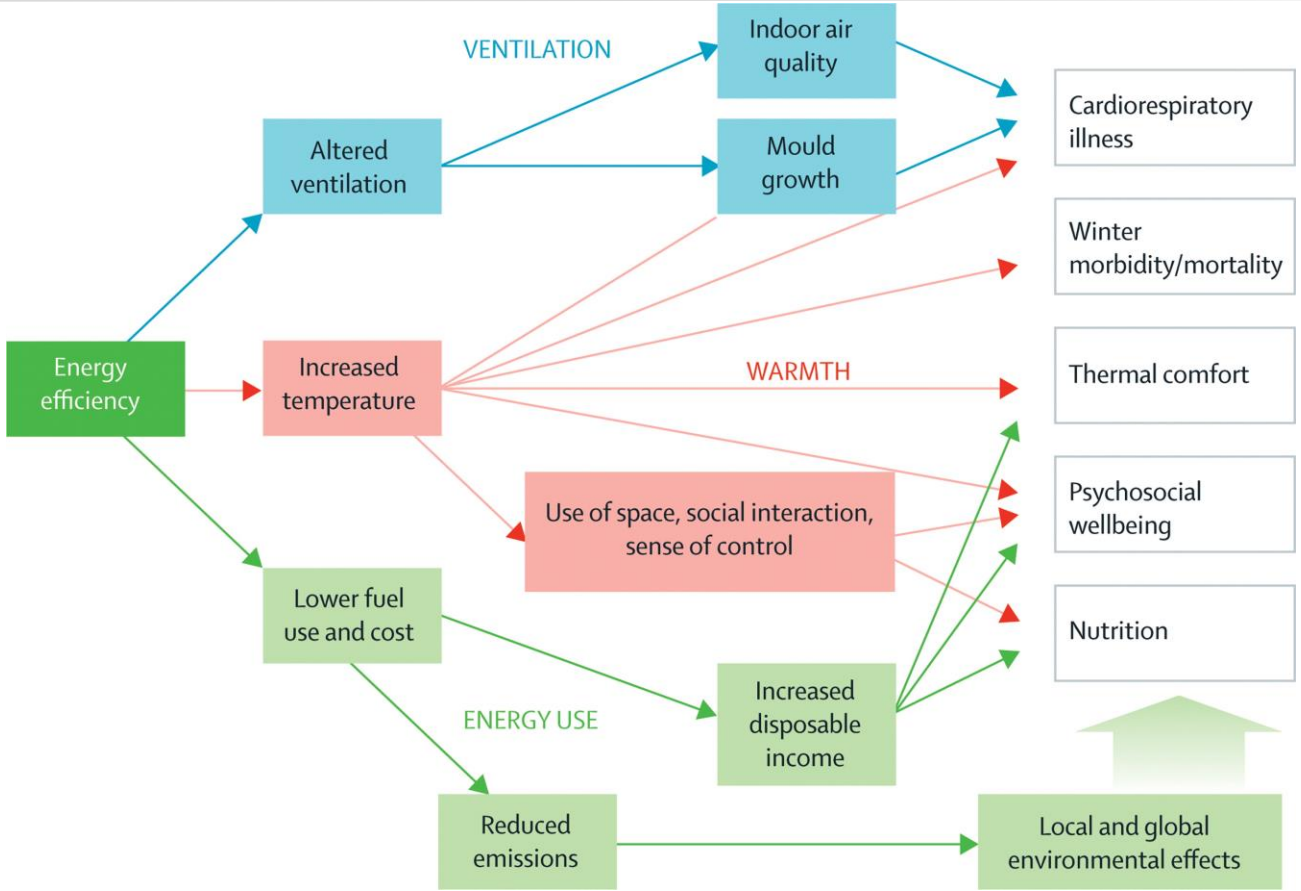
IEA 2024. CC BY 4.0.

Individuals: benefits to building occupant, owner, operator

Health and comfort	Improved indoor temperature, air quality, light and reduced noise
Access to (affordable) energy services	Access to (new) affordable energy services – lighting, cooling, refrigeration, washing
Operations & maintenance	Improved building and systems durability with reduced need for maintenance
Safety and security	Improved safety through lighting, controls and reduced chance of fire from gas leaks.
Property value	Increased rental income, reduced tenant turnover, increased habitable floor area

IEA 2024. CC BY 4.0.

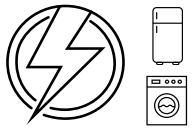
Health and wellbeing



Source: Wilkinson et al 2007

IEA 2024. CC BY 4.0.

Affordability and access



Access

- Mexican minimum standards have been in place over 30 years.
- Number of households with refrigerators have grown by 19% and with washing machines by 20%.
- Average household electricity consumption has dropped by 17% over this time.

Saving on household bills

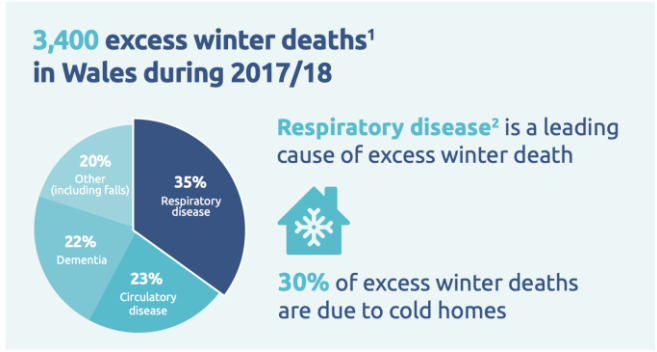
- In Brazil, about half of investment in energy efficiency under the Programme for Energy Efficiency (PEE) has been made in low-income households.
- These projects have saved around 30 kWh per household.
- Or about 15% of average electricity consumption for a low-income household.

Insulation for low-income households

- Chile has implemented a subsidy programme for insulation of low-income housing.
- From 2009-2012, nearly 33,000 families benefitted from the programme.

IEA 2024. CC BY 4.0.

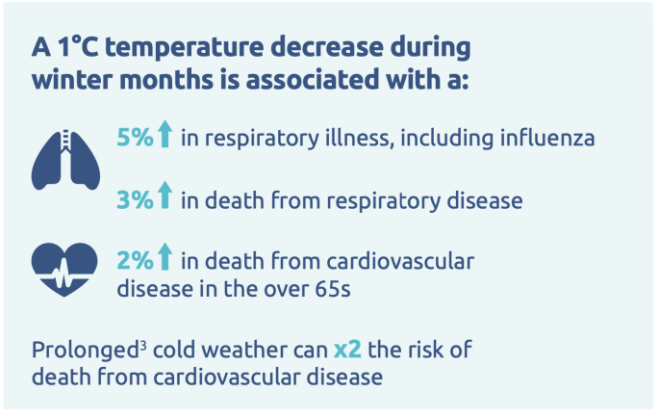
Case study: Energy efficiency retrofit (Nest) scheme in Wales



- Under the Welsh Nest scheme (2011 onwards), energy efficiency measures and advice have been provided to around 18,000 low-income households.

- Residents who received home improvements experienced **13.7% fewer general practitioner visits for respiratory conditions and 18.5% fewer asthma events** compared to residents in homes who had not yet received measures [Morrison- Rees, 2017].

- There was a **small positive impact on emergency hospital admissions**, with fewer admissions for respiratory conditions compared to the winter before receiving energy-efficient measures [Morrison-Rees, 2017].



IEA 2024. CC BY 4.0.

Source: Azam S, et al. (2019). Improving winter health and well-being and reducing winter pressures.

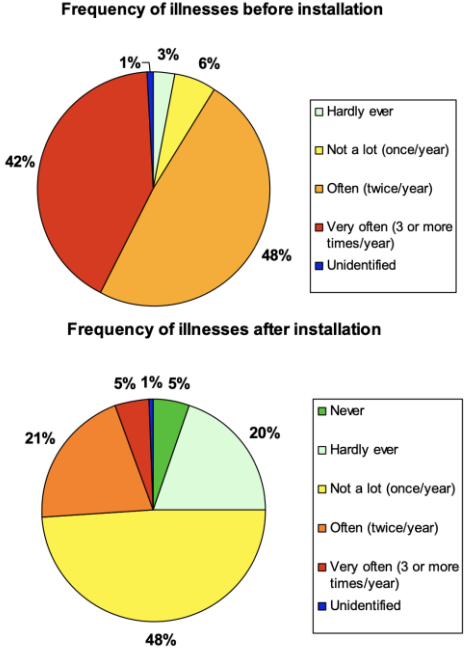
Case study: Energy efficiency retrofits in South Africa

The Kuyasa project provided energy efficiency retrofits to low-income houses in the outskirts of Cape Town, South Africa between 1999 and 2002.

Retrofits included installation of solar water heaters, ceiling insulation, and compact fluorescent lamps (CFLs).

The project was estimated to have saved 7.40 million kWh (34 percent) and 6,437 tons of CO2 emissions (33 percent) on an annual basis.

Household in Kuyasa, Cape Town who received thermal insulation in the roofs, low energy lighting and solar hot water reported a 67% reduction in self-reported illness frequency.



Source: Walsh et al. 2011. Improving urban living conditions in Kuyasa (Cape Town) through energy-efficiency retrofits: the impact on low-income communities.

IEA 2024. CC BY 4.0.

Industry: benefits to commercial, industrial and energy utility sectors

Competitiveness	Reduced production costs through more efficient equipment, systems and energy management
Operations and maintenance	Improved industrial and commercial operation; reduced need for maintenance
Working environment	Environmental quality of work space, worker health and safety
Environment	Air pollution, solid waste, wastewater, reduced input materials – lower environmental impact and lower-cost compliance with environmental standards
Energy utilities	End-use energy efficiency and demand management measures can help reduce overall system costs by reducing overall load, peak demand, and help integrate variable renewable resources

IEA 2024. CC BY 4.0.

Public sector: national and subnational

Municipal services	Savings on lighting, space and water heating/cooling, public transport, wastewater and water treatment
Lower operations & maintenance	Through energy efficiency measures and building management systems
Public education	Improve comfort, air quality and lighting – improved health and educational outcomes
Public health sector	Measures in hospitals and clinics can save energy and operations & maintenance costs while benefitting staff and patients
Air quality	Particularly transport policy, as well as fuel switching for cooking and heating

IEA 2024. CC BY 4.0.

Public budgets

USD 9.7 million saved by Mexican government in federal public expenditures

Through energy efficiency measures in Federal Public Administration (buildings and vehicle fleets) in the last 10 years.

26,351 MWh Electricity savings per year by city of Guarulhos, Brazil through 7 actions, including

Street and hospital lighting, replacing electric showers with solar water heaters in public social housing, municipal water supply system. Av'g 5 year payback.

Lighting improvement in Mexican school

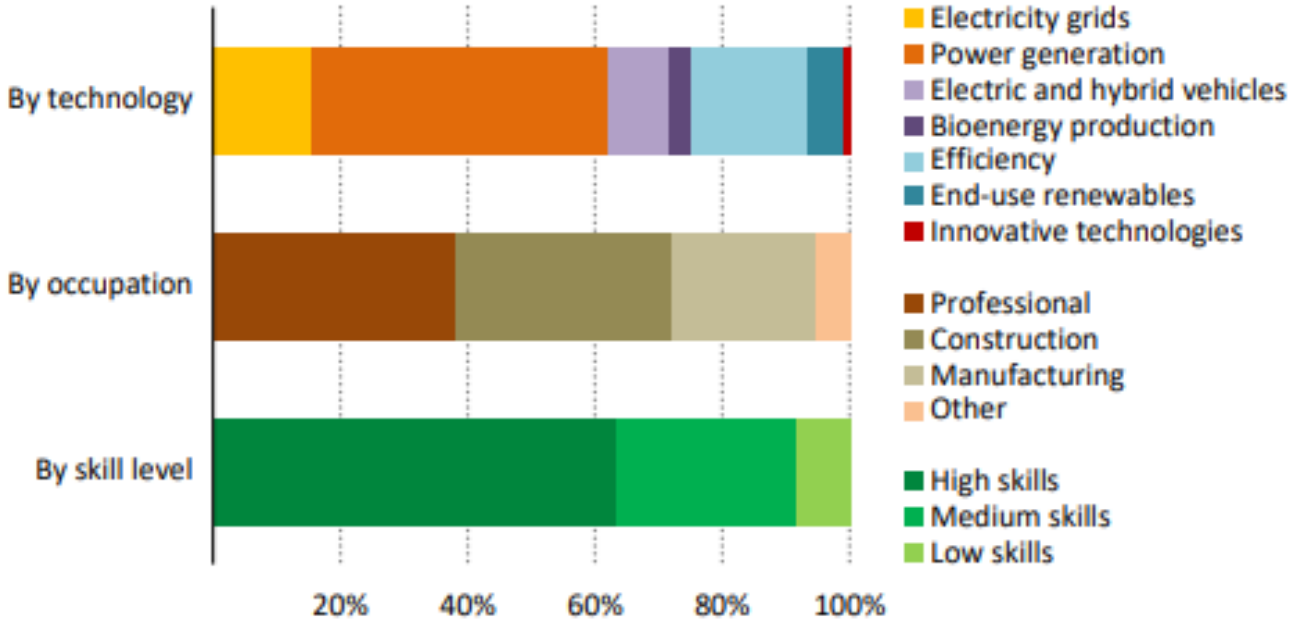
IEA 2024. CC BY 4.0.

Societal: benefits accrue across society and the economy

Economic	Benefits to improved competitiveness; reduced energy intensity of economy
Emissions	Reduced direct and indirect emissions from efficiency, refrigerants and reduced product size / quantity.
Energy system	Lower cost energy system through avoided generation, transmission and distribution costs
Environmental	Improved air quality, reduction in solid waste, wastewater, input materials
Jobs & skills	Shifting from global to local jobs and from polluting to green jobs

IEA 2024. CC BY 4.0.

Jobs created in clean energy and related sectors in a Sustainable Africa Scenario, 2021-2030



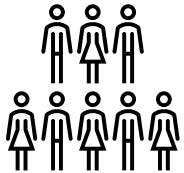
Of the clean energy jobs created across Africa to 2030, the majority are related to power generation and energy efficiency, spread across occupations

IEA 2024. CC BY 4.0.

Jobs of today and careers of the future

Jobs of today

- According to the IEA's World Energy Employment report, energy efficiency accounts for 10.9 million full-time-equivalent (FTE) jobs.
- In Latin America, direct energy efficiency jobs account for about 8% of energy sector jobs.
- In Central and South America, 33% of energy efficiency jobs are in the construction sector, and around 25% in manufacturing.



Careers of the future

- According to the ILO, a decarbonisation scenario, which includes a strong energy efficiency component, has the potential to create 15 million new net jobs in Latin America and the Caribbean by 2030.
    - Including 58% more jobs in construction and 50% more in manufacturing.
- Opportunities include: green building accreditation; energy management in industry and buildings; digital technologies and data.

IEA 2024. CC BY 4.0.

Session Activity

International Energy Agency

Activity - Energy efficiency policy package

With the information you have on your country and based on the analysis you have done in the previous exercises, identify important policies that have drive the improvement of energy efficiency in buildings. Would they be the same or different for new and existing buildings?

Expand your policy package to consider Digitalisation

Policy Instruments		
	New buildings	Existing buildings
Regulations		
Information		
Incentives		
Multiple benefits		

IEA 2024. CC BY 4.0.

International Energy Agency

Energy Efficiency Training Week

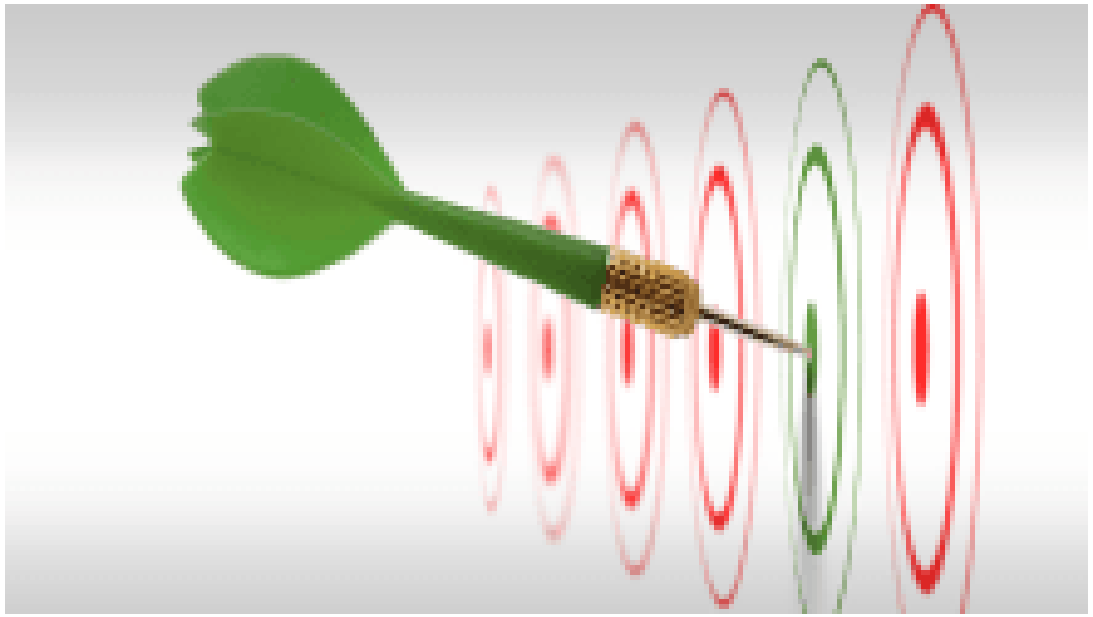
KENYA GREEN BUILDING SOCIETY

Build Green, Save Kenya

Building Sustainably: Unpacking what it means for Kenya

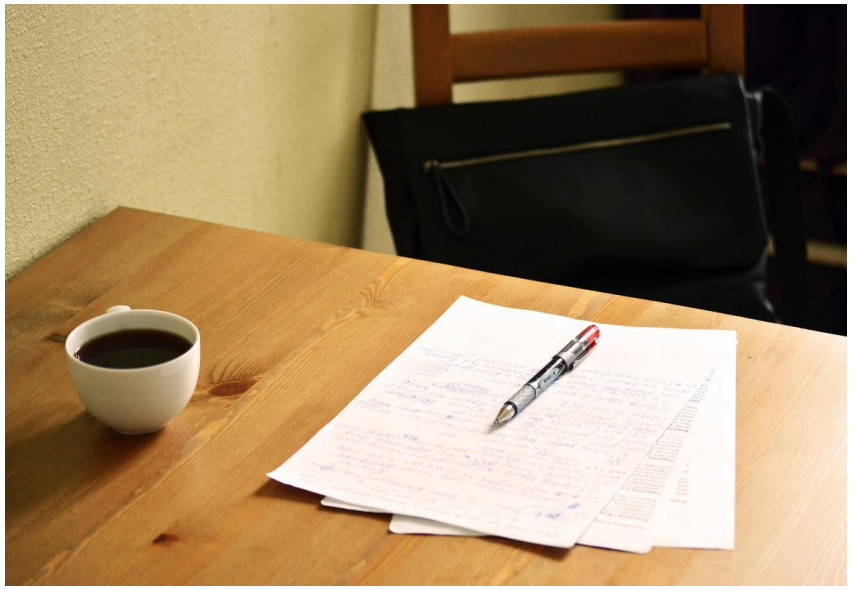
Presentation: Nasra Nanda

Objectives



1. Background.
2. Some examples
3. Why Kenya?
4. Climate & Development and why 2023 was a defining year for Africa taking charge of its narrative
5. ACS to COP28 : key outcomes for the built environment

Who we are & what we do



The Kenya Green Building Society is not your traditional green building council, we see the built environment as an **ecosystem of opportunities** and aim to champion sustainability in the built environment through:

1. Advocacy & Research:
2. Capacity Building
3. Certification
4. Facilitating market transformation and stakeholders engagement, collaboration
5. Project implementation support.

Our impact

Sustainability uptake has been on a steady increase in Kenya, with the number of green buildings in Kenya at least doubling each year since year 2021.

Additionally, voices championing for sustainability continues to grow louder as more individuals and entities recognize and join Kenya's largest action network championing sustainability in the built environment.

1.7 MILLION

Square metres of Green certified space in Kenya.

277 VOICES

Members of the Kenya Green Building Society.

3 COUNTIES

Counties being supported in enabling a sustainable built environment namely, Nairobi, Laikipia & Homa Bay counties.

100+ PROFESSIONALS

Trained and accredited professionals in green building rating tools.

Leadership In Action

Certification of the Nairobi City County Governor's Office as the first IFC EDGE Green Government office in Africa

Nairobi Govenor's office is the first IFC EDGE certified government office of its kind in Africa.

This is important since it will assist the County lead the climate action conversation by example. KGBS is also supporting the county with its climate action plan.

The buildings performance:

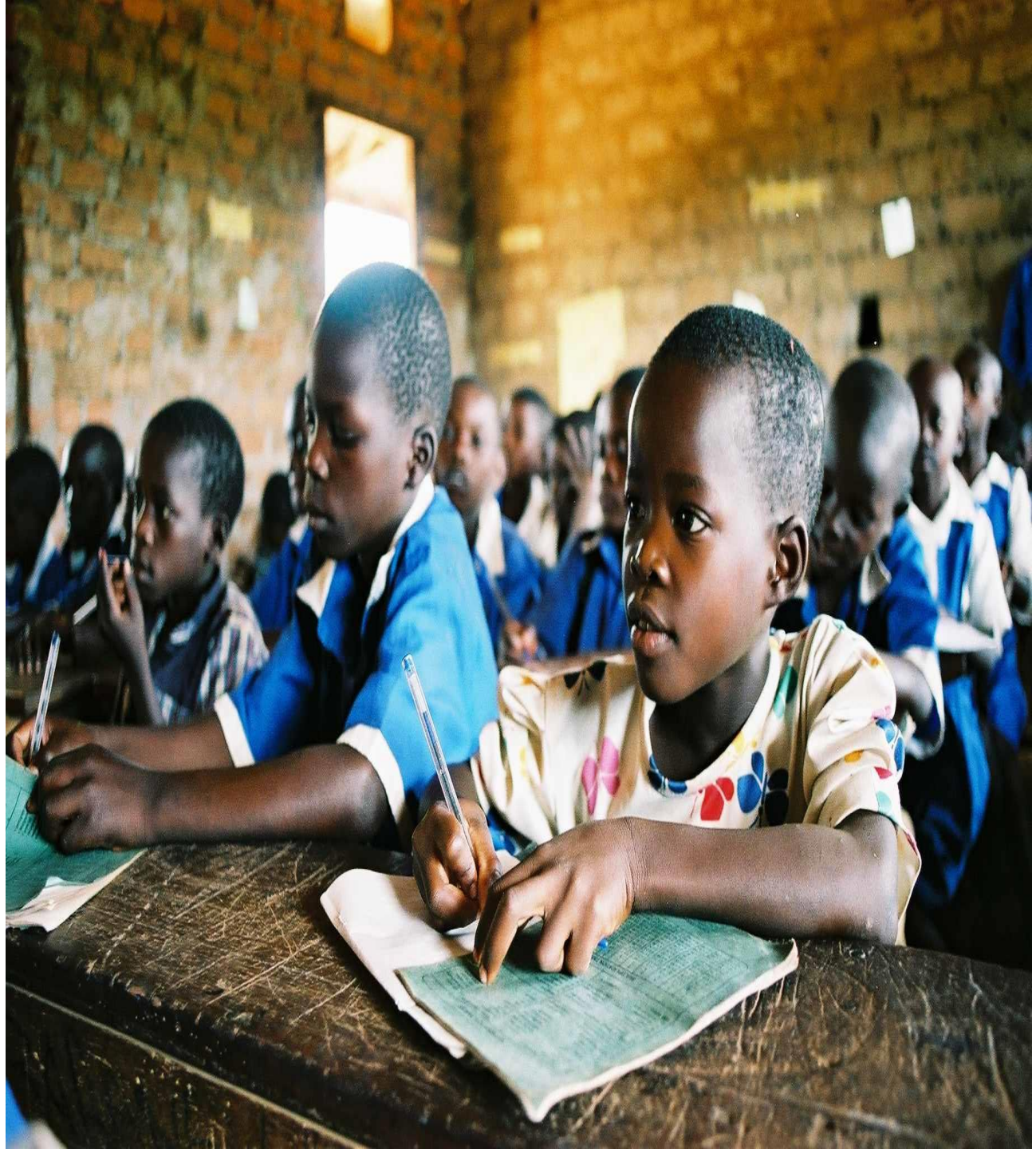
- Energy Efficiency: 20.13%
- Water Efficiency: 22.6%
- Material Efficiency: 100% (As an existing building from 1935, embodied carbon tied to materials is depleted)

KENYA GREEN BUILDING SOCIETY
Build Green, Save Kenya

Excellence In Design For Greater Efficiencies
Edge

NAIROBI CITY COUNTY

fsdafrica



LIGHTING FOR SECONDARY SCHOOLS IN KENYA

PART OF THE WIDER INITIATIVE TO PROMOTE GREEN SCHOOLS

AN INITIATIVE BY:

COPENHAGEN CENTRE ON ENERGY EFFICIENCY
SEforALL EE HUB

U4E United for Efficiency

UN environment programme | copenhagen climate centre

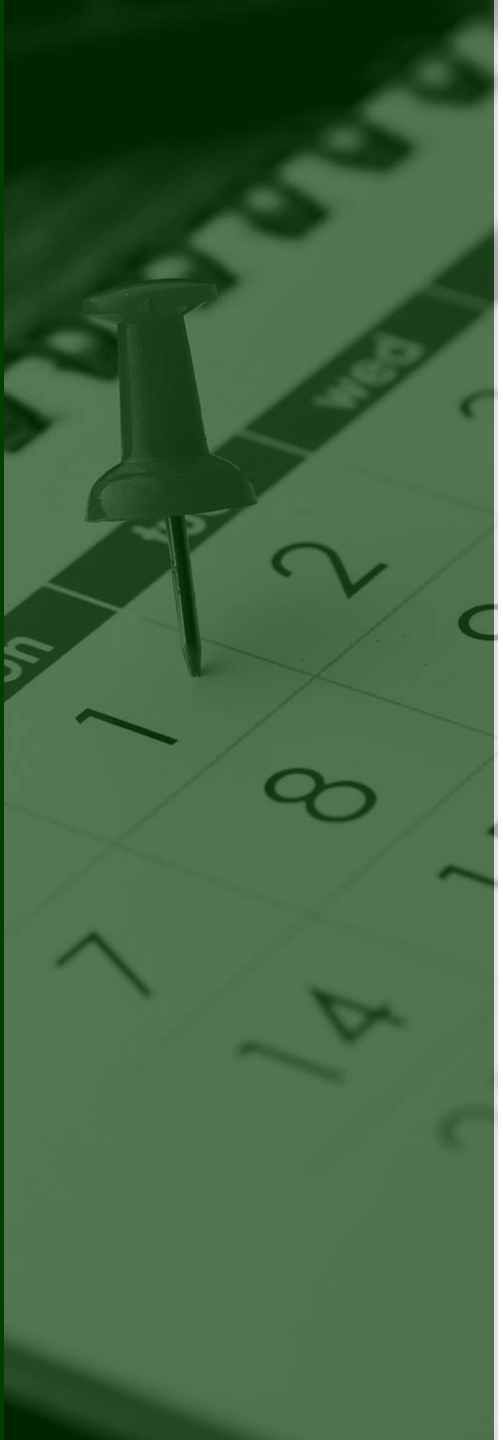
REPUBLIC OF KENYA
Ministry of Energy and Petroleum
State Department for Energy

REPUBLIC OF KENYA
Ministry of Education

signify
the meaning of light

SUSTAINABLE ENERGY FOR ALL

KENYA GREEN BUILDING SOCIETY
Build Green, Save Kenya



Green Schools

School Lighting Project, Ministry of Energy, Signify Foundation, KGBS, SEforAll

1. Kenyan Ministry of Energy and UNEP-CCC have highlighted a project proposition for energy-efficient lighting retrofit in secondary boarding schools.
2. Kenya's secondary boarding schools currently allocate half of their electricity expenses to lighting due to outdated equipment.
3. Through this project Signify Foundation aims to contribute by financing the installation of efficient lighting equipment in 100 secondary schools.
4. KGBS shall contribute by supporting in:

KGBS Scope

- Assist in Conducing Light /Energy Audit of the selected schools out of 80 schools nationwide with other partners
- Capacity building in order to ensure schools understand and become green schools are
- Lobbying for the certification of schools

Laikipia County : The Journey to being East Africa's first Zero Carbon County

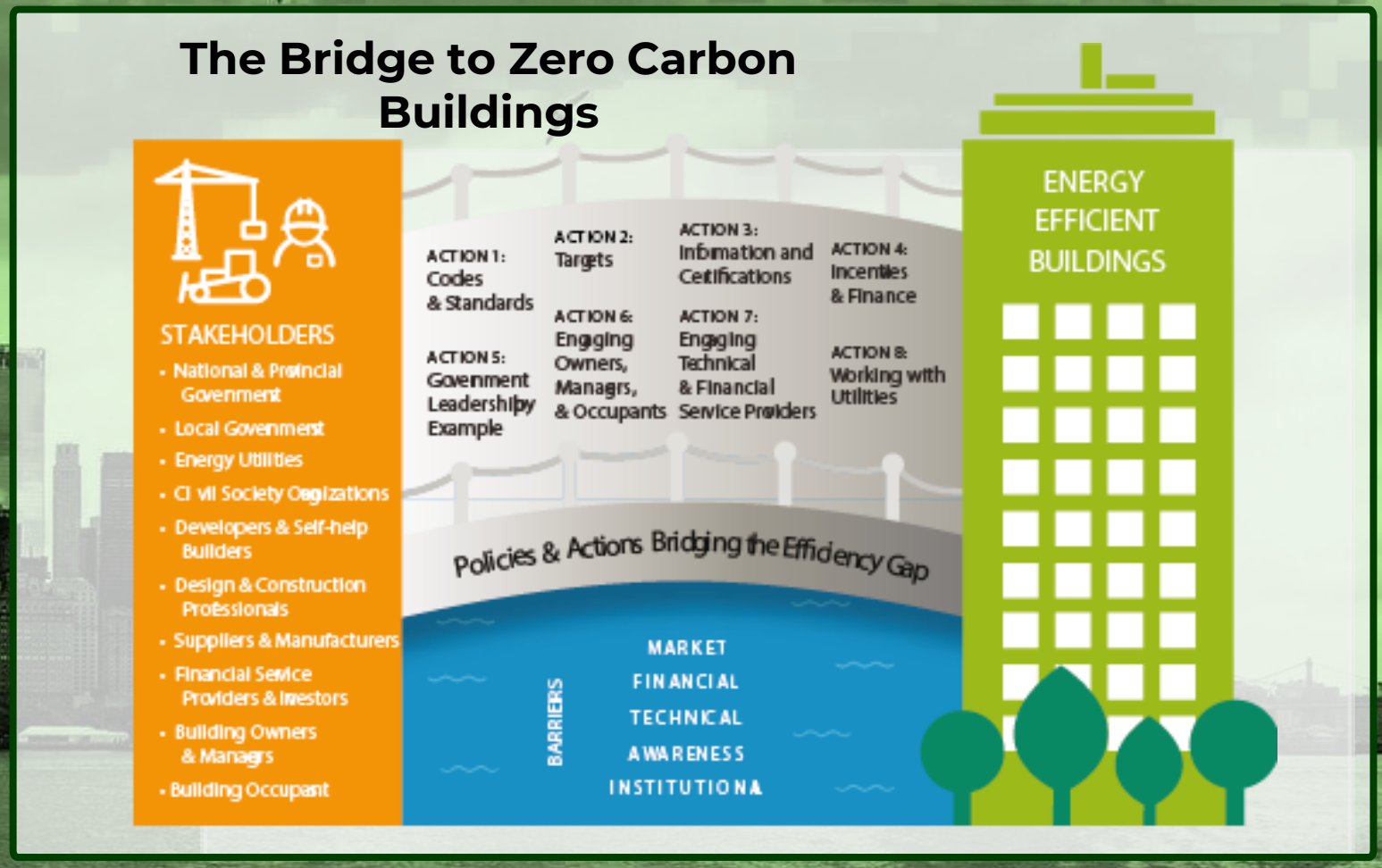
Zero Carbon Accelerator Program

"Africa's cities, and local governments are central in creating a low carbon and climate resilient future."

WORLD RESOURCES INSTITUTE

KENYA GREEN BUILDING SOCIETY

Build Green, Save Kenya



Zero Carbon County

Laikipia County in the Zero Carbon Accelerator – KGBS, WRI

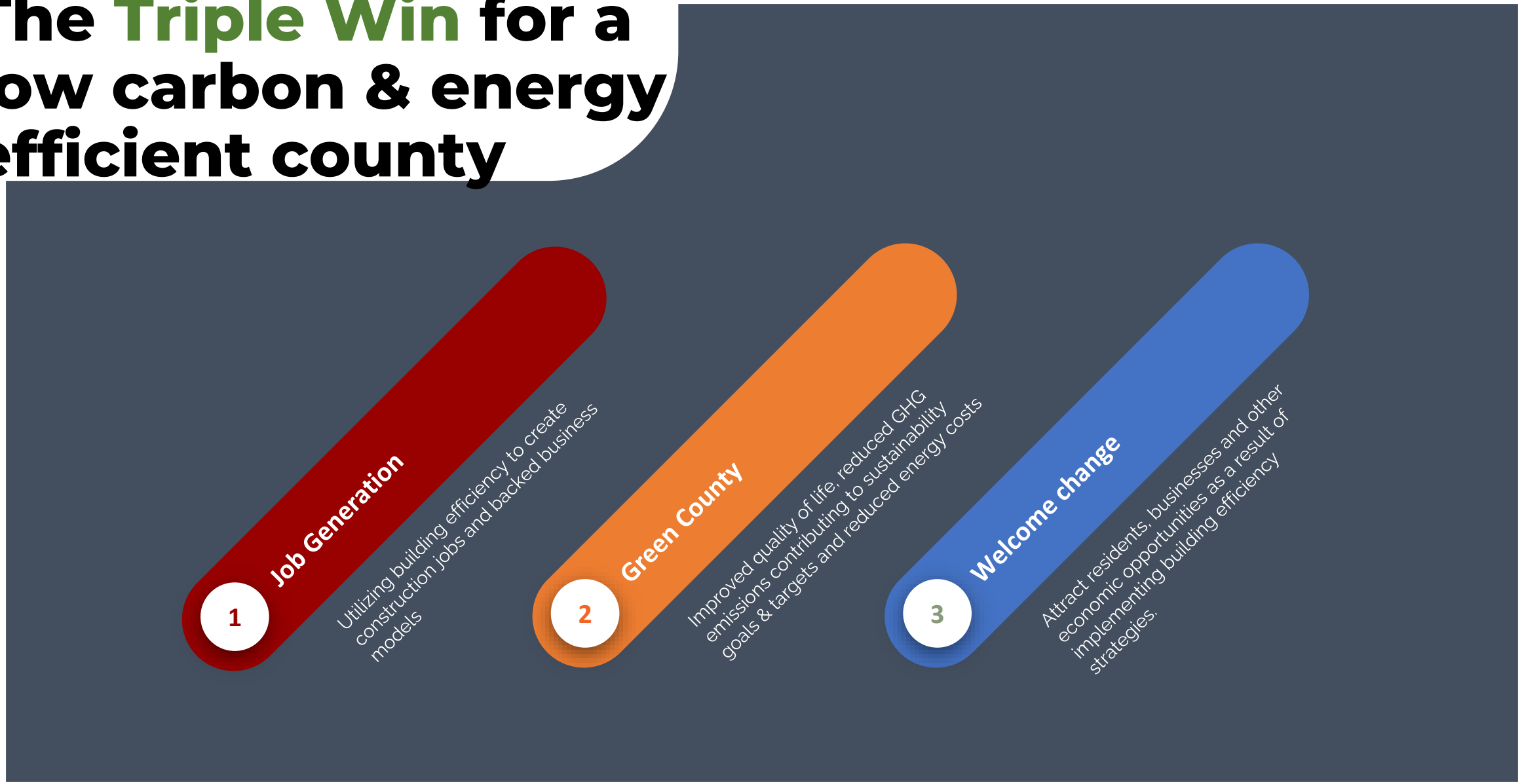
Outcomes

1. Zero Carbon Buildings Action Plan.
a) Transformative Actions
b) Implementation, Monitoring & Evaluation Plan.
2. Net Zero Carbon Buildings Commitment.
3. Enabling Policy.

Leading Implementation

- Green Building Guidelines for Laikipia County
- Solarization project of boreholes in the county.
- Affordable Housing Projects in Rumuruti
- Solarizing the Level 5 Hospital in Laikipia

The Triple Win for a low carbon & energy efficient county



East Africa’s first Green Affordable Housing

The affordable housing project is located along Kisumu- Homa-bay Highway, and is a collaboration between the State Department for Housing and Urban Development, the Homabay County Government, and the National Housing Corporation

The development boasts housing units, ample parking slots and adequate green spaces as recreation for adults and children. The development comprises of 110 units in total. (30 studio Units, 40 one-bedroom units and 40 two-bedroom units.)

Each unit has adequate floor to ceiling height to ensure proper air circulation thus having cooler internal spaces as Homa-bay is a hot and humid area. Each space has been designed to have adequate natural ventilation and natural lighting.

The development will also have spaces that are lettable as shops for the resident's/neighbor's convenience.

KGBS is currently working on green building guidelines for Homabay County.

nhc

MINISTRY OF LANDS, PUBLICWORKS, HOUSING AND URBAN DEVELOPMENT

State Department for Housing and Urban Development

Circularity, Climate & Technology

Jenga Green Library

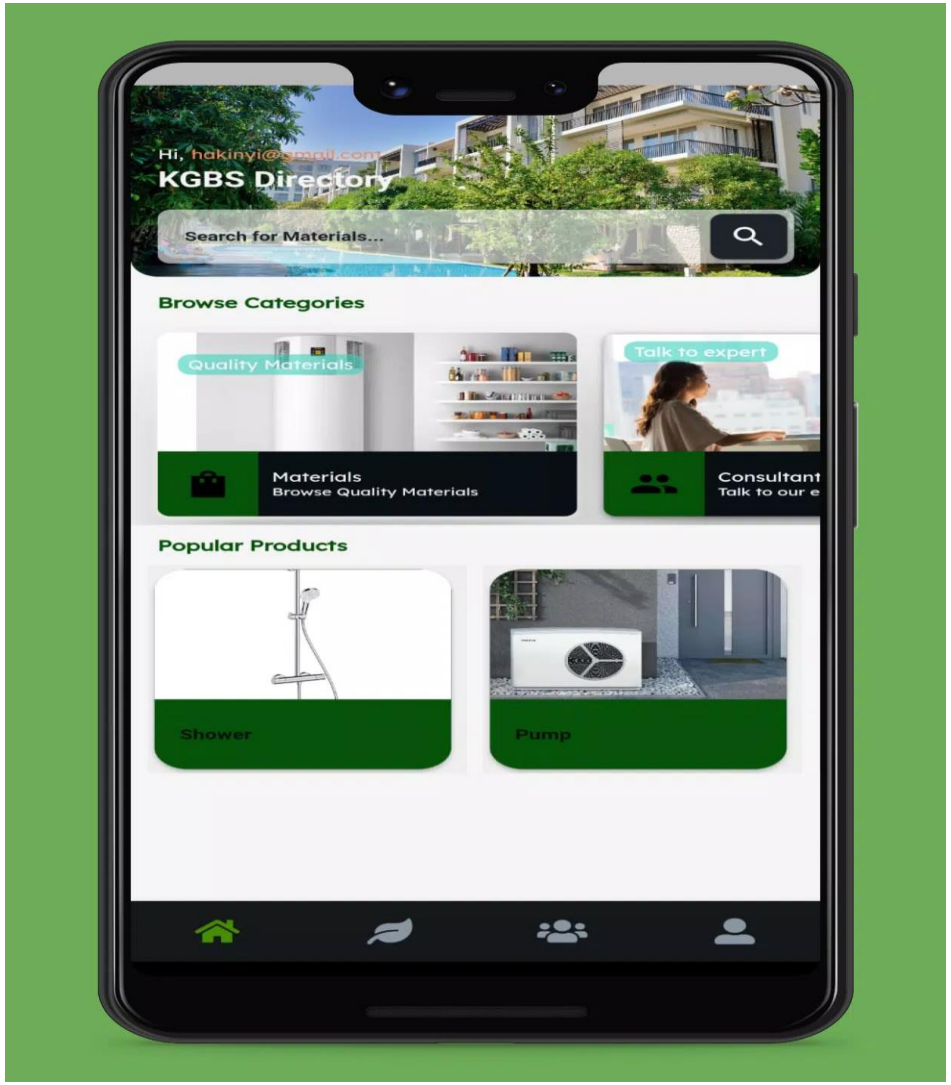
An app that provides a database of verified sustainable materials and services available in Kenya.

Providing a green supply chain solution by leveraging:

- Technology and
- Circularity

To create a compelling business case for sustainable construction.

- 100+ companies
- Promotes : resource efficiency, reduced waste generation, and significant GHG emissions and cost savings.



KENYA GREEN BUILDING SOCIETY
Build Green, Save Kenya

fsd Kenya

Green Bond for Kenya's first Green Student Accommodation /Housing

Africa's first Green Bond for the Built Environment -
Kenya's 1st green bond for USD 50 million

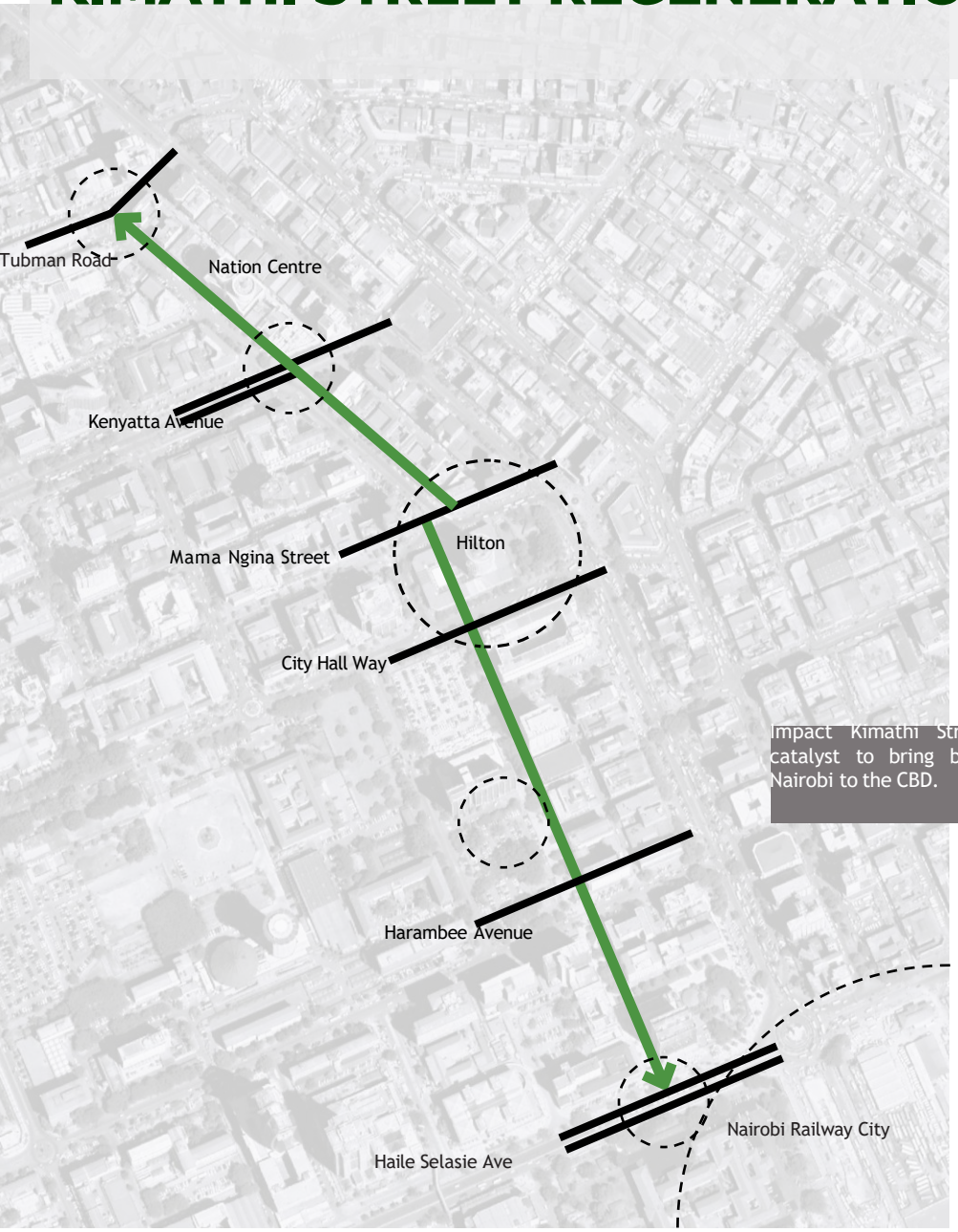
- Use of proceeds for new student accommodations that are IFC EDGE certified.
- EDGE provides reporting in line with ICMA standards.
- Acorn received Climate Bonds Initiative Pioneer Award.
- Government now made interest from green bonds tax exempt.

KENYA GREEN BUILDING SOCIETY
Build Green, Save Kenya

acorn

Excellence In Design For Greater Efficiencies
Edge

KIMATHI STREET REGENERATION



Impact Kimathi Street will be the catalyst to bring back the soul of Nairobi to the CBD.

Nairobi Railway City

Adopt walking paths that consider the human scale to connect the Kimathi Street to the rest of the CBD.
Build a bicycle circular traffic network connect to plazas and green zones to achieve a car free city

NAIROBI CITY COUNTY Lets Make Nairobi Work | PDM Property Development Management | Sarova Stanley Nairobi • Since 1902 | Hilton Hotels & Resorts | TRIANUM | KENYA GREEN BUILDING SOCIETY Build Green, Save Kenya | DLR Group

2023: Africa's defining year with Kenya at the helm

- Africa united: A new financial architecture
- ACS – africa taking charge of its narrative
- Climate & Development

ACS to COP28

- UN Habitat General Assembly
- Africa Climate Summit &Week
- COP28

KENYA AT COP 28

1. BCRUP

Building Climate Resilience for the Urban Poor

H.E. The President Dr. William Samoei Ruto launched the implementation of the UN initiative on Building Climate Resilience for the Urban Poor for Africa

On 2nd December 2023 under the framework of COP 28 in DUBAI, President Ruto launched the implementation plan of BCRUP. The plan aims to improve the living conditions and climate resilience capacity of poor urban in the following countries: Botswana, Cameroon, Cote d'Ivoir, Egypt, Ethiopia, Gabon, Ghana, Kenya, Morocco, Mozambique, Rwanda and Uganda. According to UN statistics, the total urban population in these countries amounts at 186 Million with 112 Million leaving in poor urban neighborhoods.

The effort to be put in order for these neighborhoods to improve climate resilience requires an investment of 5 Billion dollars in 10 years. Kenya has committed to contribute to this effort and has managed with other countries to convince the Green Climate Fund to demarcate a regional readiness program and prepare implementable projects with the support of different partners in the private, public and philanthropic sectors.

For the governance of BCRUP Initiative, the Government of Kenyan has put up the BCRUP secretariat steering committee co-chaired by Cabinet Secretary Lands, Public Works, Housing and Urban Development, Kenya and the Secretary General, United Cities and Local Government Africa (UCLG Africa). The initiative will be implemented in collaboration with Africa Union Commission, Africa Designated Authorities Network (AFDAN), UN-Habitat, IGAD, Economic Commission for Africa (ECA), Commonwealth Secretariat, Council of Governors, Pan Africa Climate Justice Alliance (PACJA), Expo City Dubai, Friedrich Ebert Stiftung (FES), Slum Dwellers International, Habitat for Humanity, Kenya Green Building Society among others.

President Ruto called for action to be consistent with the SDGs motto of "Leaving No One behind". He also insisted that the stock take of COP 28 be the kick off moving from statements to implementation. Different partners commended the BCRUP initiative and pledged support.

2. BUILDINGS BREAKTHROUGH

3. FCLP

Forests and Climate Leaders Partnership (FCLP)

This coalition, an initiative coordinated by Kenya, Canada, and France, aligns with FCLP's mission to bring together 28 countries and the European Union (EU) to combat forest loss and land degradation by 2030, while concurrently fostering sustainable development and promoting inclusive rural transformation.

Questions?


KENYA GREEN BUILDING SOCIETY
Building Better Places for Better Living

KENYA GREEN
BUILDING SOCIETY

Build Green, Save Kenya

Thank you

Kenya Green Building Society.
+254 710 869547
brand@kgbs.co.ke
Kgbs.co.ke

Africa Energy Efficiency Policy in Emerging Economies Training Week

Nairobi

18-22 March 2024

Implementing Energy Efficiency in Ghana's Building Sector: Ghana Building Code

Ebenezer Kyere
Energy Commission, Ghana

Outline

- Introduction
- Overview of the Ghana Building code: GS-1207-2018
- Implementation of the Ghana Building Code
- Concluding Remarks

IEA 2024. CC BY 4.0.

Introduction

❖ **Energy Commission of Ghana**:

- Governmental body mandated to manage the energy sector and promote energy efficiency and renewable energy initiatives.
- **Energy Efficiency**: Enforcing energy efficiency in buildings to support sustainability and reduce emissions.

IEA 2024. CC BY 4.0.

Policy and Regulatory Framework

❖**Legal framework**:

– The best point to begin is to leverage a legislative instrument that regulate the sector

- Ghana Building Code (GS-1207-2018)
- Building Regulations, 2022 (L.I 2465)
- National Energy Transition Framework (2022-2070)
  - "Encourage the construction of energy-efficient buildings"

- **Setting right Building Regulations**:

" buildings should be oriented in such a way that natural lighting, solar penetration and ventilation are taken care of "

" Buildings shall normally be oriented on the East-West axis but if site problems and topography demand otherwise, other orientation axis may be considered"

IEA 2024. CC BY 4.0.

Overview of the Ghana Building Code: GS-1207-2018

❖ **Comprehensive Coverage**:

- The code is divided into **38 parts** and spans **1,700 pages**.

- Set standards for construction practices
  - Site development and land use
  - Soils and foundations
  - Fire safety
  - Energy Efficiency and Sustainability
  - Building materials
  - Electrical and mechanical systems and allied installations
  - Noise control
  - Occupancy classification and use , etc.

IEA 2024. CC BY 4.0.

Overview of the Ghana Building Code: GS-1207-2018

❖ **Scope and Applicability**:

- All matters concerning the design and construction **new buildings**
- **Installation, alteration**, replacement, **maintenance**, **repair**, **renovation**, **enlargement etc of energy-related** systems
- **Demolition** of buildings.

IEA 2024. CC BY 4.0.

Overview of the Ghana Building Code: GS-1207-2018

❖ **Buildings Targeted Standards**:

- **Commercial buildings** (offices, shops, markets, restaurants, and cinemas)
- **Hospitality housing** (hotels and motels)
- **Administrative public buildings**
- **Residential buildings** above **75 m²**

500 m²

❖ **Buildings Not Targeted by the code**:

- **Industrial buildings**, **warehouses**, and **storehouses**
- **Farm buildings**
- Buildings requiring **special internal conditions** (e.g., greenhouses, cold storage)
- **Churches**, **mosques**, and other places of worship
- Buildings on the **heritage protection list**
- **Temporary constructions** designed for a lifespan of **two years or less**

IEA 2024. CC BY 4.0.

Key Provisions of the Ghana Building

❖Sustainability and Energy Efficiency

– The **Ghana Building Code GS 1207:2018** set standards for the design, construction and operation of energy-efficient buildings in order to minimize energy consumption and contribute to a sustainable future.

1. **Energy Efficiency Requirements**: Part 14 of the code focuses on energy efficiency and sustainability, making it a **mandatory requirement.**

   ❖**Energy-Efficient Design**:

   – Architects and builders are encouraged to consider energy efficiency during the design phase.

   – Key considerations:

   ○**Proper Orientation**: optimize to maximize natural light, reduce heat gain, and minimize reliance on artificial lighting and cooling.

IEA 2024. CC BY 4.0.

Sustainability and Energy Efficiency: Energy Efficiency Requirements

❖**Energy-Efficient Materials and Envelopes**:

- The code promotes the use of materials that contribute to energy efficiency in buildings. Specific provisions include insulation requirements for walls, roofs, and floors.
- Key considerations:
  - **Thermal Performance Standards**: The code sets standards for the thermal performance of building materials. E.g. **Low U-Value** windows to reduce heat transfer and overall energy consumption
  - **Insulation Levels and Air Sealing**:
    - Well-insulated building envelope helps maintain indoor comfort.
    - Airtight construction minimizes air infiltration and leakage which reduce energy loss, and enhance overall energy efficiency.

IEA 2024. CC BY 4.0.

❖ Efficient Building Services & Systems

- "Services and equipment in buildings shall be as energy efficient as practicable, facilitate the conservation of energy…"

- **Lighting**:
  - Proper and efficient lighting design
  - Efficient Use of Natural Light: e.g large windows, skylights, and light wells to reduce reliance on electric lighting during daylight hours.
- **Electrical Systems**: Electrical systems should be designed for optimal energy use and safety.
- **Appliances and Equipment**: Proper selection and installation of energy-efficient appliances.

IEA 2024. CC BY 4.0.

Sustainability and Energy Efficiency: Energy Efficiency Requirements

❖ **Heating, Ventilation, and Air Conditioning**:

– HVAC systems play a crucial role in energy efficiency

– Key points include:

- Proper design and installation of HVAC systems
  - Sizing and equipment selection (calculating cooling load)
  - Properly designed duct systems for efficient air distribution and minimal energy losses
  - HVAC controls for optimized operation and reduced energy consumption

IEA 2024. CC BY 4.0.

2. **Green Building Requirements**:

- Specific requirements outlined in GS-1207-2018:
  - ❖Sustainable site development criteria.
  - ❖Water conservation practices.
  - ❖Responsible handling, disposal, and recycling of construction waste.
  - ❖Efficient plumbing practices.
  - ❖Passive solar design,
  - ❖Green roof
  - ❖Rainwater harvesting
  - ❖Efficient landscaping.

IEA 2024. CC BY 4.0.

Renewable Energy Integration

3. Renewable Energy Integration:

- The code recognizes the importance of **renewable energy** for sustainable construction practices.

❖ Buildings must incorporate on-site renewable energy systems.

- Zero-Energy Building

IEA 2024. CC BY 4.0.

Economic Considerations in Sustainable Building Practices

4. Balancing sustainability and affordability

- True Sustainability: Environment, Social and Economic aspects
- Implementing energy standards may increase construction and living costs.

"Services and equipment in buildings shall be as energy efficient as practicable, facilitate the conservation of energy with most economically satisfactory solution "

- Multiple benefit analysis

IEA 2024. CC BY 4.0.

Compliance Pathways

– The **Ghana Building Code GS 1207:2018** employs both **prescriptive** and **performance-related** provisions as compliance mechanisms

❖ **Prescriptive Provisions**:

- **Specific, clear instructions** and detailed rules dictating precisely how certain aspects of construction should be carried out.
  - **Envelope** (roof, wall, window)
  - **Lighting systems**
  - **Space conditioning system (HVAC)**
  - **Water heating system**

❖ **Performance-Based Approach**:

- Instead of specifying exact details, performance-related provisions focus on desired outcomes.
  - **Model building approach**

IEA 2024. CC BY 4.0.

Prescriptive Requirement: Building Envelop

- **Building envelope requirements**
  - **Exterior Wall**: the opaque wall must comply with specific insulation requirement
    - **Type**:
      - Block walls: Exterior expanded polystyrene (25 mm thickness)
        - **RSI of 0.7 m²/W°C** is recommended for unconditioned spaces
        - **RSI of 0.86 m²/W°C** is recommended for air-conditioned spaces
      - Block walls with cavity: Fiberglass or equivalent (32 mm)
        - **RSI of 0.7 m²/W°C** is recommended for unconditioned spaces
        - **RSI of 1.72 m²/W°C** is recommended for air-conditioned spaces

Table 2: Wall Minimal Requirements

Type	Wall Insulation	
	Type	Thickne (mm)
Block Walls	Exterior Expanded Polystyrene or Equivalent	25
Block Wall with Cavity	Fiberglass or Equivalent	32

- **Additional Notes**: reflective paint or coating to further improve performance

IEA 2024. CC BY 4.0.

Prescriptive Requirement: Building Envelop

- **Roof**:
  - **Flat Roof**:
    - Material: Expanded polystyrene and external reflective paint (R 0.75)
    - Thickness: 25 mm
    - **Thermal Transmittance (U-value)**: ≤0.58 W/m²·°C
  - **Pitched Roof**:
    - Material: Internal radiant barrier (film) with bronze tinting or ove
    - Additional Notes: No specific thickness provided.
- **Ceiling**:
  - **Not Air-Conditioned floors**:
    - **Thermal Transmittance (U-value)**: ≤1.16 W/m²·°C

Table 3: Reflectivity in the Solar Spectrum for Various Paints

Roof Paint	Assumed Reflectivity (Aged 3 Years)2
Aluminum	0.6
Silver	0.75
Dark	0.1
Medium	0.4
Light	0.6
White Semi-gloss	0.7
Dark Grey	0.09
Blue Medium	0.49
Brown Medium	0.16

Roof solar reflectance and thermal emittance shall comply with Table 4.

Table 4: Minimal Requirements for Roofs

Type	Roof Insulation		
	Type	(mm)	RSI (m²·°C/W
Flat Roof	Expanded Polystyrene (or equivalent) and External Reflective Paint (Reflectivity 0.75 or Better)	25	
Pitched Roof	Internal Radiant Barrier at underside of roof	Film	Emissivity <

[1] https://www.energystar.gov/productfinder/product/certified-roof-products/
[2] eQUEST values

IEA 2024. CC BY 4.0.

Prescriptive Requirement: Building Envelop

- **Windows/Glazing**:

- Not air-conditioned space
  - Single-glazed
  - **Thermal Transmittance (U-value)**: ≤5.5 W/m²·°C
  - **Shading**: 50% of window height (WH) with bronze tinting or overhangs
  - **Solar Transmissivity**: 0.89
  - **Absorptivity**: 0.03

- Air-Conditioned Space:
  - **Sealed**
  - **Double glazed**
  - **Thermal Transmittance (U-value)**: ≥2.839 W/m²·°C
  - **Single Bronze Window**: Solar transmissivity 0.48, absorptivity 0.46
  - **Single Reflective Window**: Solar transmissivity 0.07, absorptivity 0.6

IEA 2024. CC BY 4.0

Windows/Glazing: continuation

- Avoid glazing in walls subjected to heavy sun exposure
- Heat-resistant glass
- Glazing **tilted inward at about 120 degrees** to reduce direct solar radiation transmission.
- Use of overhang

IEA 2024. CC BY 4.0.

Prescriptive Requirement: Ventilation

❖ **Ventilation Requirements**:

– The **Ghana Building Code GS 1207:2018** emphasizes indoor environmental quality, health, and sustainability:

- Minimum air renewal or ventilation rate: 8 l/s up to 15 l/s per person (depending on occupancy type)
- **Installation of sensors:** large spaces (auditoriums, conference rooms, theaters:200 m²).

- carbon dioxide : 1000ppm
- Temperature : **24°C**
- Humidity: 77% – 85%

- **Carbon monoxide sensors** must be installed to automatically activate ventilation fans (e.g. car parks)

IEA 2024. CC BY 4.0.

Prescriptive Requirement: Air Conditioning

❖ Air conditioning/cooling

- **General Requirements**:
  - Air conditioning should be installed only where necessary for human comfort, temperature-sensitive materials, or specific equipment.
  - Air conditioners must meet minimum efficiency requirements according to **the energy efficiency regulation L.I. 2458**
  - Thermostat set points while occupied should be around **24°C**.

IEA 2024. CC BY 4.0.

Heating

❖ **Hot water:**

- **Hot Water System Necessity**: Hot water should be installed only for health, safety, or specific process requirements. Typically needed in hotels, restaurants, and office buildings.

- **Combustion Efficiency**: Combustion devices producing hot water must have a rated combustion efficiency of **at least 80%**.

- **Fuel Source Consideration**: solar water heating or heat recovery from other systems should be considered before opting for conventional water heating equipment.

- **Design of Solar Water system**: Solar systems should be designed to meet at least 70% of the daily hot water demand even during the absence of the sun.

- **Point-of-Use Heaters**: **instantaneous heaters** should be used in buildings where hot water demand is projected to be less than **150 liters/day** rather than a central hot water system.

IEA 2024. CC BY 4.0.

Hot Water

- **Storage tank:**
  - Storage temperature: for domestic use should **not exceed 130°F**
  - **Standby Losses**: thermal resistance (R value or RSI) of at least **1.76 m²·°C/W**.
  - Storage capacity: **70% of the average daily hot water demand**.
- **Circulating Temperature**: The **circulating temperature** should **not exceed 50°C**
- **Insulation for Circulating Systems**: **at least 20 mm fiberglass insulation or equivalent if the a**verage demand profile of is **6 hours/day,** (only recommended in commercial buildings)
- **Timers for Circulating Systems**: if usage is nil during a period averaging **10 or more hours per week**
- **Hot Water System Pumps**: Provisions should be made for hot water system pumps to be **turned off automatically or manually** when the hot water system is not in operation.

IEA 2024. CC BY 4.0.

Extra compliance measures

❖ **Supervision and Inspection:**

- Proper supervision is critical for consistent quality during construction.
- Regular inspections verify adherence to the code's requirements.

❖ **Monitoring, and Maintenance**:

– monitoring and maintenance are essential for sustained energy efficiency and safety.

❖ **Certifications and Labels**:

- Certifications such as **LEED, DGNB** and **BREEAM** validate adherence to green and sustainable standards.
- They enhance marketability and demonstrate environmental stewardship.

IEA 2024. CC BY 4.0.

Implementaion Plan

❖**The current status of GS-1207-2018**:

- **Launch and Awareness**:
  - The code was officially launched in **October 2018**.
  - Awareness campaigns to inform professionals, builders, and the public .
- **Training and Education**:
  - Local Ghanaian training institutions received copies of the code.
  - Educational institutions educate professionals about the code.
- **Online Accessibility**:
  - for widespread access.
- **Enforcement and Compliance**:
  - The code is now enforceable by law, Building Regulation, 2022- L.I 2465
  - Government agencies, professional bodies, and construction stakeholders ensure compliance during construction and maintenance.

IEA 2024. CC BY 4.0.

Implementation Challenges

– Implementation is never a straightforward affair that comes without challenges.

- **Lack of Awareness: Even** among stakeholders.
- **Capacity Constraints:** Limited capacity within enforcing agencies, such as the regulatory bodies and local authorities: trained personnel and funding.
- **Technical Capacity:** Limited technical expertise or skill gap among construction professionals and regulatory officials.
- **Lack of Institutional Collaboration:** Collaboration among stakeholder organizations is essential to ensure effective enforcement of building regulations, standards, and codes.

IEA 2024. CC BY 4.0.

The critical next step

❖ Implementing and Enforcing the Ghana Building Code (GS 1207:2018):

- Addressing these challenges first requires **Public Awareness, Education**, **Capacity Building and** technical assistance.
  - ensure that the code is understood, and various practitioners have the needed skills to comply with the requirement and enforcement agencies can implement the building code effectively.

- **Collaboration and Partnerships:**
  - The implementation and enforcement of the Ghana **Building Code GS 1207:2018** involve several key organizations, agencies, and stakeholders not state level authorities
  - Build partnerships with international organizations to access technical expertise and resources for implementing best practices.

IEA 2024. CC BY 4.0.

Building Energy Efficiency Program (BEEP)

❖ Save before you Build

- **Architects and Engineers**: Design energy-efficient structures.
- **Builders and Contractors**: Follow sustainable construction practices.
- **Government Agencies**: Enforce compliance.
- **Local government authorities: Metropolitan, Municipal, and District Assemblies (MMDAs):**

  - involved in enforcement of building regulations at the grassroots local level.
  - issue building permits, conduct inspections, and enforce compliance of Building regulations within their jurisdictions.

IEA 2024. CC BY 4.0.

Development Permitting Procedure

❖ The current process in Ghana is implemented as follows:

1. The builder provides plans including detailed engineering specifications to the TCPD.
2. The plan undergoes a desk officer review
3. The plan is submitted to the Technical Subcommittee.
4. The plan is submitted to the Main Committee for approval or rejection.
5. The Works Department of each Metropolitan Municipal Assembly is then responsible for making the inspection.

use **“Stop Orders”** to halt buildings banned from occupation.

IEA 2024. CC BY 4.0.

Concluding Remarks

❖A highly efficient, technically-equipped and smarter building stock have the potential to be at the forefront of a decarbonised economy.

❖Let us work together and leverage our respective mandates and expertise to support the sustainability of the built environment.

❖Now is the right time,

- rapid urbanization and development of our continent and the influx of construction projects.
- Let’s avoid current situation in Europe
  - Two-thirds (65%) of the European building stock was built before any legally binding energy saving regulation: about 97% of the EU’s buildings must be upgraded to achieve the 2050 decarbonisation goal

❖We are the right people

IEA 2024. CC BY 4.0.

Africa Energy Efficiency Policy in Emerging Economies Training Week

Buildings

Nairobi

18-22 March 2024

https://www.iea-events.org/energy-efficiency-training-week-nairobi

International Energy Agency

Energy Efficiency Training Week – Buildings – Day 3: 16. Evaluation and energy efficiency indicators

Introduction

IEA 2024. CC BY 4.0.

Evaluation

What is evaluation?

Ex-ante evaluation

Ex-post evaluation

IEA 2024. CC BY 4.0.

What is evaluation?

Evaluation is an objective process of understanding how a policy or programme was implemented, what effects it had, for whom and why.

It leads to more effective policies and programmes

IEA 2024. CC BY 4.0.

What are indicators

Indicators are clues, signs or markers that describe observable changes or events which relate to a programme or policy and show how close a programme or policy is to its desired path and outcomes.

Indicators provide the evidence that something has happened – e.g. an output delivered, an immediate effect occurred or a long-term change observed.

IEA 2024. CC BY 4.0.

When should you evaluate?

Ex-post evaluation

Ex-ante evaluation

The term **ex-post** is a phrase meaning "after the fact“

The term **ex-ante** is a phrase meaning "before the event“

IEA 2024. CC BY 4.0.

Ex-ante evaluation analysis approaches

1. **Technical potential**: analysing the total energy efficiency potential without any economic or market constraints (e.g. analysing the energy savings potential if all buildings used best available technology)

2. **Economic potential**: analysing the energy efficiency potential assuming economic constraints for cost effectiveness (e.g. analysing the energy savings potential if buildings used the most-efficient cost-effective technology)

3. **Market potential**: analysing the energy efficiency potential assuming market constraints in implementing energy efficiency (e.g. analysing the energy savings potential using a adoption curve to estimate typical market implementation given the available policies and technologies)

Technical potential, economic potential and market potential are used for different purposes

IEA 2024. CC BY 4.0.

Ex-post evaluation: did it work?

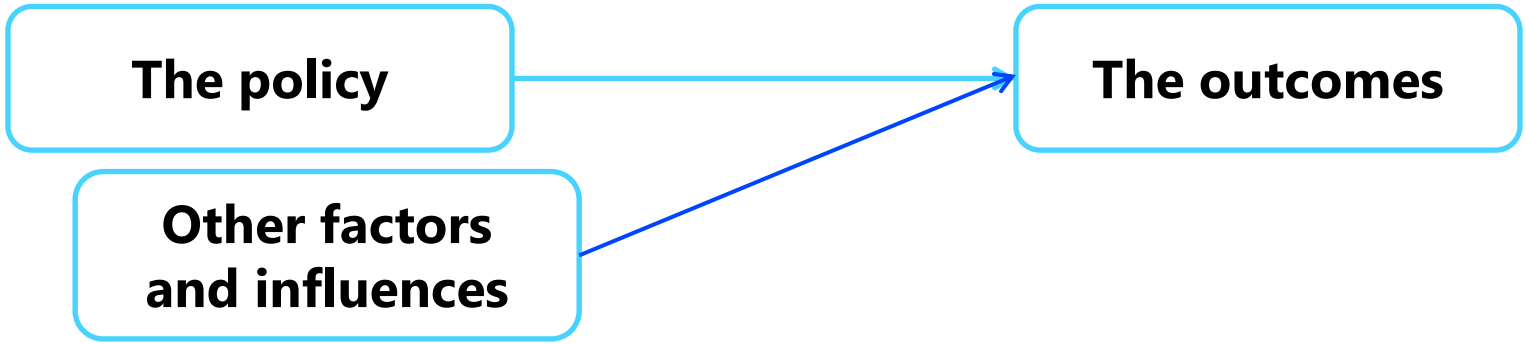
Measuring activities and outputs is straightforward, if not simple. Outcomes / impacts are more difficult…

Why is it more difficult?

IEA 2024. CC BY 4.0.

Ex-post evaluation: did it work?

Measuring activities and outputs is straightforward, if not simple. Outcomes / impacts are more difficult…



Other factors include:
Global, national, local trends / events
Other policies
Something you haven't even thought of…

IEA 2024. CC BY 4.0.

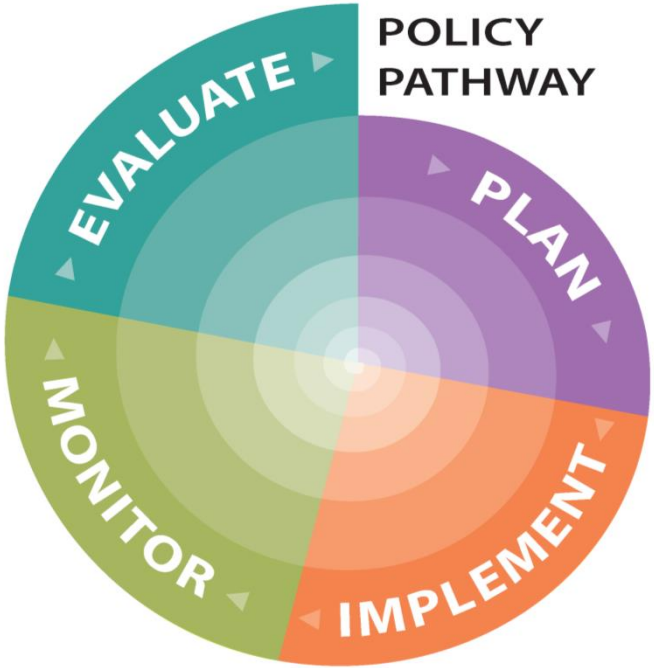
Energy efficiency data

Indicators manuals

Indicators data pyramid

IEA 2024. CC BY 4.0.

Data is essential at all stages of the policy cycle

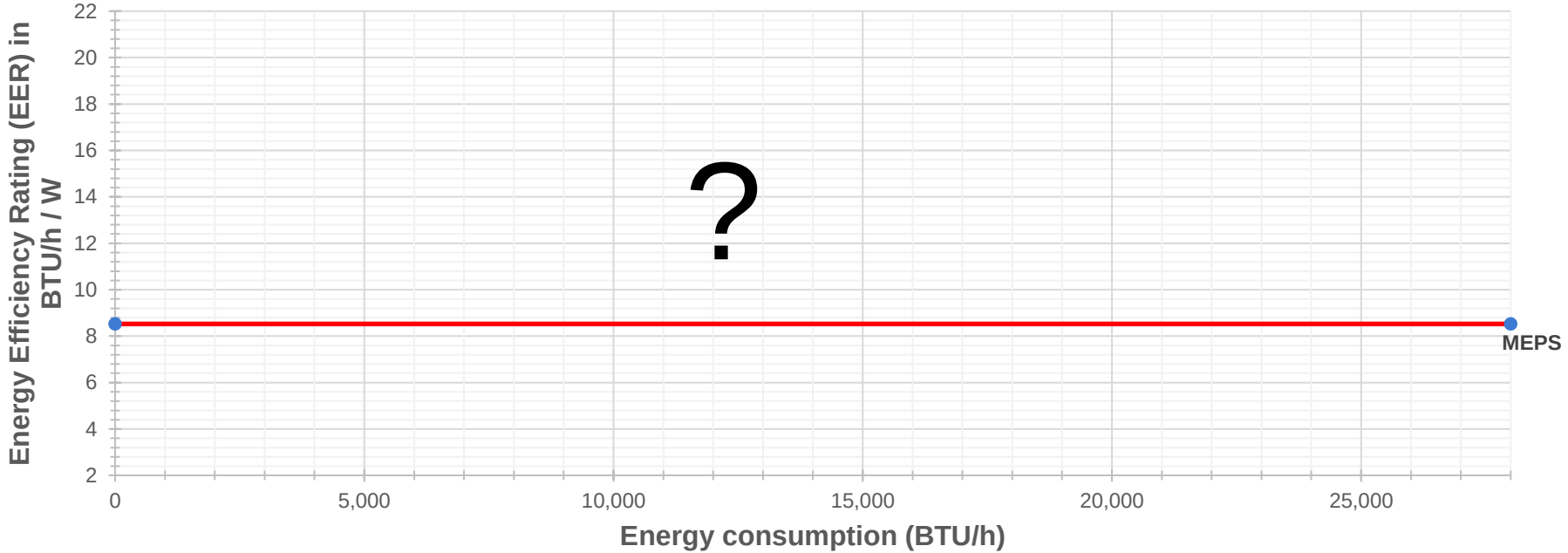


- **Plan**: Inform policy design based on current state and ambition
- **Implement**: Adapt the policy during adoption and enforcement stages
- **Monitor**: Track how the policy is performing
- **Evaluate**: Use the data to see what happened and why

Each step requires appropriate data to be effective

IEA 2024. CC BY 4.0.

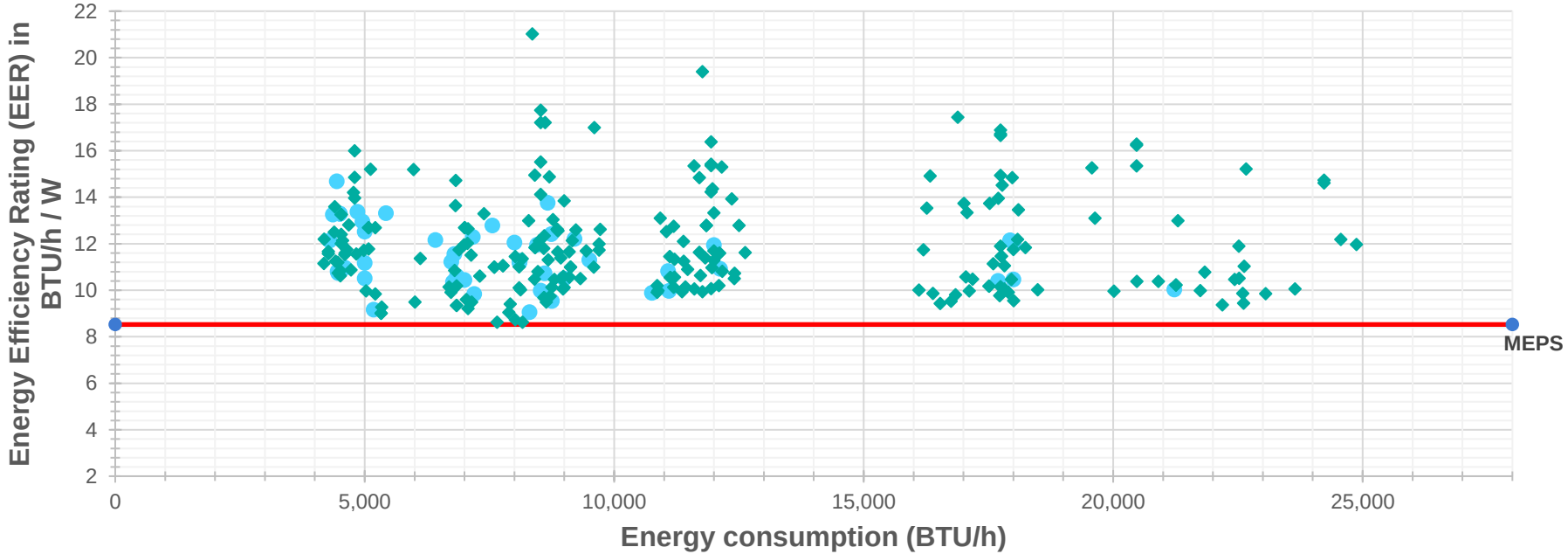
Why do we need data for policy design?



Where do you set your minimum energy performance standards (MEPS)?
Without national market data, you may set the MEPS here…

IEA 2024. CC BY 4.0.

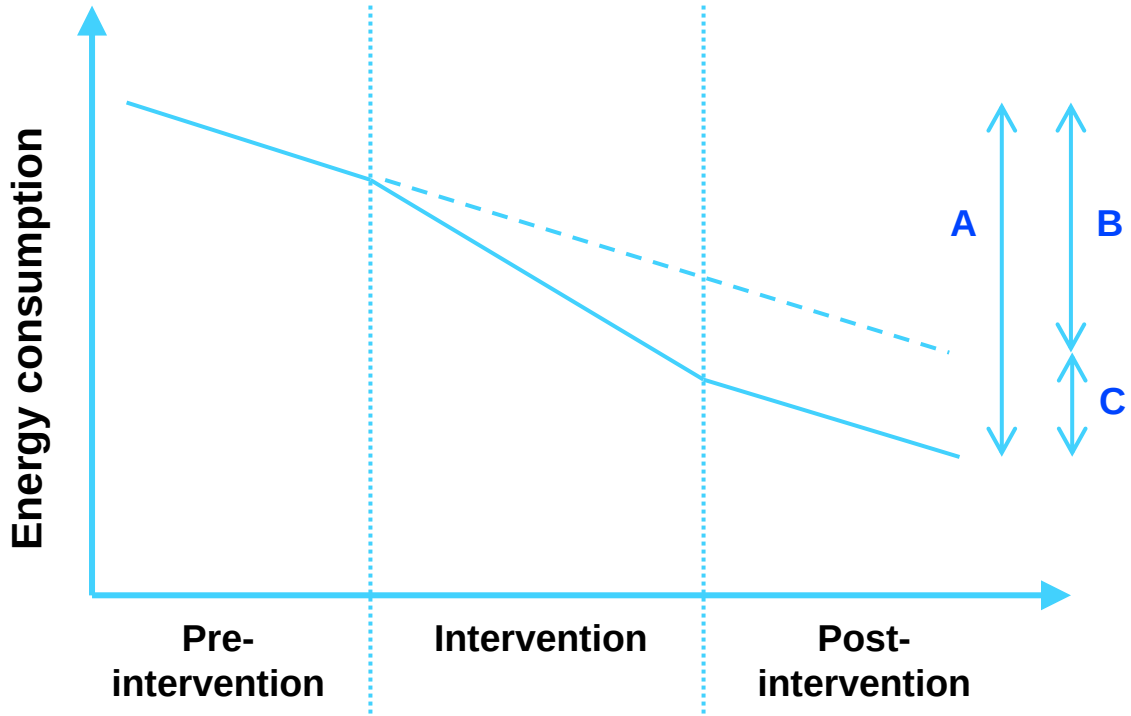
Why do we need data for policy design?



In this case, without appropriate data, MEPS were set too low.
Providing an unfair advantage to benefit importers over local companies…

IEA 2024. CC BY 4.0.

How does data help in implementation?



Impacts are assessed compared to “control” group (what would have happened)

IEA 2024. CC BY 4.0.

Monitoring and Evaluation

- **Monitoring** provides headline data on policy performance
  - What happens as a result of the policy?
- **Evaluation** provides an understanding of what is happening / has happened
  - Why and what can be done about it?
- **Why is monitoring and evaluation needed?**
  - Understand what happens as a result of the policy
  - Verify the policy is performing as expected
  - Ability to change policy during its implementation
  - Learn for other policies
  - Understand the energy efficiency and energy market more
    - What drives changes in the market?
    - How do energy consumers react?

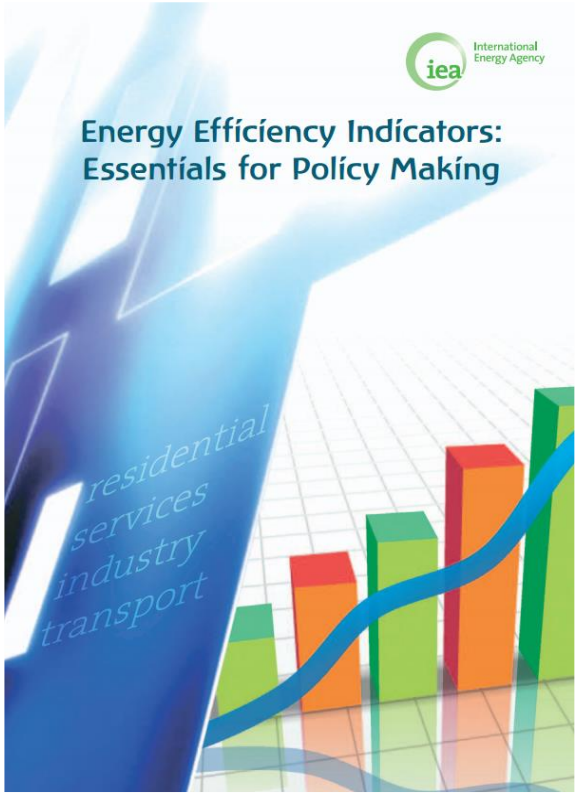
IEA 2024. CC BY 4.0.

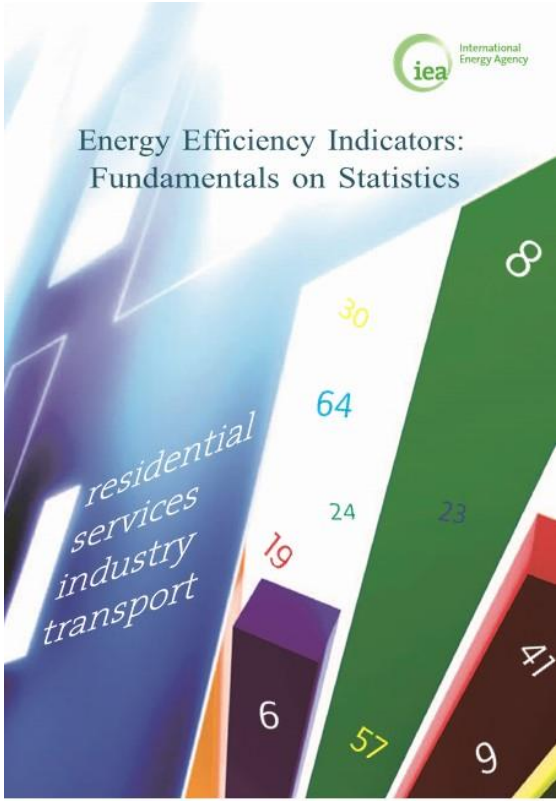
Main sources of data, information and indicators

- Management information/reporting
- Measurement e.g. meter readings, compliance data
- Experiments/testing
- Modelling
- Surveys
- Interviews and focus groups

IEA 2024. CC BY 4.0.

Energy efficiency indicators: manuals

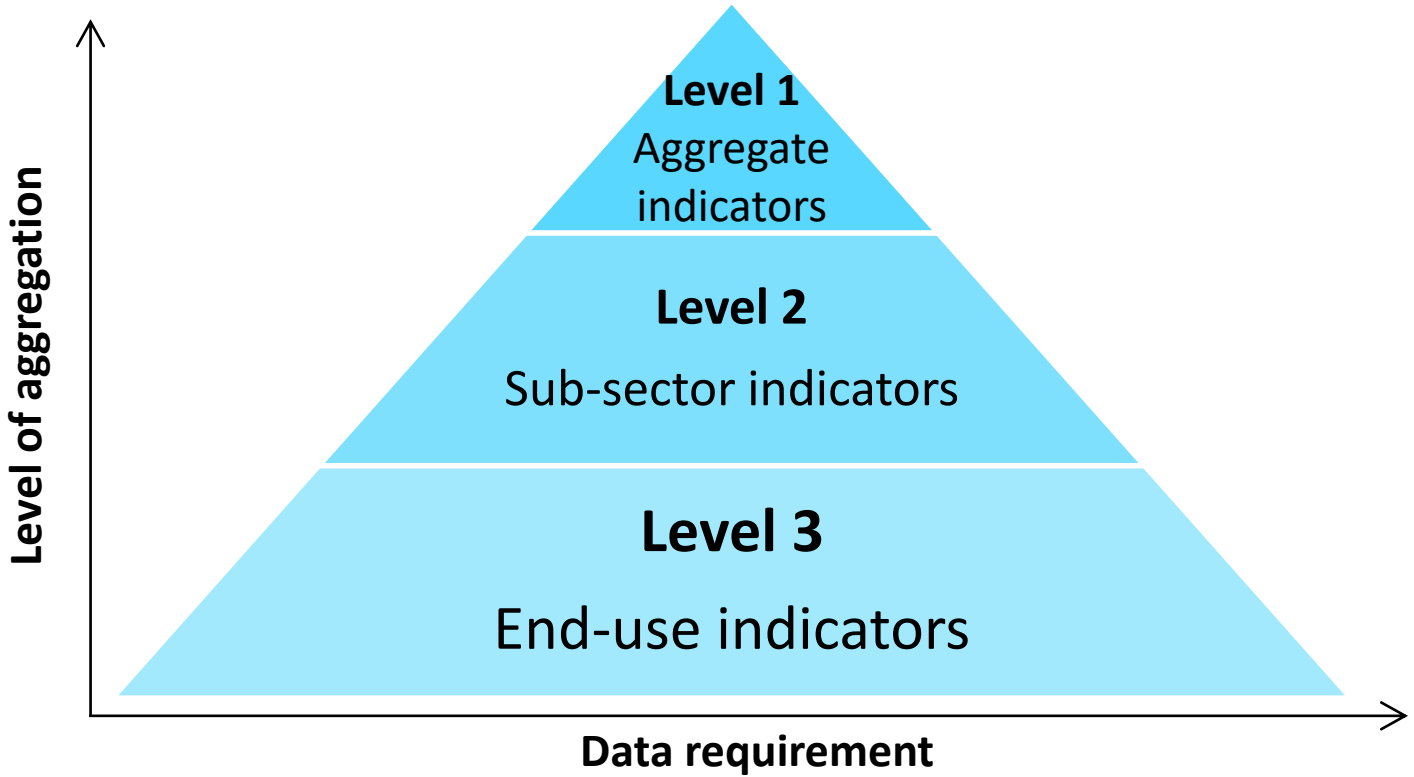




Source: IEA energy efficiency indicators

IEA 2024. CC BY 4.0.

Energy efficiency indicators pyramid



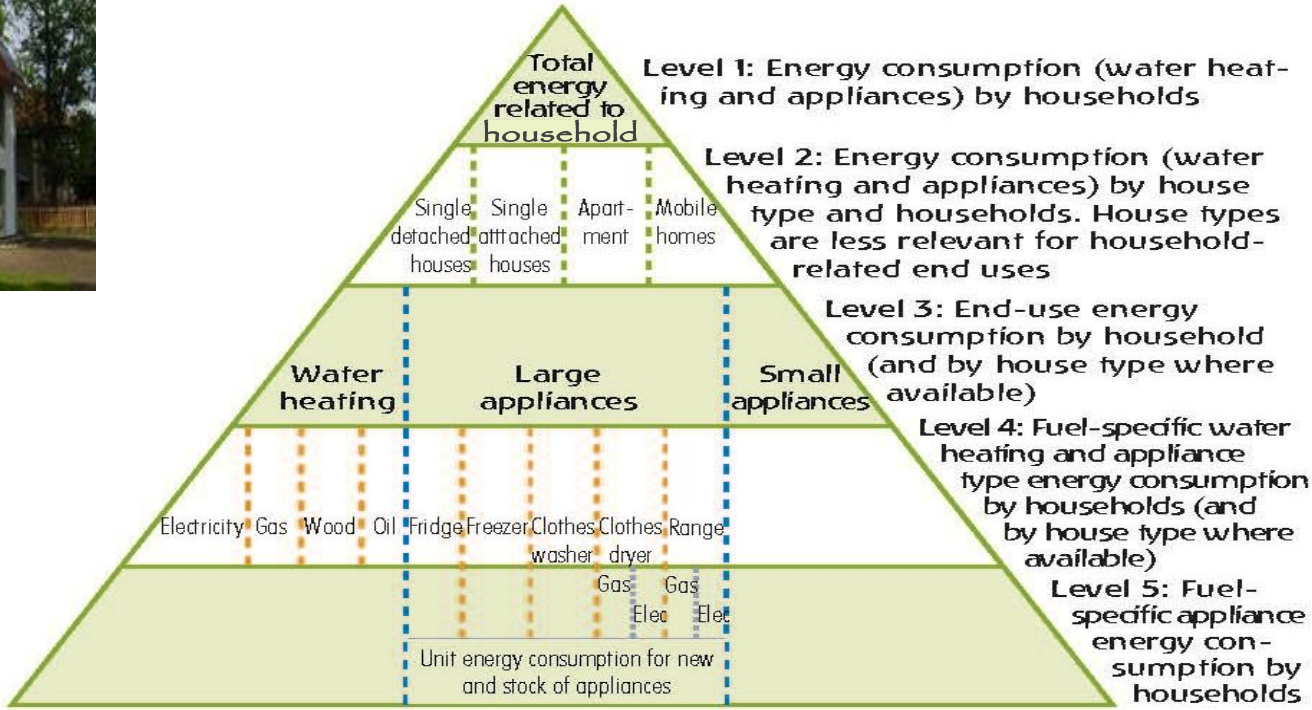
More detailed data is required to get to Level 3 indicators

Source: IEA energy efficiency indicators

IEA 2024. CC BY 4.0.

Energy efficiency indicators pyramid: residential per household

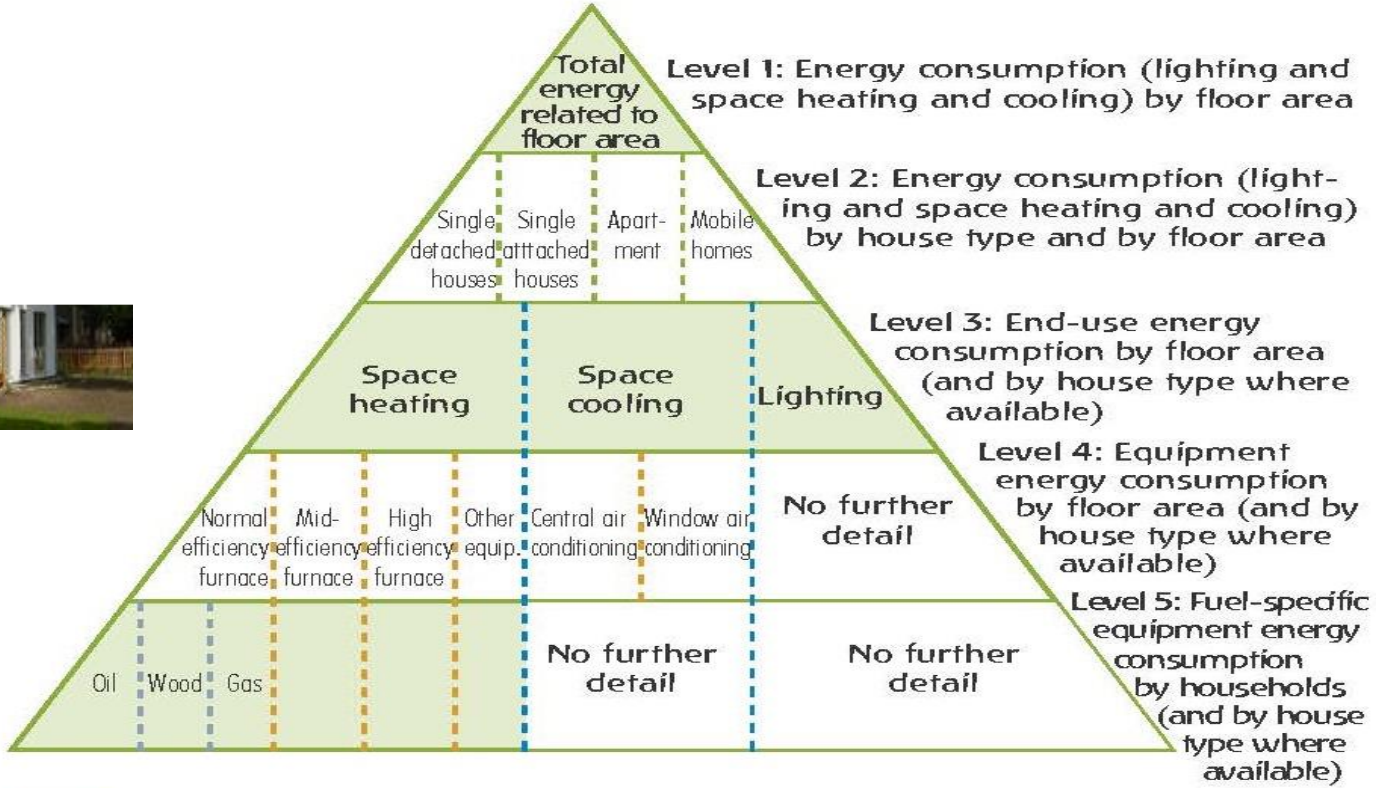
- Data and analysis can be used to get end-use and fuel values



Source: IEA energy efficiency indicators

IEA 2024. CC BY 4.0.

Energy efficiency indicators pyramid: residential per floor area

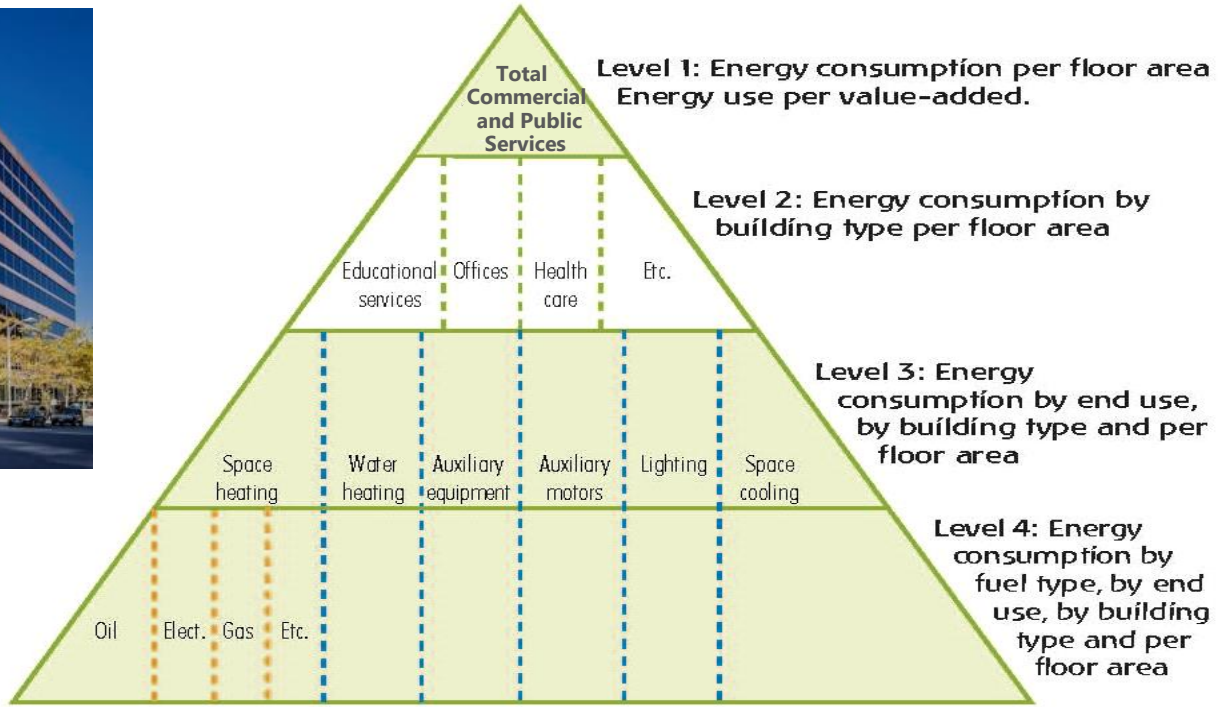


Data and analysis can be used to get end-use and fuel values

Source: IEA energy efficiency indicators

IEA 2024. CC BY 4.0.

Energy efficiency indicators pyramid: non-residential per floor area

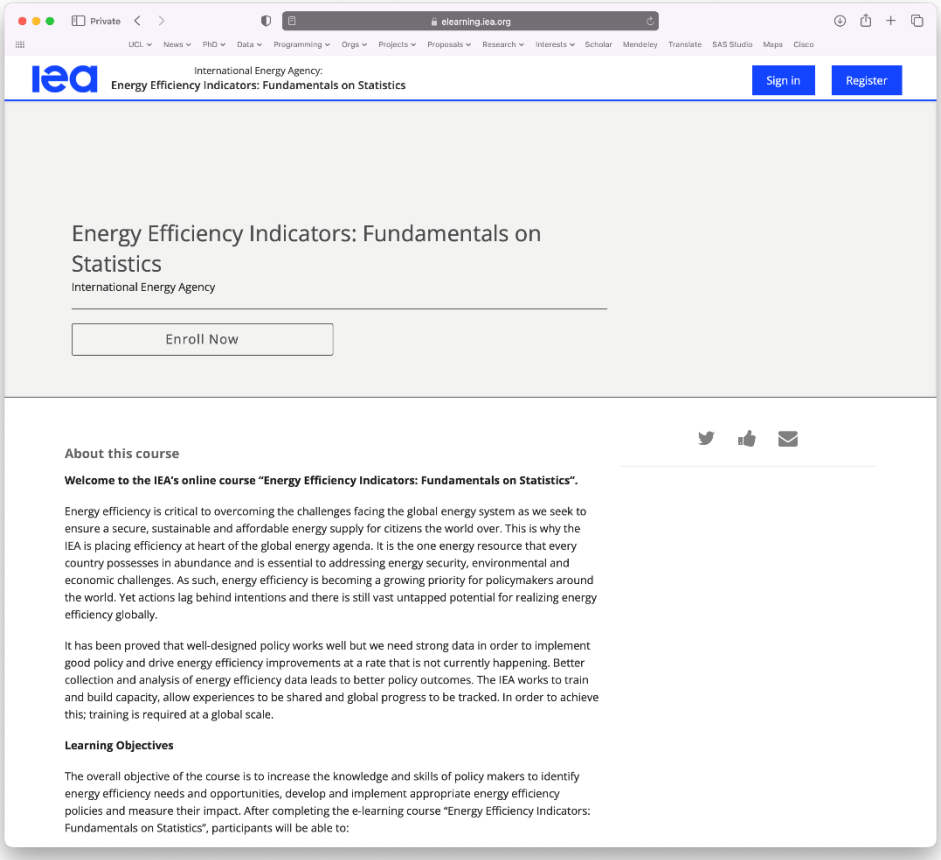


Data and analysis can be used to get end-use and fuel values

Source: IEA energy efficiency indicators

IEA 2024. CC BY 4.0.

Energy efficiency indicators: online courses



- Step-by-step and sector-by-sector through energy efficiency indicators.
- Self-paced and interactive.
- No set time limit to complete the course, to fit into your professional and personal lives.

IEA 2024. CC BY 4.0.

Energy performance metrics

Limitations

Energy consumption

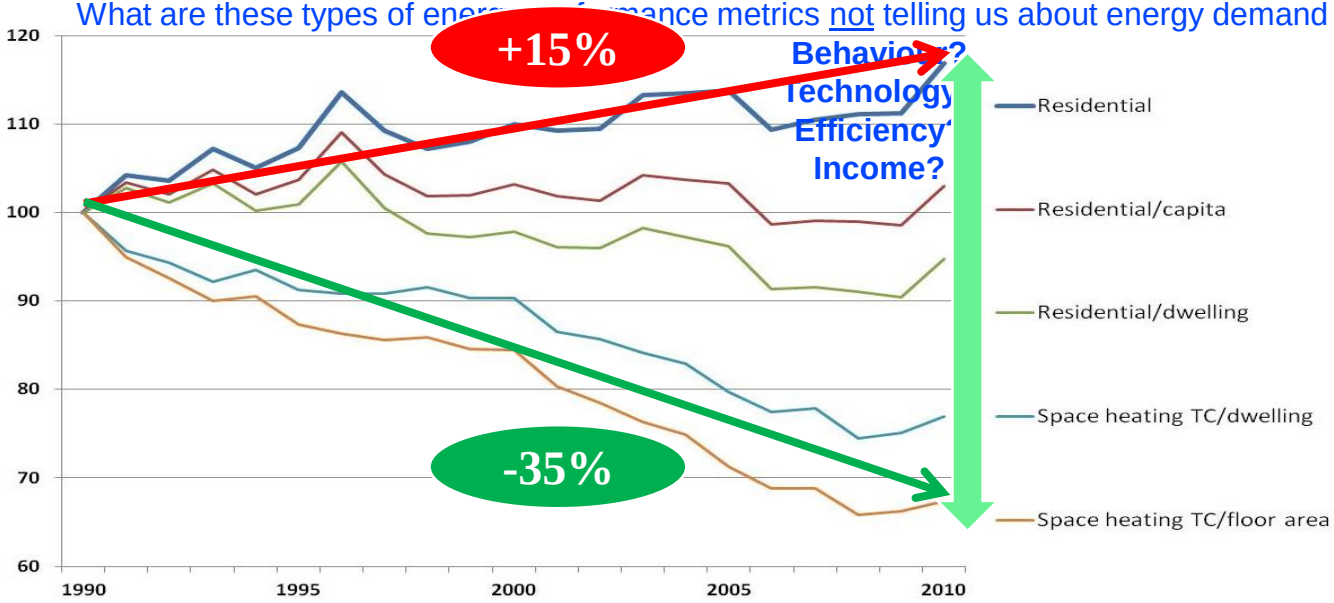
Energy per person

Energy per floor area

IEA 2024. CC BY 4.0.

Evaluation: choosing the right metric

What are these types of ener[illegible]mance metrics not telling us about energy demand and efficiency progress?



Index: 1990=1. Data for IEA18 (Australia, Austria, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, Norway, Slovakia, Spain, Sweden, Switzerland, UK, USA).
TC: Temperature Corrected.

The right energy performance metric is crucial to understanding & tracking progress over time.

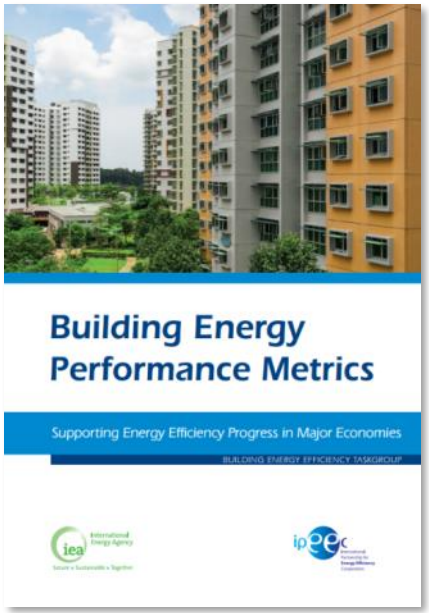
Source: IEA energy efficiency indicators database

IEA 2024. CC BY 4.0.

Evaluation: Building energy performance metrics

Limitations of Energy Performance Metrics

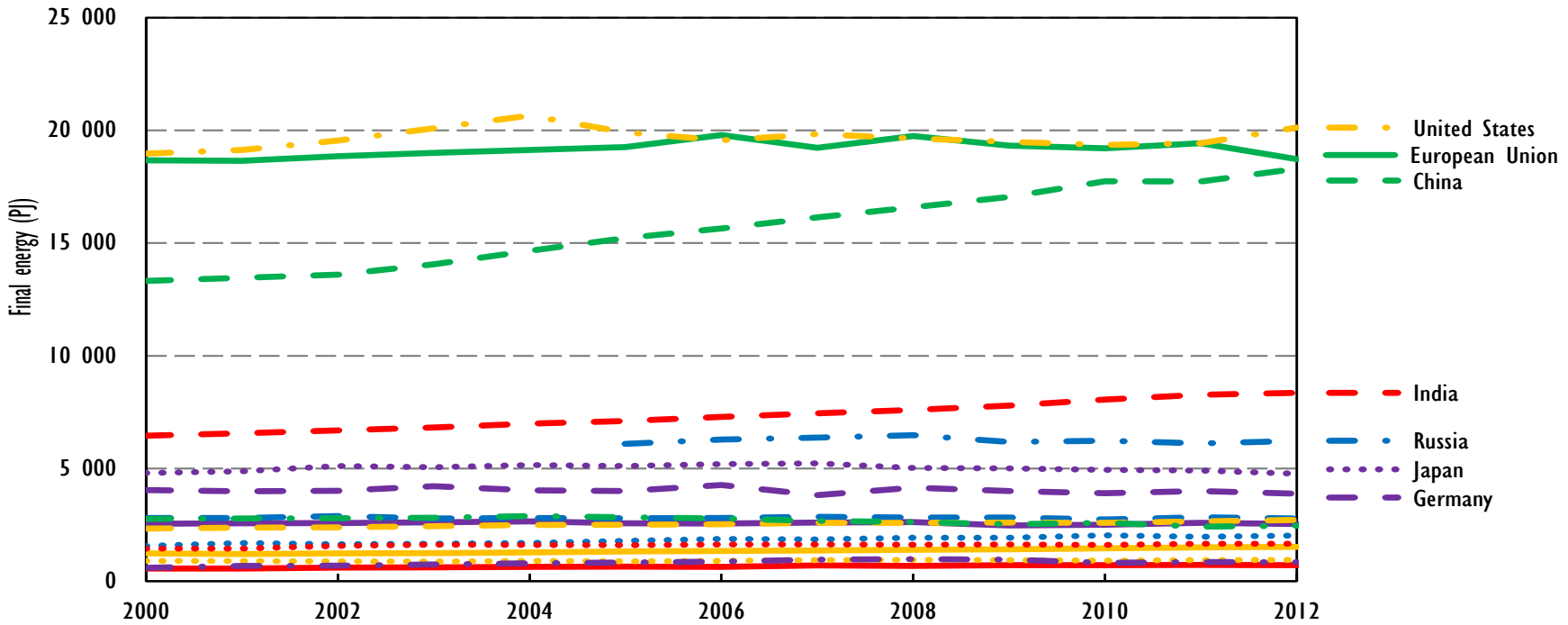
- Metrics cannot predict variation in overall energy consumption or quantify the impact of individual components or factors on overall energy consumption.
- It is often necessary to undertake more detailed analysis to fully understand the combined impact of a number of different factors or driving forces on overall energy consumption.



Source: IEA Building Energy Performance Metrics 2015

IEA 2024. CC BY 4.0.

Building energy performance metrics: energy consumption

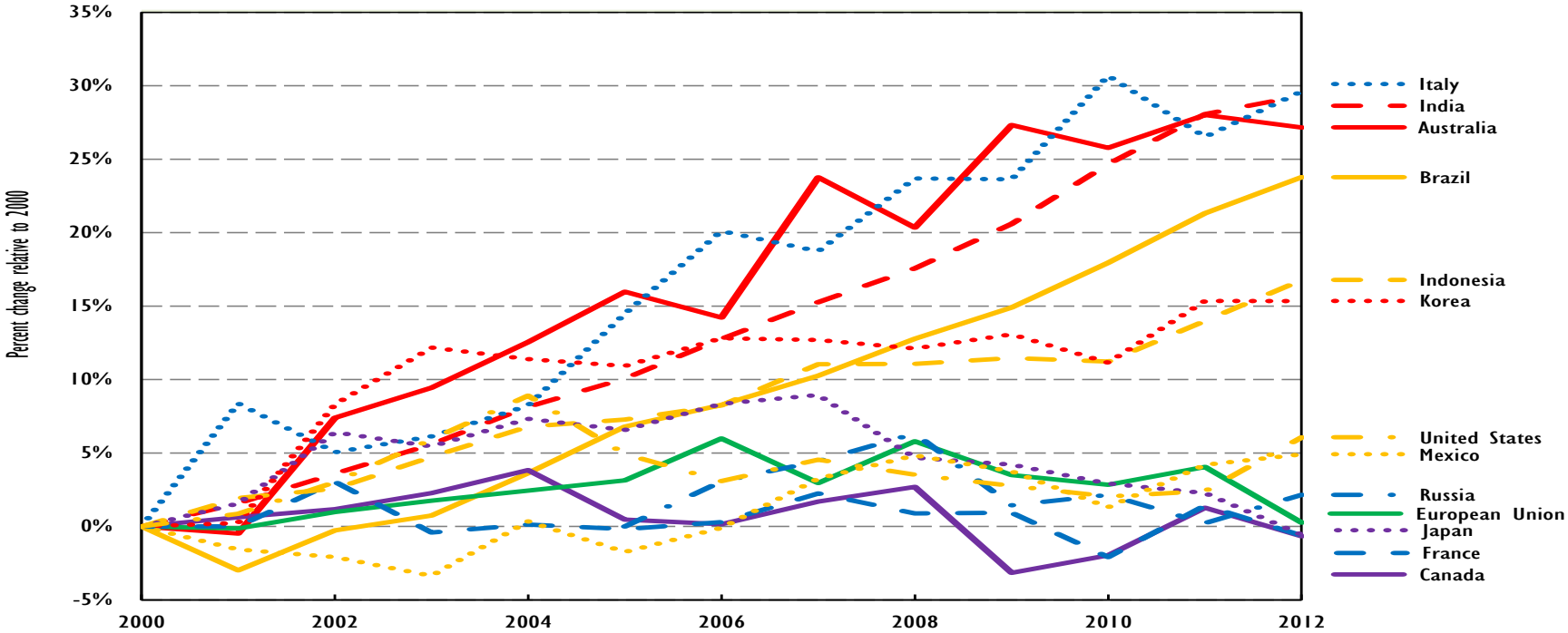


What does this tell us about energy efficiency in buildings?

Source: IEA Building Energy Performance Metrics 2015

IEA 2024. CC BY 4.0.

Building energy performance metrics: change in energy consumption

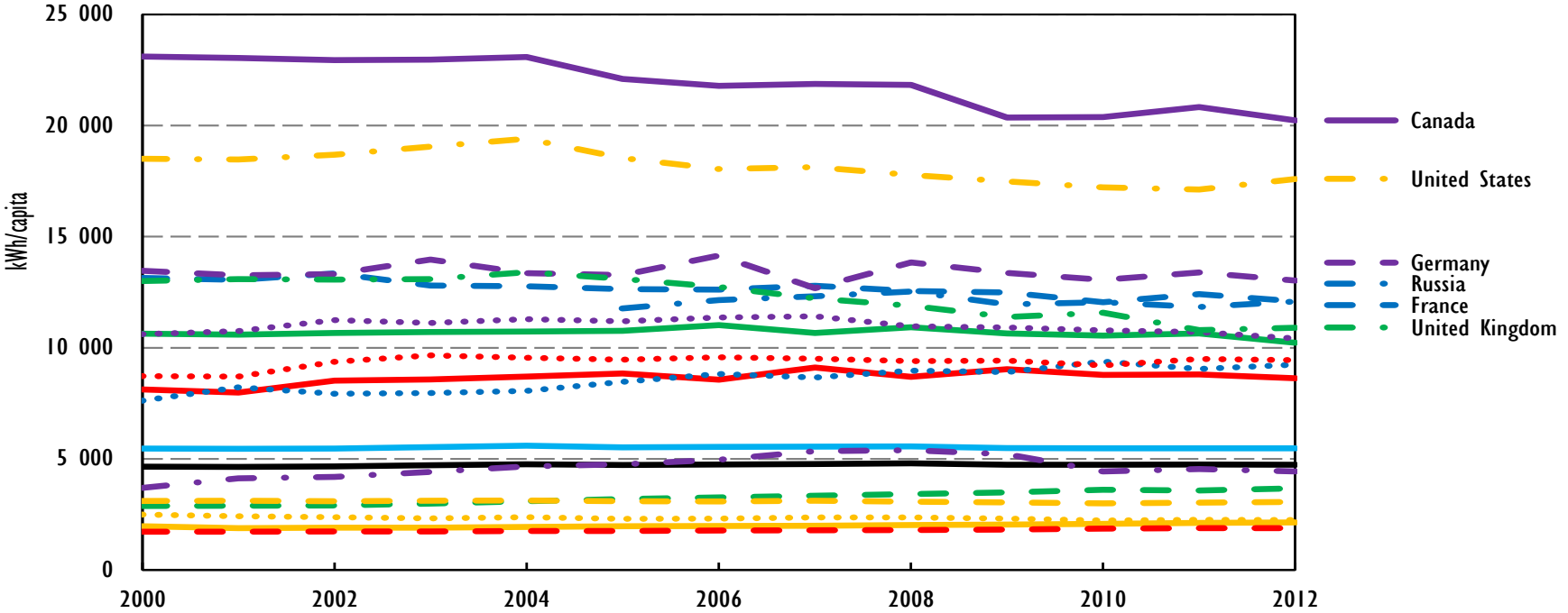


What does this tell us about energy efficiency in buildings?

Source: IEA Building Energy Performance Metrics 2015

IEA 2024. CC BY 4.0.

Building energy performance metrics: energy per person

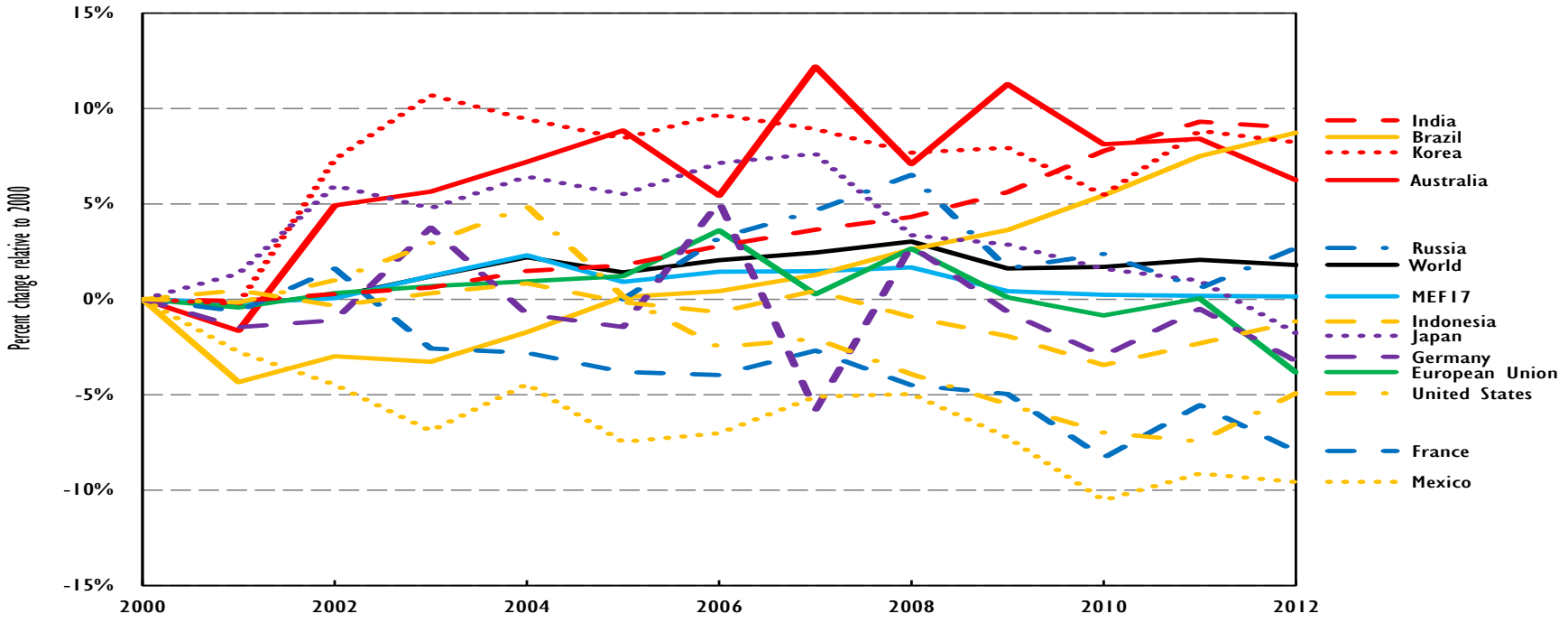


What does this tell us about energy efficiency in buildings?

Source: IEA Building Energy Performance Metrics 2015

IEA 2024. CC BY 4.0.

Building energy performance metrics: change in energy per person

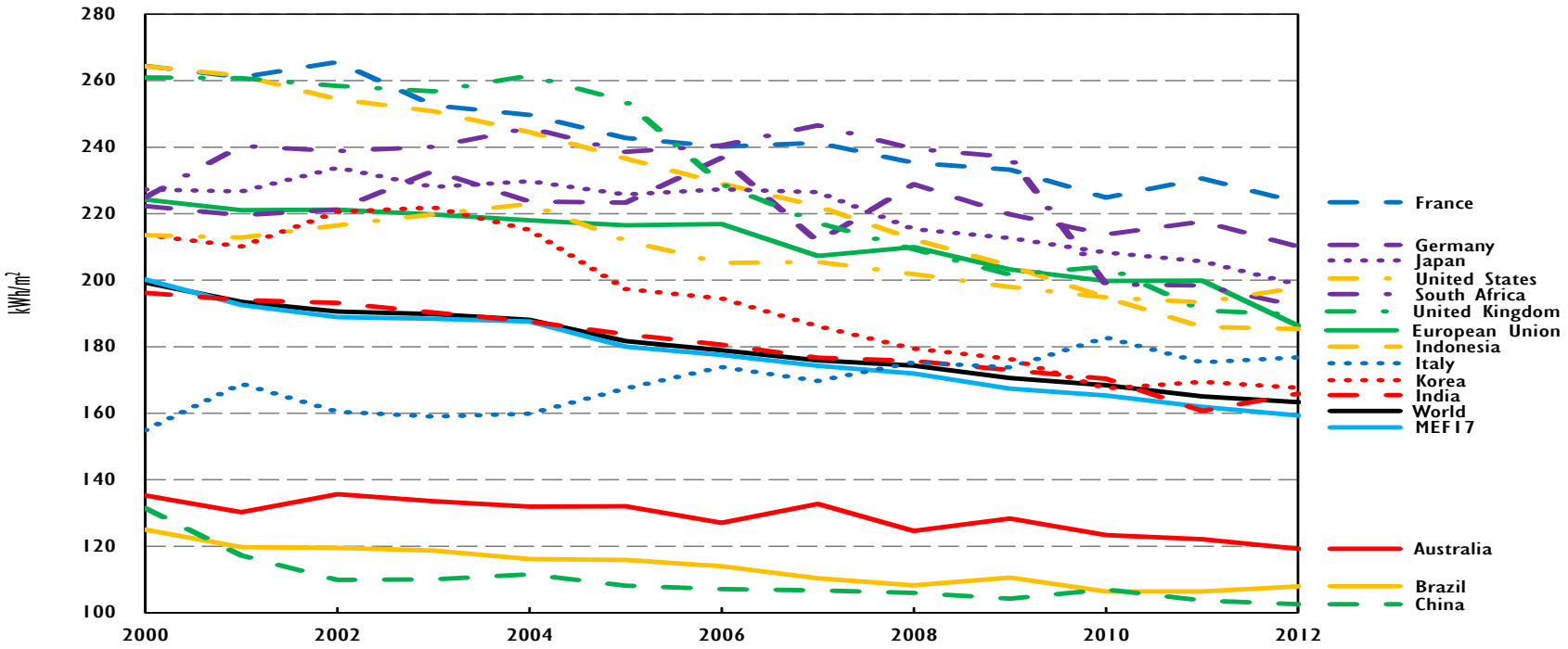


What does this tell us about energy efficiency in buildings?

Source: IEA Building Energy Performance Metrics 2015

IEA 2024. CC BY 4.0.

Building energy performance metrics: energy per floor area

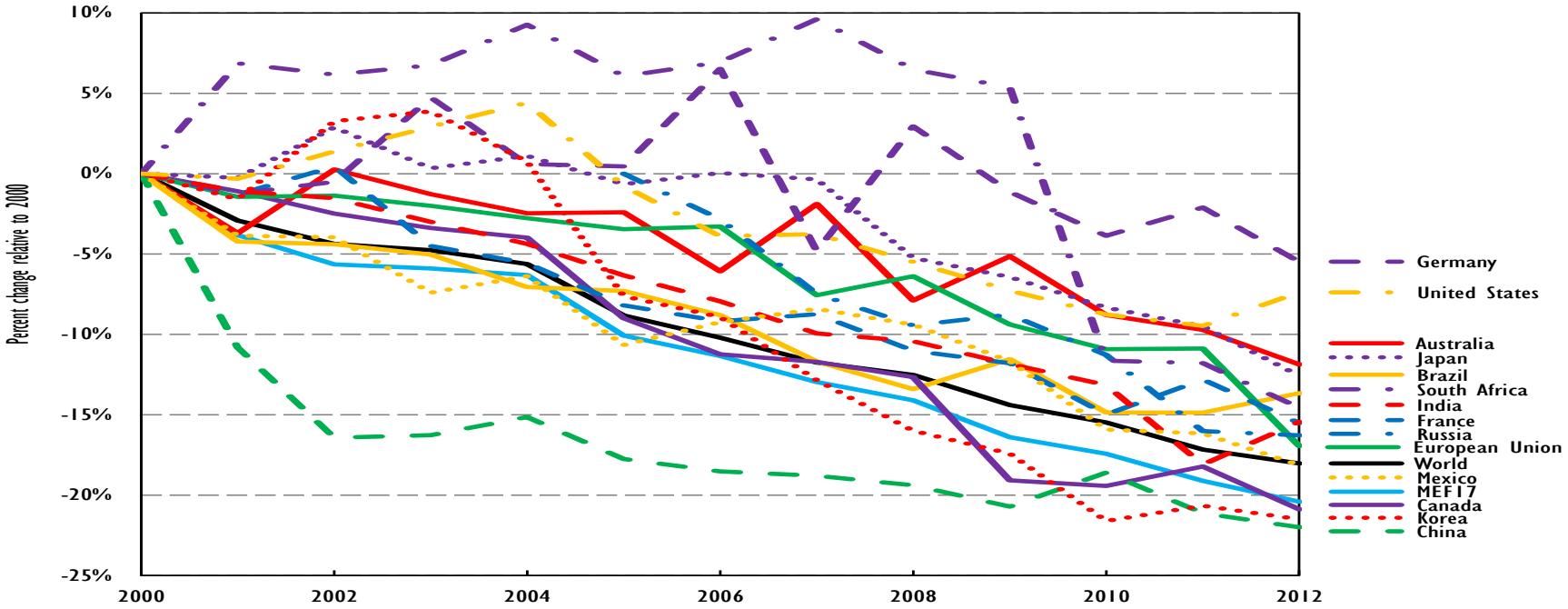


What does this tell us about energy efficiency in buildings?

Source: IEA Building Energy Performance Metrics 2015

IEA 2024. CC BY 4.0.

Building energy performance metrics: change in energy per floor area



What does this tell us about energy efficiency in buildings?

Source: IEA Building Energy Performance Metrics 2015

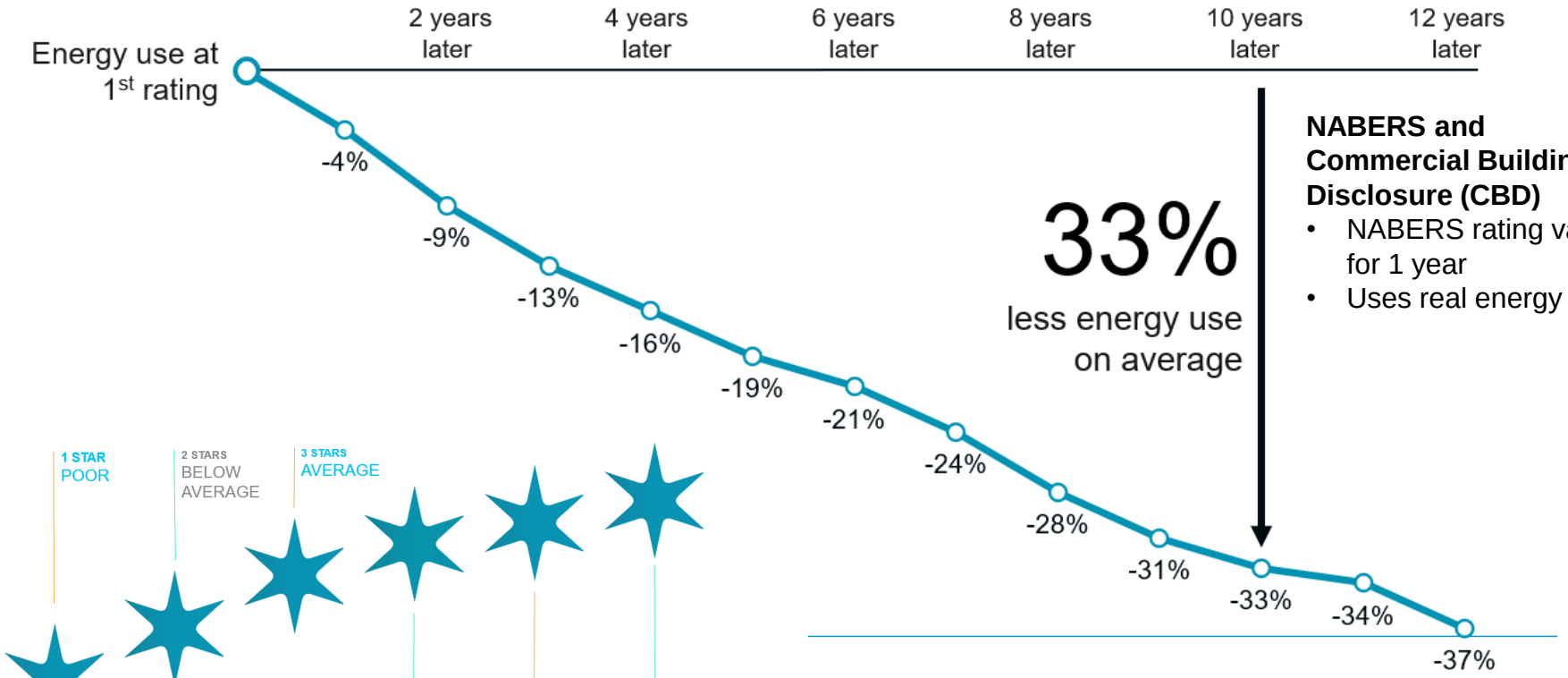
IEA 2024. CC BY 4.0.

Showing potential

IEA 2024. CC BY 4.0.

How do I calculate potential: impact assessment (Australia)

#1 NABERS-certified buildings reduce energy use at one of the fastest rates in the world



NABERS and Commercial Buildings Disclosure (CBD)

- NABERS rating valid for 1 year
- Uses real energy data

The National Australian Built Environment Rating System - NABERS

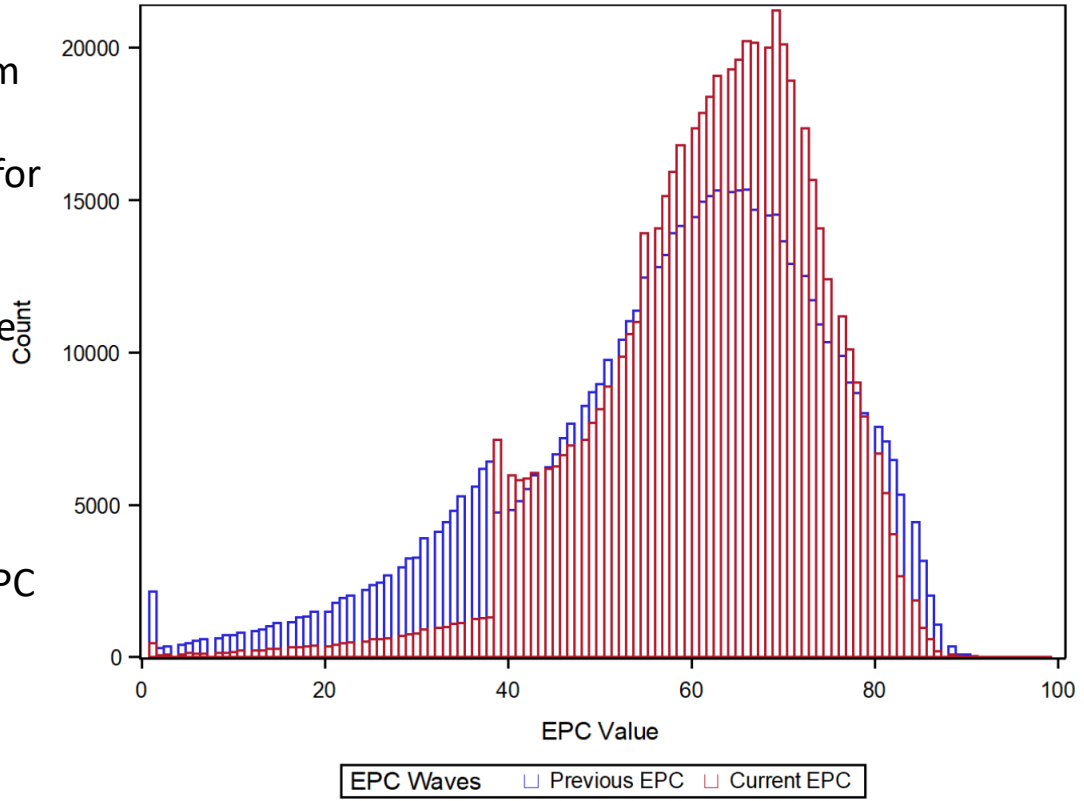
How do I calculate potential: impact assessment

PRS MEES Impact

The UK's Private Rental Sector Minimum Energy Efficiency Standard requires all landlords to achieve a minimum EPC E for new rentals from April 2020.

Compliance levels among the PRS to the regulations are approximately 96%

The majority of dwellings that had previously been in EPC level F&G, and who experienced an increase in their EPC level, had installed a form of insulation, either roof, wall or floor and their combination.



Source: BEIS, PRS Minimum Energy Efficiency Standard interim Report

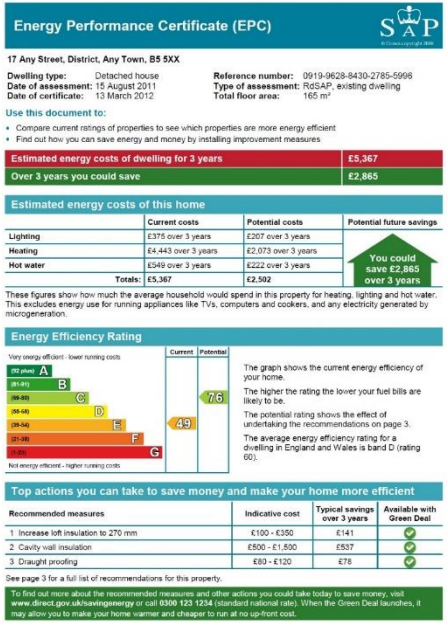
IEA 2024. CC BY 4.0.

How do I calculate potential: modelling

Energy performance certificates (EPC) provide information to consumers on buildings they plan to purchase or rent.

They include an energy performance rating and recommendations for cost-effective improvements.

EPC indicators can be a powerful tool if they are recognised by the real estate market


Energy Performance Certificate (EPC)

SAP

17 Any Street, District, Any Town, B5 5XX

Dwelling type: Detached house
Date of assessment: 15 August 2011
Date of certificate: 13 March 2012
Reference number: 0919-9628-8430-2785-5996
Type of assessment: RdSAP, existing dwelling
Total floor area: 165 m²

Use this document to:

- Compare current ratings of properties to see which properties are more energy efficient
- Find out how you can save energy and money by installing improvement measures

Estimated energy costs of dwelling for 3 years	£5,367
Over 3 years you could save	£2,865

Estimated energy costs of this home

	Current costs	Potential costs	Potential future savings
Lighting	£375 over 3 years	£207 over 3 years	You could save £2,865 over 3 years
Heating	£4,443 over 3 years	£2,073 over 3 years	
Hot water	£549 over 3 years	£222 over 3 years	
Totals:	£5,367	£2,502	

These figures show how much the average household would spend in this property for heating, lighting and hot water. This excludes energy use for running appliances like TVs, computers and cookers, and any electricity generated by microgeneration.

Energy Efficiency Rating

Current Potential

Very energy efficient - lower running costs
(92 plus) A
(81-91) B
(69-80) C
(55-68) D
(39-54) E
(21-38) F
(1-20) G
Not energy efficient - higher running costs

Current: 49
Potential: 76

The graph shows the current energy efficiency of your home.

The higher the rating the lower your fuel bills are likely to be.

The potential rating shows the effect of undertaking the recommendations on page 3.

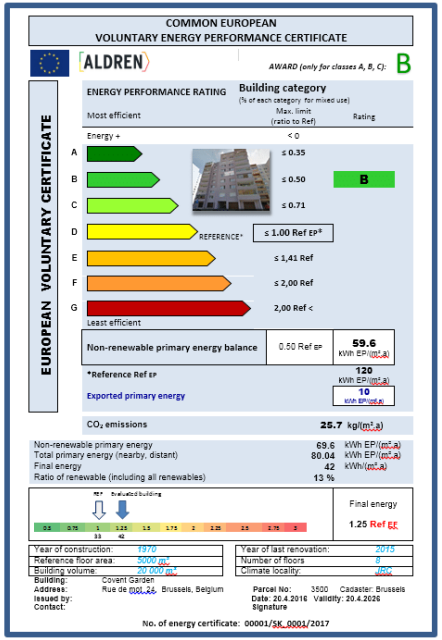
The average energy efficiency rating for a dwelling in England and Wales is band D (rating 60).

Top actions you can take to save money and make your home more efficient

Recommended measures	Indicative cost	Typical savings over 3 years	Available with Green Deal
1 Increase loft insulation to 270 mm	£100 - £350	£141	
2 Cavity wall insulation	£500 - £1,500	£537	
3 Draught proofing	£80 - £120	£78	

See page 3 for a full list of recommendations for this property.

To find out more about the recommended measures and other actions you could take today to save money, visit www.direct.gov.uk/savingenergy or call 0300 123 1234 (standard national rate). When the Green Deal launches, it may allow you to make your home warmer and cheaper to run at no up-front cost.


COMMON EUROPEAN
VOLUNTARY ENERGY PERFORMANCE CERTIFICATE

ALDREN

AWARD (only for classes A, B, C): B

EUROPEAN VOLUNTARY CERTIFICATE

ENERGY PERFORMANCE RATING

Building category
(% of each category for mixed use)

Most efficient	Max. limit (ratio to Ref)	Rating
Energy +	< 0	
A	≤ 0.35	
B	≤ 0.50	B
C	≤ 0.71	
D	≤ 1.00 Ref EP*	
E	≤ 1,41 Ref	
F	≤ 2,00 Ref	
G	2,00 Ref <	
Least efficient		

REFERENCE*

Non-renewable primary energy balance	0.50 Ref EP*	59.6 kWh EP/(m².a)
Reference Ref EP		120 kWh EP/(m².a)
Exported primary energy		10 kWh EP/(m².a)

CO_2 emissions 25.7 kg/(m².a)

Non-renewable primary energy	69.6 kWh EP/(m².a)
Total primary energy (nearby, distant)	80.04 kWh EP/(m².a)
Final energy	42 kWh/(m².a)
Ratio of renewable (including all renewables)	13 %

EP* Evaluated building
0.5 0.75 1 1.25 1.5 1.75 2 2.25 2.5 2.75 3
33 42

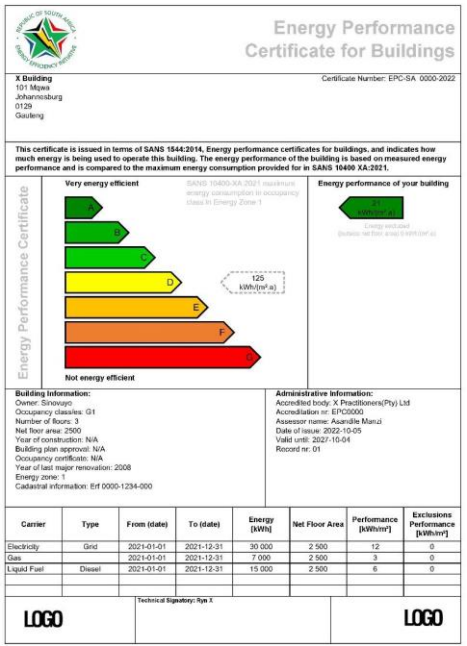
Final energy 1.25 Ref EP

Year of construction:	1970	Year of last renovation:	2015
Reference floor area:	5000 m²	Number of floors	8
Building volume:	20 000 m³	Climate locality:	Uccle

Building: Covent Garden
Address: Rue de la Loi 24, Brussels, Belgium
Issued by:
Contact:

Parcel No: 3500 Cadaster: Brussels
Date: 20.4.2016 Validity: 20.4.2026
Signature

No. of energy certificate: 00001/SK_0001/2017


Energy Performance Certificate for Buildings

X Building
101 Mqwa
Johannesburg
0129
Gauteng

Certificate Number: EPC-SA 0000-2022

This certificate is issued in terms of SANS 1544:2014, Energy performance certificates for buildings, and indicates how much energy is being used to operate this building. The energy performance of the building is based on measured energy performance and is compared to the maximum energy consumption provided for in SANS 10400 XA:2021.

Energy Performance Certificate

Very energy efficient
A
B
C
D
E
F
G
Not energy efficient

125 kWh/(m².a)

Energy performance of your building

Building Information:
Owner: Sinovayo
Occupancy classes: G1
Number of floors: 3
Net floor area: 2500
Year of construction: N/A
Building plan approval: N/A
Occupancy certificate: N/A
Year of last major renovation: 2008
Energy zone: 1
Cadastral information: Erf 0000-1234-000

Administrative Information:
Accredited body: X Practitioners(Pty) Ltd
Accreditation nr: EPC0000
Assessor name: Asandile Manzi
Date of issue: 2022-10-05
Valid until: 2027-10-04
Record nr: 01

Carrier	Type	From (date)	To (date)	Energy [kWh]	Net Floor Area	Performance [kWh/m²]	Exclusions Performance [kWh/m²]
Electricity	Grid	2021-01-01	2021-12-31	30 000	2 500	12	0
Gas		2021-01-01	2021-12-31	7 000	2 500	3	0
Liquid Fuel	Diesel	2021-01-01	2021-12-31	15 000	2 500	6	0

LOGO

Technical Signatory: Syn X

LOGO

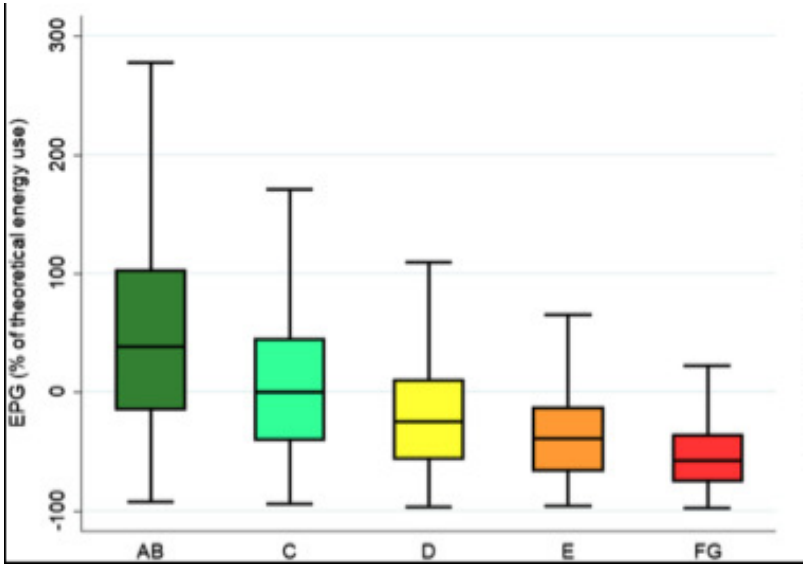
Benefits

- Understand the energy performance of your home
- Identify areas for improvement
- Make changes to save money and reduce emissions

Energy Performance Gap (EPG)

Discrepancy between theoretically estimated/modelled buildings energy performance (usually only for heating) of EPCs and the actual/metered energy use of buildings

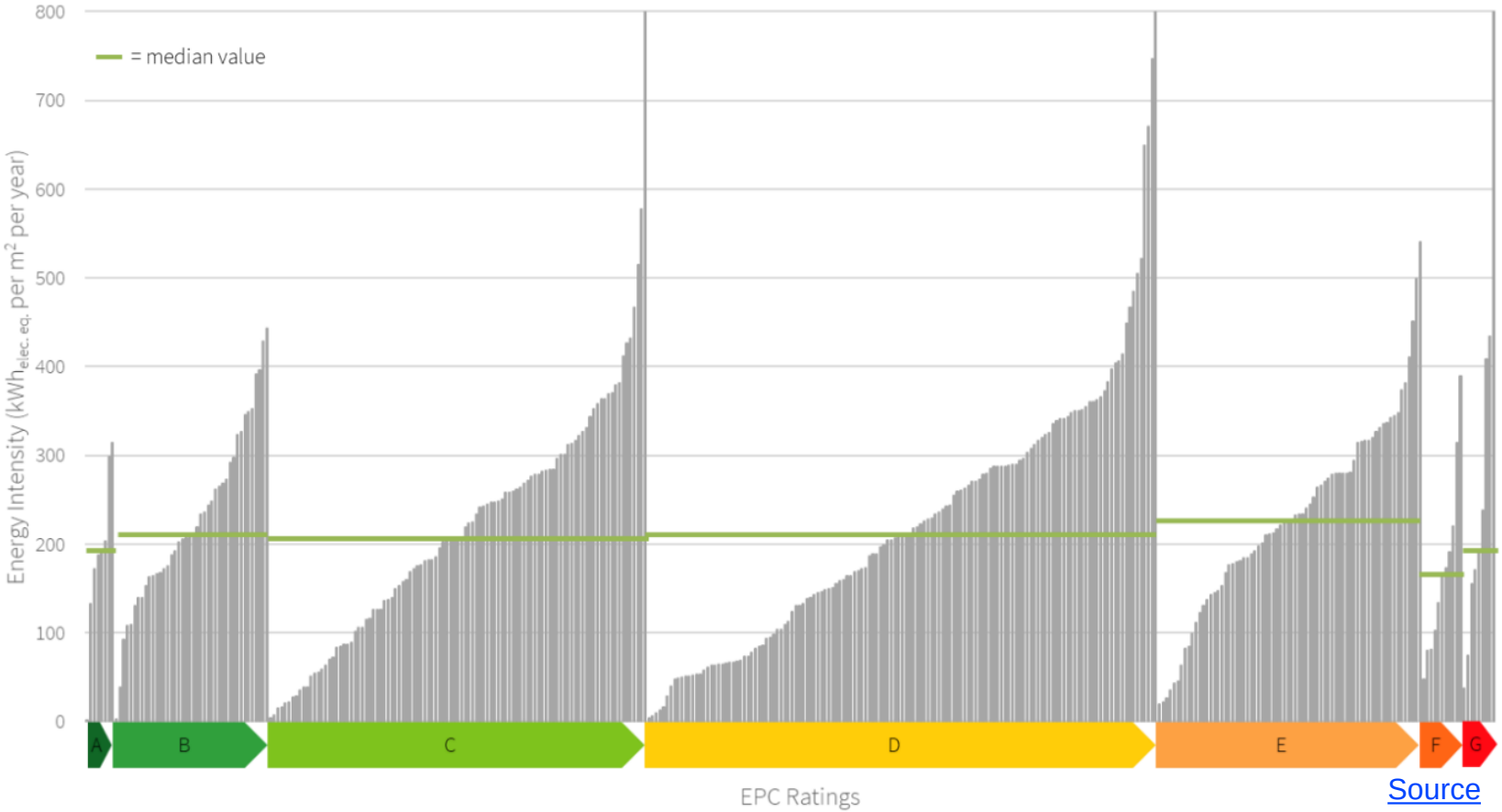
- **Ireland (2021):** EPG for the least EE dwellings feature from -15 to -56%; EPG for EE houses display from +39 to 54% of the relevant EPC.
- **Sweden (2020):** energy savings for retrofit based on the theoretical consumption were overestimated by 37%, whereas the prediction of savings using measured consumption before retrofit were in line with the actual savings (3.6% overestimation).
- **Serbia (2020)**: large EPG in buildings with individual boilers than those connected to DHS
- **Netherlands (2013)**: energy inefficient homes consume less than predicted and EE homes consume more than predicted
- **UK (2012) & (2019):** data does not show correlation between how efficiently a building uses energy and its EPC rating



Data for Ireland (2021)

IEA 2024. CC BY 4.0.

Offices' actual energy intensities show little correlation with EPC rating in the UK



Source

IEA 2023. All rights reserved.

Process for Tracking Progress

Key steps in the process

Examples

IEA 2024. CC BY 4.0.

Tracking progress: Key steps in the process

Step 1: Identify what needs to be tracked

- What story should be told?
- What were the objectives?
- What are the risks?

Step 2: Define the tracking indicators

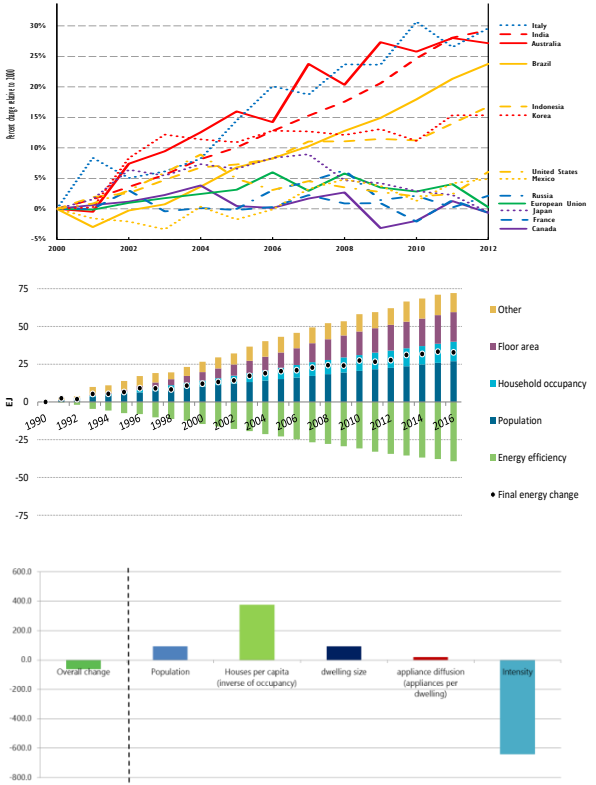
- What performance metrics can you use?
- What data is needed?

Step 3: Assess the data

- What analysis method should you use?

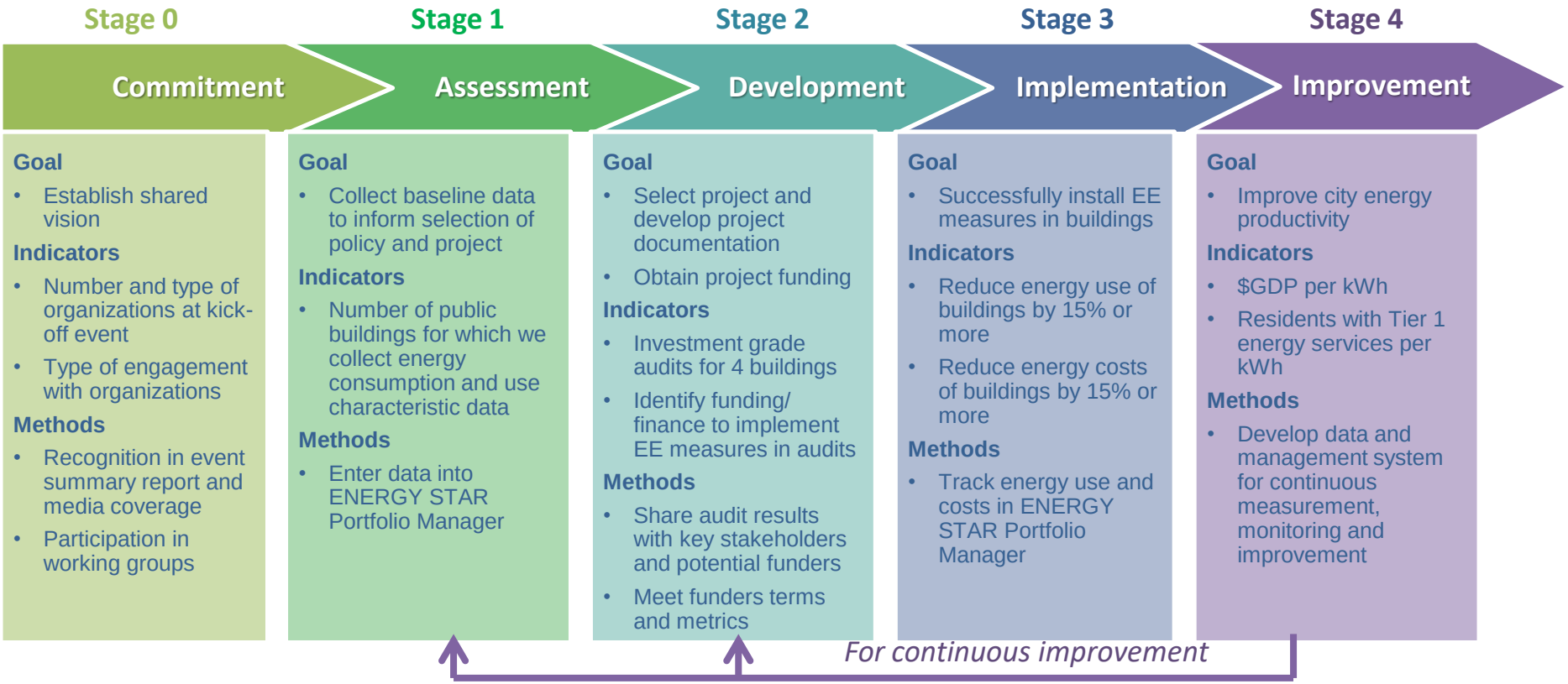
Step 4: Tell the story

- How do you visualise the results?
- How would it vary across countries?



IEA 2024. CC BY 4.0.

Example: Tracking progress in the Building Efficiency Accelerator



Source: Building Efficiency Accelerator

IEA 2023. All rights reserved.

Tracking progress example: cooling

Step 1: Identify what needs to be tracked

- What story should be told about the impact of cooling?
  - What objectives could be achieved through policies on cooling?
  - What are the risks and threats from increasing cooling energy use?

Potential issues related to cooling

- Demand for and access to cooling thermal comfort
- Energy used for cooling based on AC efficiency levels
- Peak electricity loads, grid stability and power sector investments
- Job creation through design, manufacturing, selling or installing ACs
- Sales tax and public budgets financial impacts
- Market availability of efficient products

IEA 2024. CC BY 4.0.

Tracking progress example: cooling

Step 2: Define the tracking indicators

- What performance metrics can you use?
- What data do you have on cooling and buildings?

Issues with metrics and indicators

- How do you separate the influences? (Income; demand; population; climate; efficiency)
- What options are there for metrics?
  - Final energy use for cooling
  - Final energy use for cooling per square meter cooled per cooling degree-day
  - Change in average efficiency of ACs (stock, sold, manufactured, imported, exported)
  - Share of products covered by labels or MEPS policies

IEA 2024. CC BY 4.0.

Tracking progress example: cooling

Step 3: Assess the data

- What analysis method can you use?
- Which method will provide the information needed?

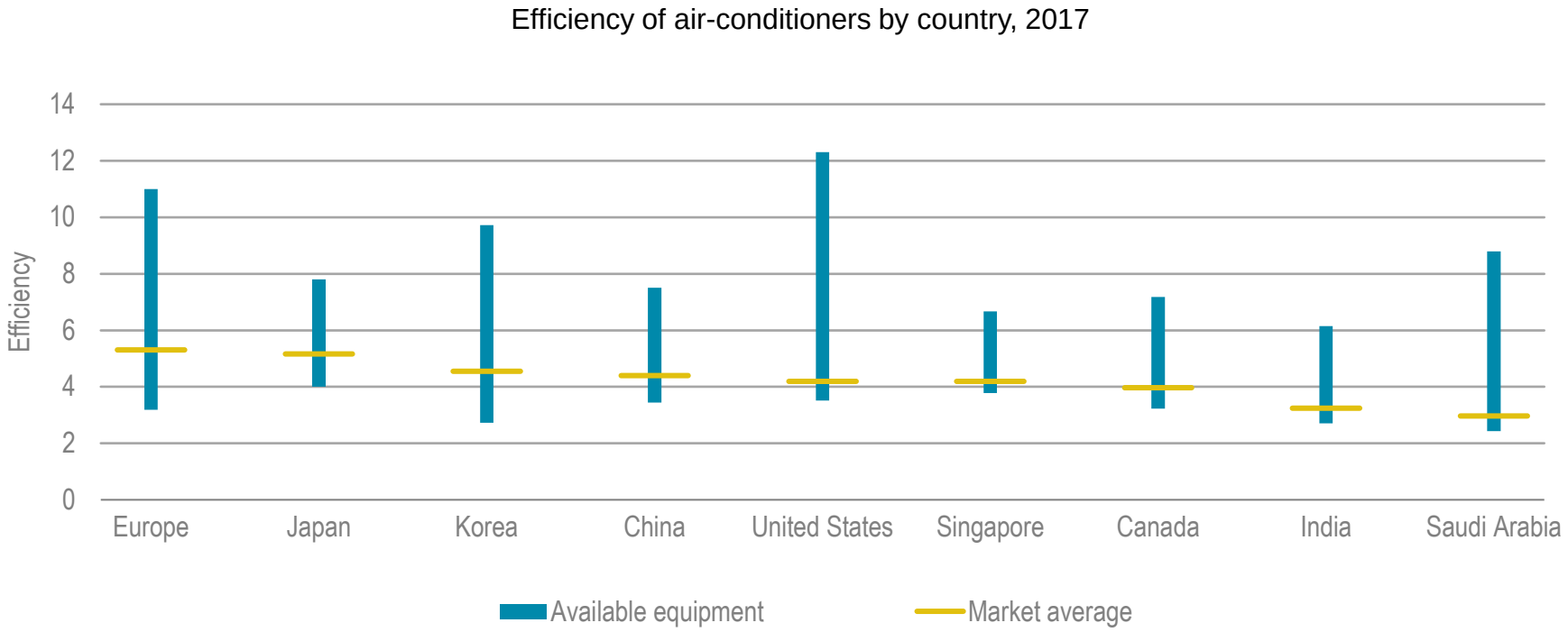
Step 4: Tell the story

- How do you visualise the data?
- What part of the story is important for your country?

Issues with metrics and indicator analysis methods

- What results will be compelling and told with simple visuals or statements?
- What options are there for methods?
  - Energy performance metrics
  - Bars held analysis
  - Energy decomposition (LMDI)

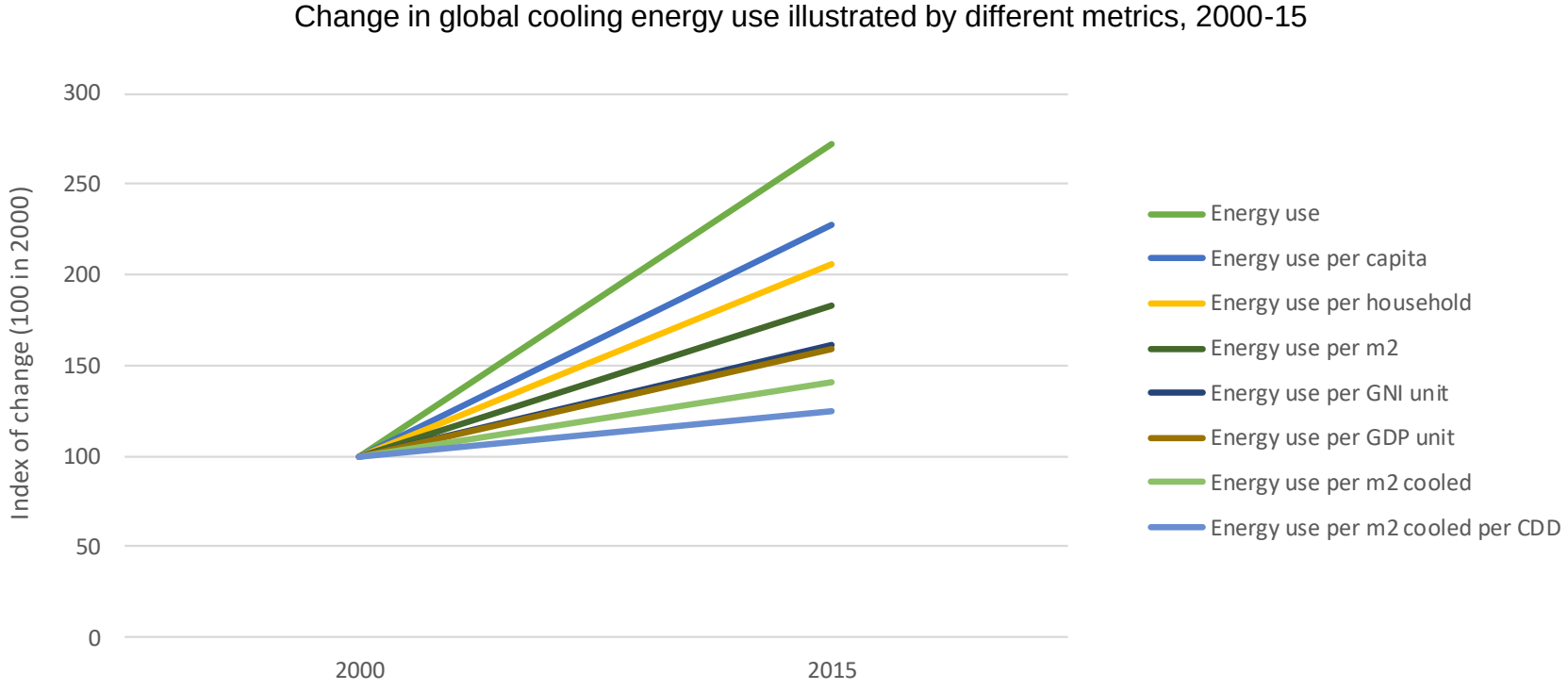
Tracking progress: cooling example



Best available technology efficiency levels vary widely between countries.
And, best available technology is much more efficient than the market average.

IEA 2024. CC BY 4.0.

Tracking progress: cooling example

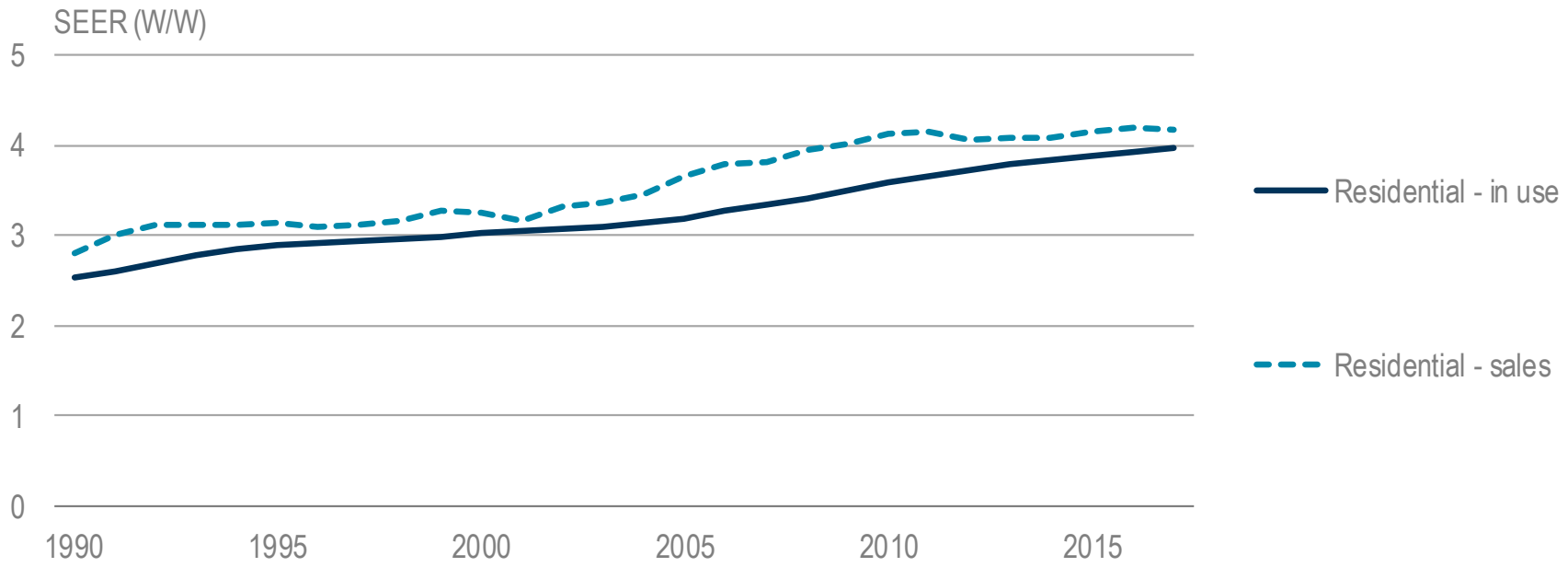


“Energy use per m2 cooled per CDD” may be an accurate performance indicator at the building. But depending on the story you want to tell, “energy use” offers a different story for the country.

IEA 2024. CC BY 4.0.

Tracking progress: cooling example

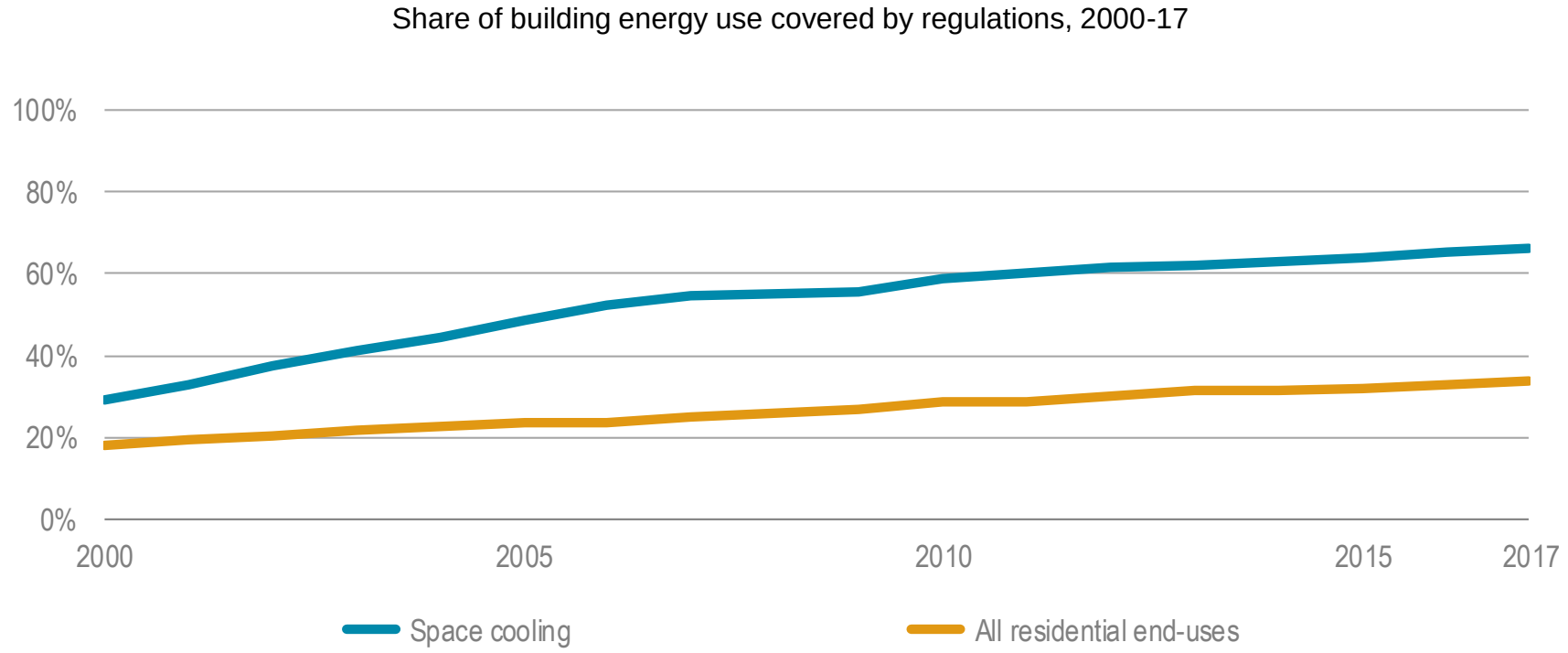
Global weighted average residential SEER of air-conditioners, 1990-2017



More efficient cooling technologies are being sold.
But the efficiency levels are well below the best available technologies.

IEA 2024. CC BY 4.0.

Tracking progress: cooling example

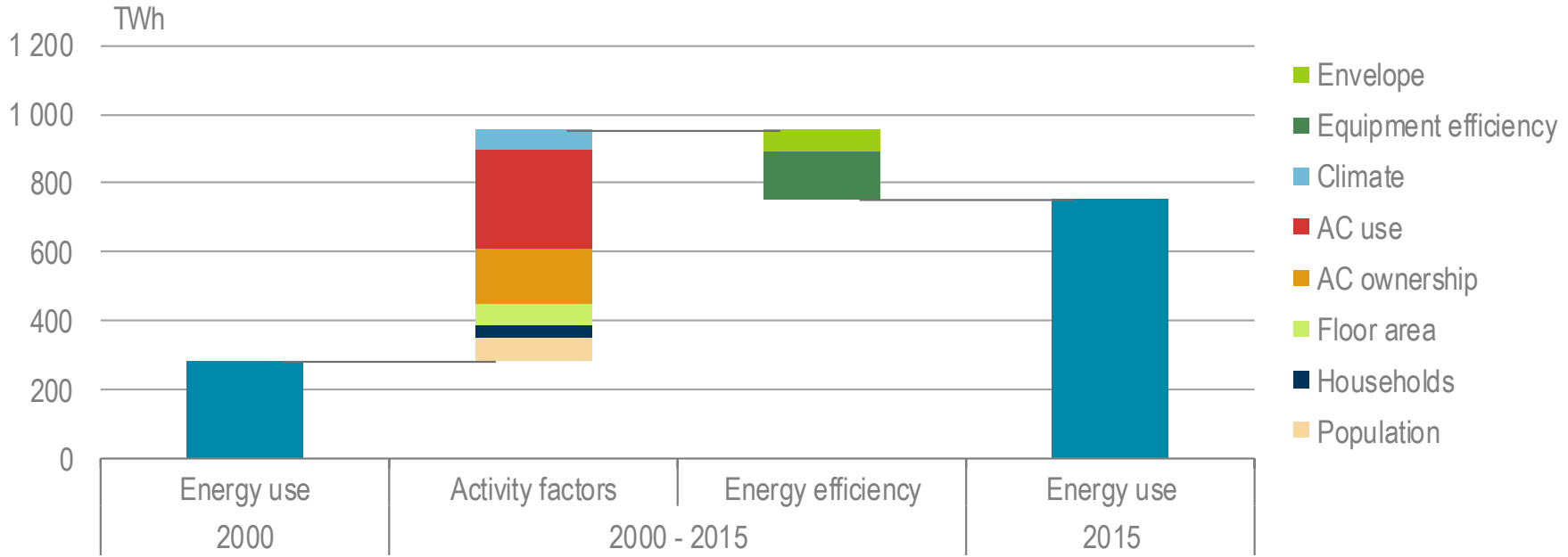


Increasingly more policies are covering space cooling energy use.
But the strength of those policies are not keeping pace with best available technologies.

IEA 2024. CC BY 4.0.

Tracking progress: cooling example

Global decomposition of final energy use for cooling by key contribution, 2000-15



Energy efficiency has saved 200 TWh of cooling final energy from 2000 to 2015, but this has been offset by activity factors contributing to a 650 TWh increase during this period.

IEA 2024. CC BY 4.0.

Session Activity

International Energy Agency

Activity – Evaluation and energy efficiency indicators

	Provide a description
Evaluation objective	
Indicators	
Data requirements	

IEA 2024. CC BY 4.0.

International Energy Agency

Energy Efficiency Training Week

Africa Energy Efficiency Policy in Emerging Economies Training Week

Nairobi

18-22 March 2024

https://www.iea-events.org/energy-efficiency-training-week-nairobi

International Energy Agency

Energy Efficiency Training Week - Buildings - Day 3: 17 - Making it happen: Climate Action Roadmaps

Global Alliance for Buildings and Construction

UN environment programme

UNOPS

Learning Objectives

1. Understand the role of the GlobalABC and how it can be a resource
1. Understand why and how decarbonization roadmaps are critical tools for climate action and the decarbonization of the buildings and construction sector
1. Understand the basics of the GlobalABC methodology to develop decarbonization roadmaps
1. Be able to apply the basic principles of the GlobalABC methodology

IEA 2024. CC BY 4.0.

About The GlobalABC

- Founded at COP21, hosted by UNEP and **with 271 members, including 38 countries**, the Global Alliance for Buildings and Construction (GlobalABC) is the leading global platform for all buildings stakeholders committed to a common vision: **A zero-emission, efficient and resilient buildings and construction sector**.

- The GlobalABC aims to:

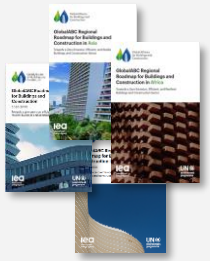
1. BE A CATALYST:

Deep collaboration; high-level international events; national alliances; building passports

2. TRACK PROGRESS:

Through the annual Global Status Report for Buildings and Construction; MPGCA Human Settlements Pathway; SURGe initiative

3. SUPPORT COUNTRIES:



Through **building decarbonization roadmaps**; Buildings Breakthrough Target; NDC frontrunner criteria and tool

IEA 2024. CC BY 4.0.

Why do we need Climate Action Roadmaps ?

The buildings and construction sector faces **an action gap, not a technological gap.**

Only 26% of the world countries have mandatory codes for building energy performance.

IEA 2024. CC BY 4.0.

What are the benefits of Climate Action Roadmaps ?

The roadmap process helps the **goal setting** exercise and the identification of **tangible and quantifiable objectives**

The roadmap presents **a comprehensive approach** along the full building lifecycle.

The roadmap leverages **synergies** of actions and ensure **actions are designed to achieve defined objectives**

The roadmap brings **stakeholders together** to address cross-cutting issues

The roadmap process ensures **strong governments and national/local stakeholder ownership** supporting roadmap implementation

IEA 2024. CC BY 4.0.

Why is there an urgency to develop decarbonization roadmaps?

The Human Settlement - Climate Action Pathways objectives:

"By 2030, all countries have national roadmaps for decarbonizing the built environment."

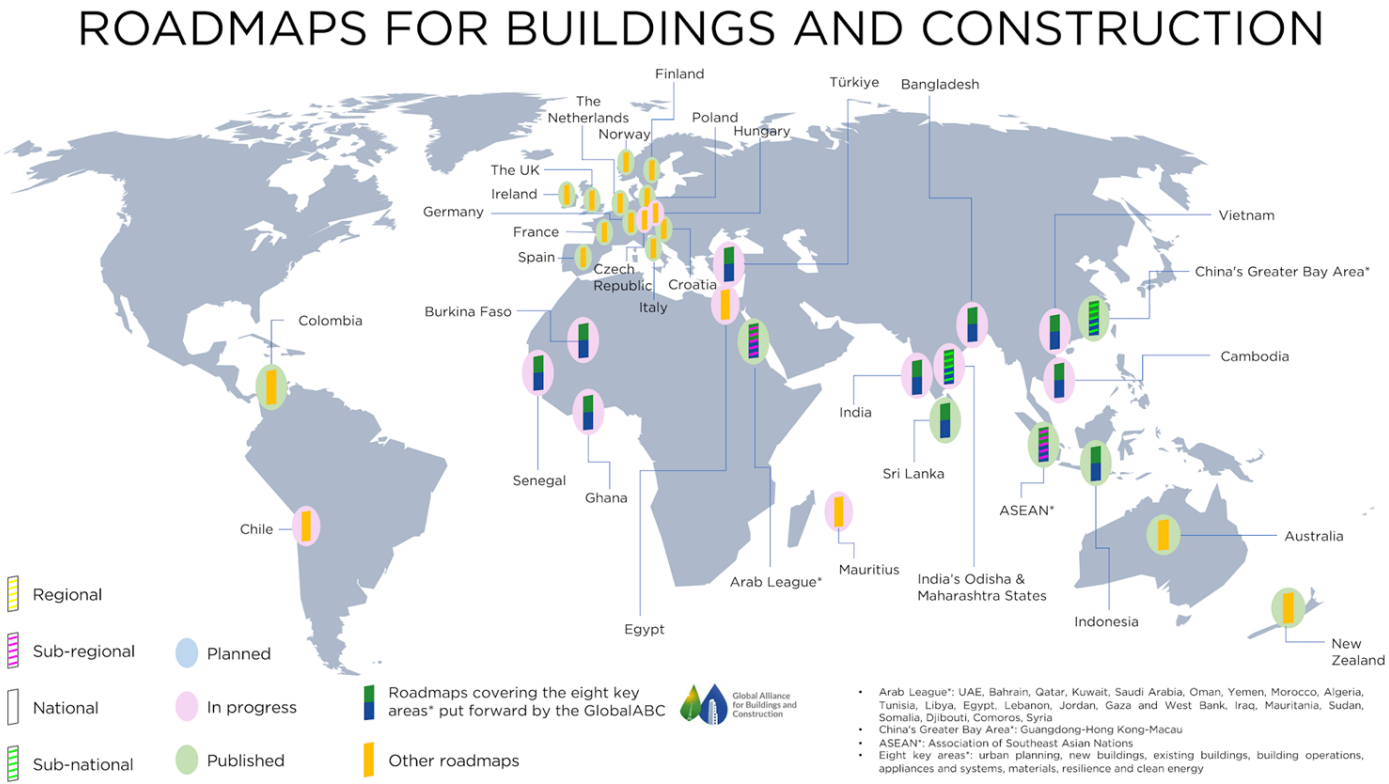
Also:

- *By 2030, the built environment should halve its emissions, whereby 100 per cent of new buildings must be net-zero carbon in operation.*
- *By 2050, all buildings must be decarbonized along the lifecycle.*

7

IEA 2024. CC BY 4.0.

The GlobalABC and the Buildings and Construction Roadmaps



Roadmaps underway in 30+ countries at the **national, sub-national or sub-regional levels** by GlobalABC/UNEP and partners

8

IEA 2024. CC BY 4.0.

A GlobalABC initiative to better support Climate Action Roadamps

A Step-by-step Guidance

+

Tools

"A robust and standardised methodology to assist countries to identify their priorities and develop their own pathway to Sustainable Buildings and Construction"

Led by:

UN environment programme

Developed by:

UNOPS

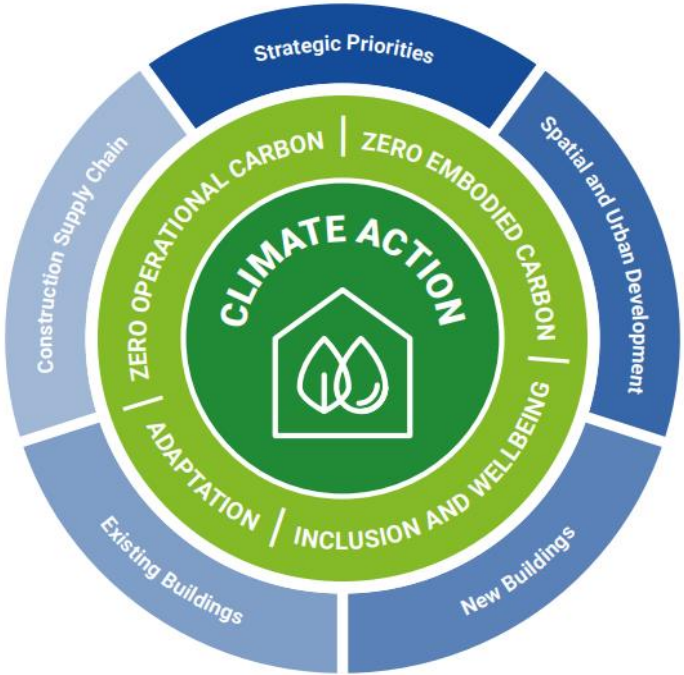
Piloted by:

UN HABITAT FOR A BETTER URBAN FUTURE

Funded by:

BMZ

The GlobalABC framework



5 Action Areas:

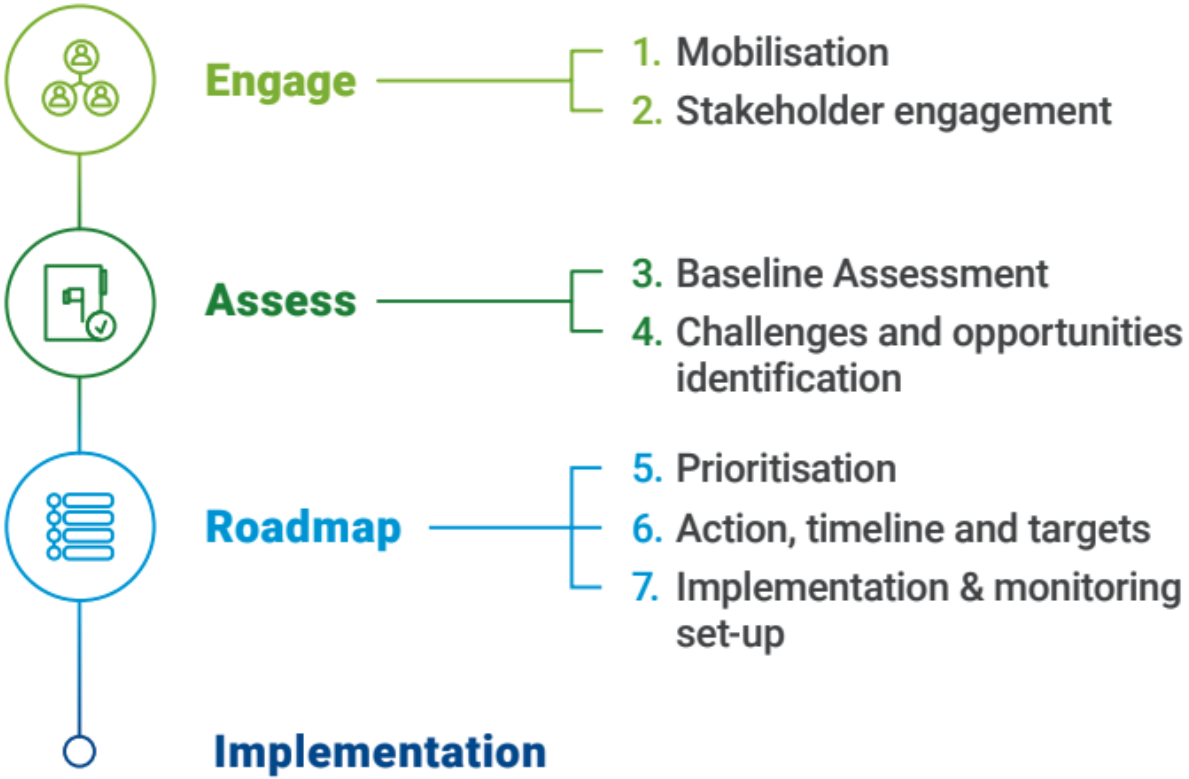
- Strategic Priorities
- Spatial and Urban Development
- New Buildings
- Existing Buildings
- Construction Supply Chain

4 Objectives:

- Zero embodied carbon
- Zero operational carbon
- Inclusion & Wellbeing
- Adaptation

IEA 2024. CC BY 4.0.

The Step-by-step approach



11

IEA 2024. CC BY 4.0.

ENGAGE - Step 1: Mobilisation

Step 1: Mobilisation

Duration: 2-3 months

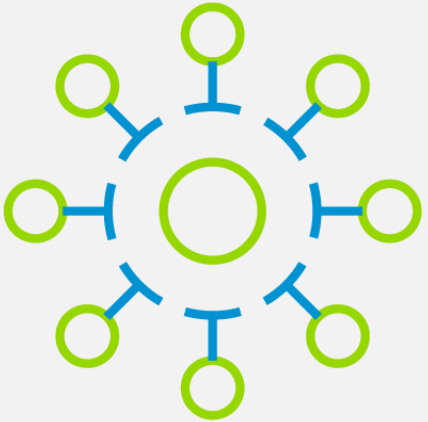
- Sub-step 1.1: Government Agreement
- Sub-step 1.2: Objective and Scope Definition
- Sub-step 1.3: Steering Committee Mobilisation
- Sub-step 1.4: Delivery Team Creation
- Sub-step 1.5: Project Management Set-up

ENGAGE - Step 2: Stakeholders Engagement

Step 2: Stakeholders Engagement

Duration: 2-3 months

- Sub-step 2.2: Stakeholder and Initiative Mapping
- Sub-step 2.2: Establishment of Stakeholder Group
- Sub-step 2.3: Management of Stakeholder Group

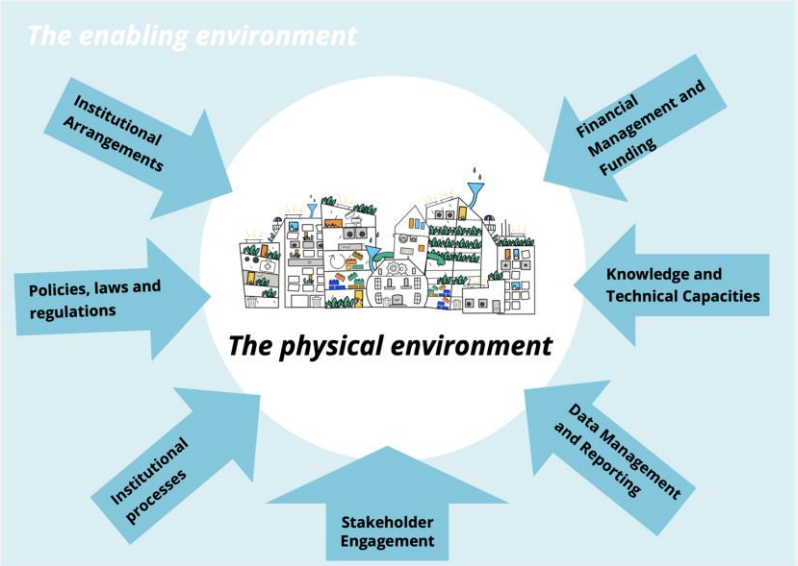


ASSESS - Step 3: Baseline Assessment

Step 3: Baseline Assessment

Duration: 3-5 months

- Sub-step 3.1: The Physical Environment Assessment
- Sub-step 3.2: The Enabling Environment Assessment

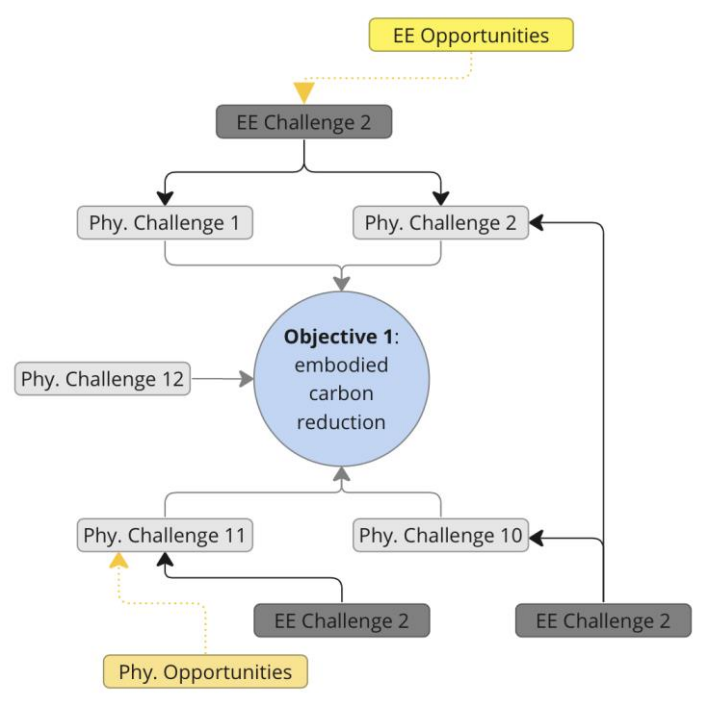


ASSESS - Step 4: Challenges and Opportunities Identification

Step 4: Challenges and Opportunities Identification

Duration: 1 month

- Sub-step 4.1: Listing of Challenges and Opportunities
- Sub-step 4.2: Mind Mapping Exercise

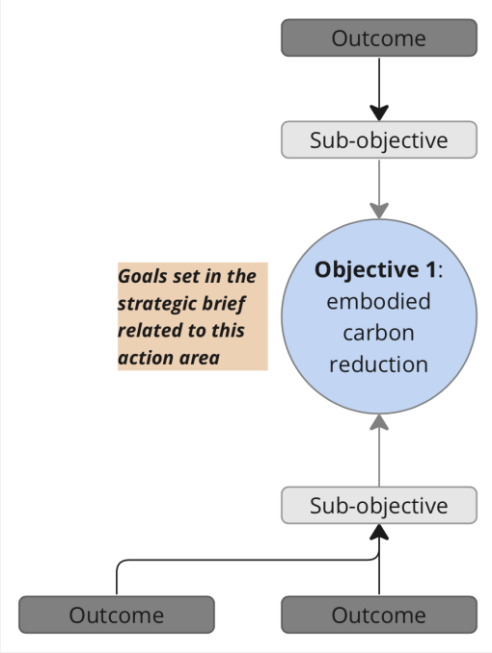


Sample of the mind mapping exercise

ROADMAP - Step 5: Prioritization

Step 5: Prioritization | Duration: 1 month

- Sub-step 5.1: Root Causes Analysis
- Sub-step 5.2: Solution Tree
- Sub-step 5.3: Prioritization Domains of Change
- Sub-step 5.4: Review Objectives and Targets
- Sub-step 5.5: Defining the Theory of Change



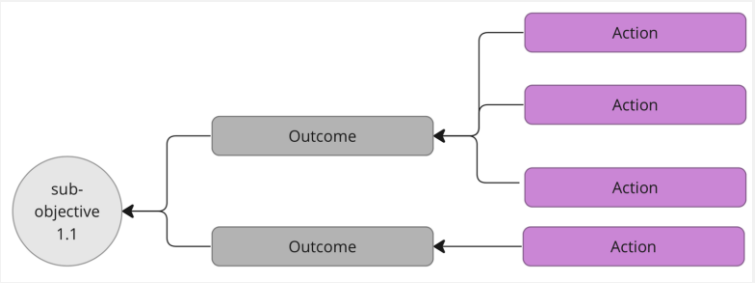
Sample of the theory of change

ROADMAP - Step 6: Action, Timeline and Indicators

Step 6: Action, Timeline and Indicators

Duration: 1 month

- Sub-step 6.1: Actions Identification
- Sub-step 6.2: Actions Feasibility
- Sub-step 6.3: Actions Prioritization
- Sub-step 6.4: Results Matrix
- Sub-step 6.5: Roadmap Draft



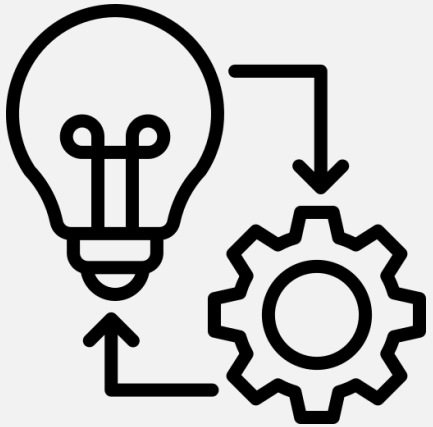
Sample of the action identification

ROADMAP - Step 7: Implementation and Monitoring Set-up

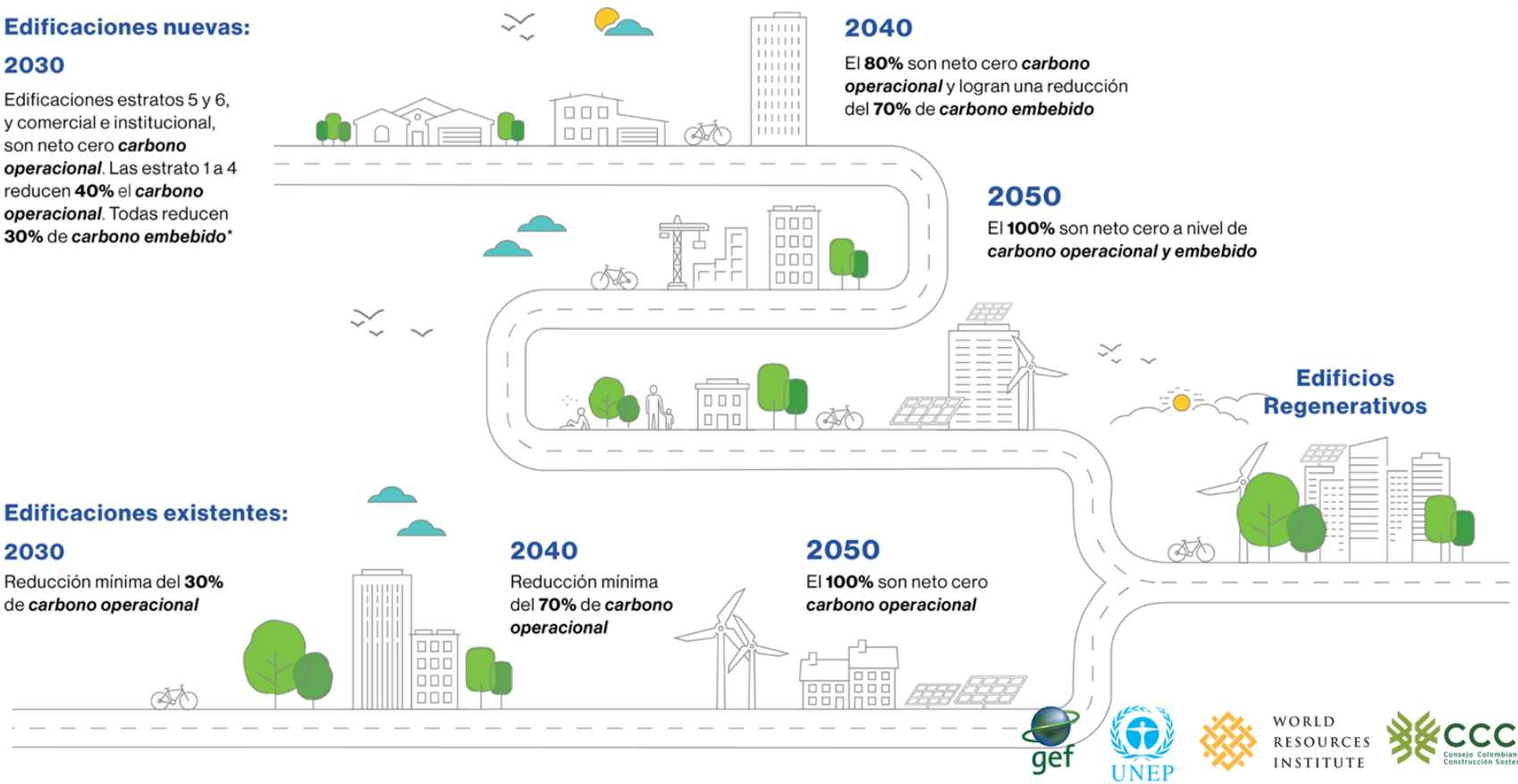
Step 7: Implementation and Monitoring Set-up

Duration: 1 month

- Sub-step 7.1: Monitoring Plan
- Sub-step 7.2: Designation of Leading Entities
- Sub-step 7.3: Roadmap Endorsement

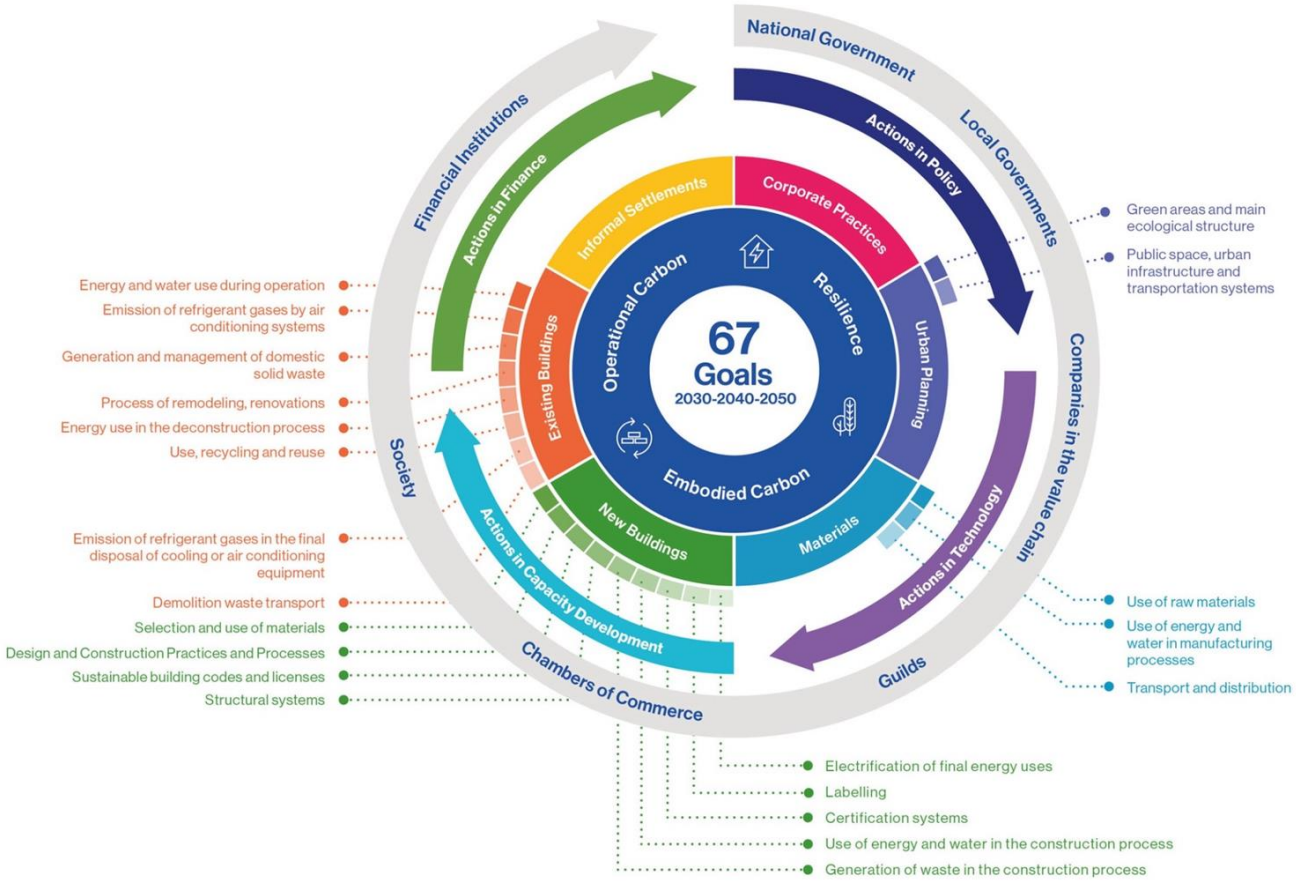


EXAMPLE: The Colombia Roadmap - Main Goals



IEA 2024. CC BY 4.0.

EXAMPLE: The Colombia Roadmap - Structure



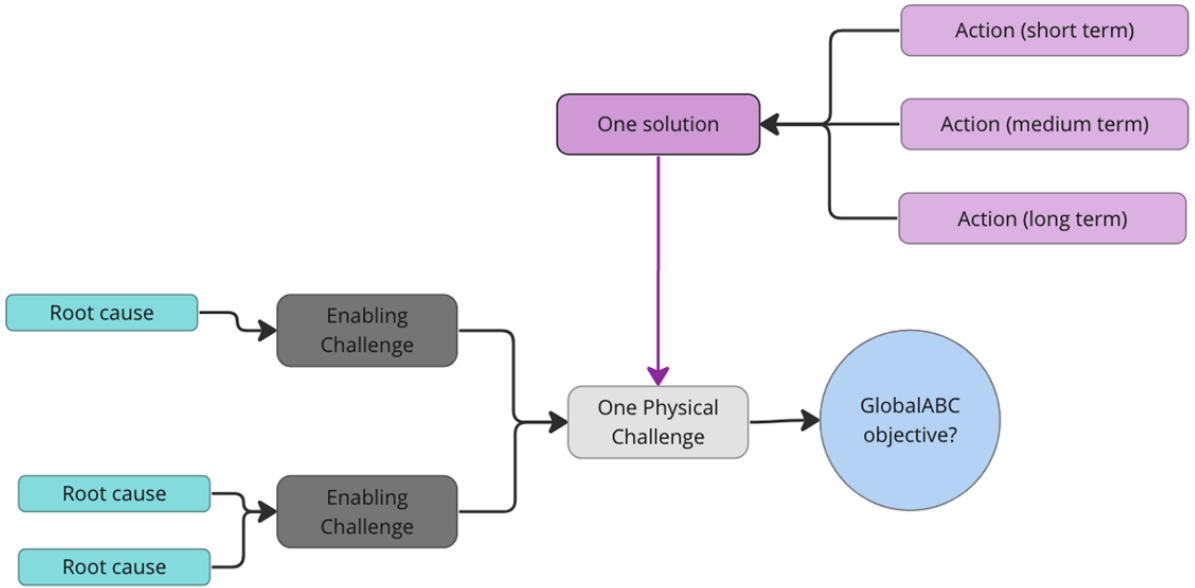
IEA 2024. CC BY 4.0.

EXAMPLE: The Colombia Roadmap - Transformative Actions

IEA 2024. CC BY 4.0.

Activity: From Challenges to Actions - 40 minutes

1. Select **one GlobalABC action area.**
2. Identify **one physical environment challenge** within this action area from your country.
3. Identify related **enabling environment challenges** and their **root causes.**
4. Identify **one solution** and the related **actions** that should be implemented.
5. List the **stakeholders** who need to be involved in.



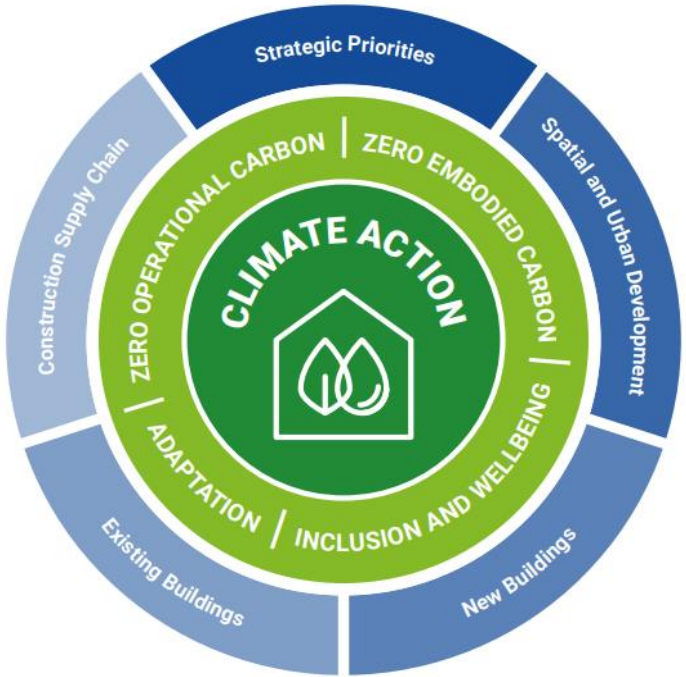
Stakeholders to involve:
1.
2.
3.
4.
5.
etc...

22 *You have **15 minutes** to develop the table. Then each group will have **5 minutes** to present.*

IEA 2024. CC BY 4.0.

Activity: from Challenges to Actions - 40 minutes

1. Select **one GlobalABC action area.**



5 Action Areas:

- Strategic Priorities
- Spatial and Urban Development
- New Buildings
- Existing Buildings
- Construction Supply Chain

23

IEA 2024. CC BY 4.0.

Activity: from Challenges to Actions - 40 minutes

2. Identify **one physical environment challenge** within this action area from your country.

Examples:

- High land consumption due to sprawl
- High and increasing use of air conditioning
- Poor flood drainage and other flood mitigation systems
- Generalised use of high embodied carbon materials: concrete and cement blocks

IEA 2024. CC BY 4.0.

Activity: from Challenges to Actions - 40 minutes

3. Identify related **enabling environment challenges** and their **root causes.**

Examples:

E.E Challenges:

- No construction regulations
- No adaptation plans
- Limited national offer of low carbon materials
- Lack of local capacities to undertake environmental impact assessments

Root causes:

- Limited revenues from land use taxes
- Lack of political commitment to update the construction codes.
- No academic programs teaching environmental impact assessment.

IEA 2024. CC BY 4.0.

Activity: from Challenges to Actions - 40 minutes

4. Identify **one solution** and the related **actions** that should be implemented.

Examples:

Solutions:

- A new construction codes that integrates energy efficiency regulations
- A urban expansion plans for the three main cities
- New flood mitigation infrastructure

Actions:

- Develop national guidance for every local government to update its construction code
- Pass a law making it mandatory to have construction codes updated every 5 years with stringent measures for climate actions
- Create a national entity offering technical support for local governments to update their construction codes

IEA 2024. CC BY 4.0.

Activity: from Challenges to Actions - 40 minutes

5. List the **stakeholders** who need to be involved in.

Examples:

- Cement industry
- Civil society organisations working on social inclusion
- Ministry of urban development and housing
- Local governments
- Donors
- National banks
- Construction worker unions

IEA 2024. CC BY 4.0.

Africa Energy Efficiency Policy in Emerging Economies Training Week

Buildings

Nairobi

18-22 March 2024

https://www.iea-events.org/energy-efficiency-training-week-nairobi

International Energy Agency

Energy Efficiency Training Week – Buildings – Day 3: 18. Energy efficiency Minister’s game

Minister’s Game

- Within your group, your Minister has asked your team to prepare elements of a Policy Package for achieving an efficient net-zero building stock. Your minister then has asked you to present each of your elements to an elementary school.

- Each team will separately prepare a poster with content on:
  - Buildings regulation
  - Design of an energy efficient home
  - Building energy performance label
  - Grid-interactivity requirements for buildings
  - An incentive scheme

- In 30 minutes, discuss and agree on your policy package element, exchange with other groups to align the strategies of the elements across the groups.

- Then, in 30 minutes, create a skit to present your policy package element to an elementary school class – no slides needed, lots of creativity.

IEA 2024. CC BY 4.0.

Minister’s Game

Instructions:

- Your Audience has a short attention span, so the presentation:
  - ❑ Cannot exceed 5 minutes
  - ❑ should be memorable and designed to impress
  - ❑ provide main assumptions
  - ❑ focus on key messages only

IEA 2024. CC BY 4.0.

International Energy Agency

Energy Efficiency Training Week