



Bureau of Energy Efficiency



सत्यमेव जयते
Government of India
Ministry of Power



german
cooperation
DEUTSCHE ZUSAMMENARBEIT

giz Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH

ANGAN

Augmenting Nature by Green Affordable New-habitat

A Courtyard for Revolutionary Change in Building Energy Efficiency

An International Conference on Building Energy Efficiency

9th-11th September, 2019 | Hotel The LaLiT, New Delhi





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Zusammenarbeit (GIZ) GmbH

THIS PRESENTATION WAS SHARED BY

Mr. Spondon Bhagowati

Green Building Consultant, International Finance Corporation (IFC)

FOR THE SESSION:

“Policy Framework for Energy Efficiency in Buildings (Rating and Labelling System)”

DURING ANGAN 2019

Knowledge Partner

teri | THE ENERGY AND
RESOURCES INSTITUTE
Creating Innovative Solutions for a Sustainable Future

Event Partner

TEC INDIA™
EVENT & BRAND MANAGEMENT CO.

A nighttime photograph of a modern cityscape. In the foreground, a curved, illuminated walkway or bridge structure arches over a street. The street is filled with light trails from moving vehicles. In the background, several tall, modern buildings are lit up, with one prominently displaying the 'EDGE' logo. The overall scene is vibrant and futuristic.

Key Policies and Strategies for Developing Green Buildings & Introduction to EDGE

ANGAN, 2019

URBANIZATION IN INDIA

India has a population of **1.3 billion**
(272 million households)



17.7% of the world's population

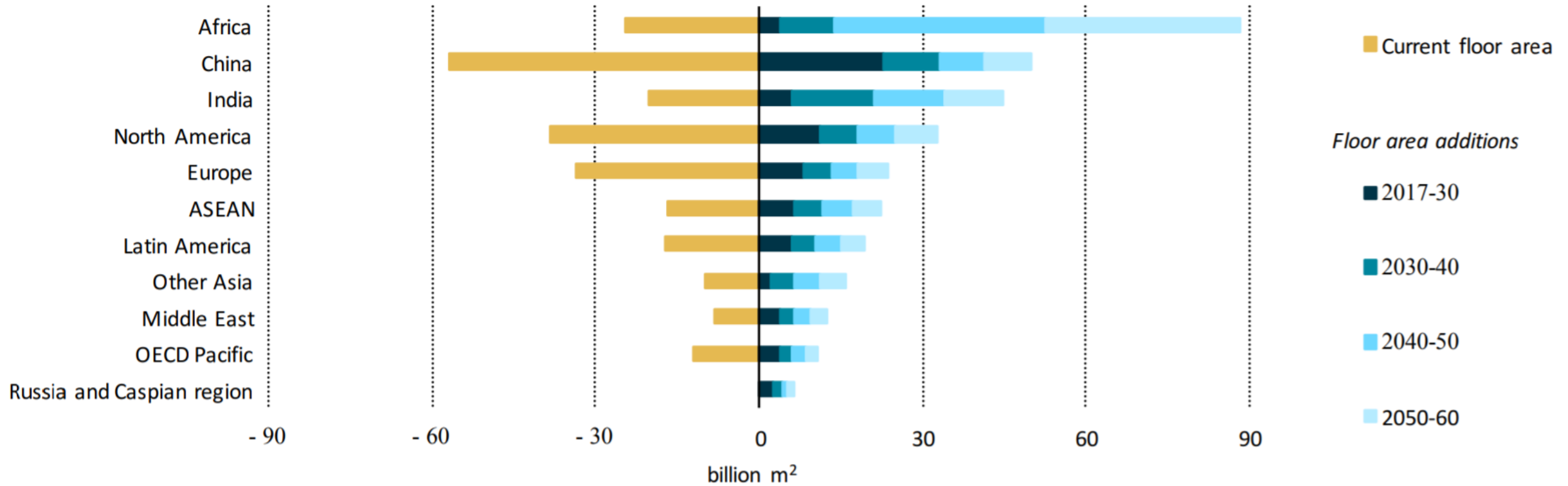
450 million Indians live in cities



More than the total population of the US

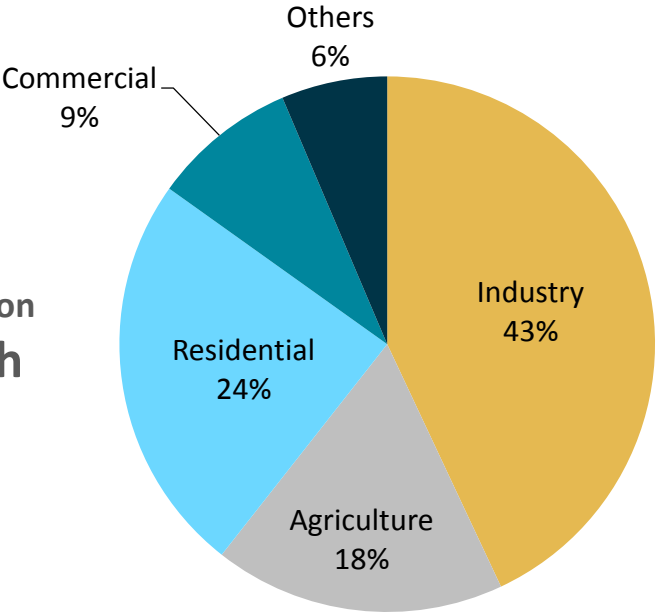
GROWTH OF INDIA'S BUILDING SECTOR FOOTPRINT

Floor area additions to 2060 by key regions

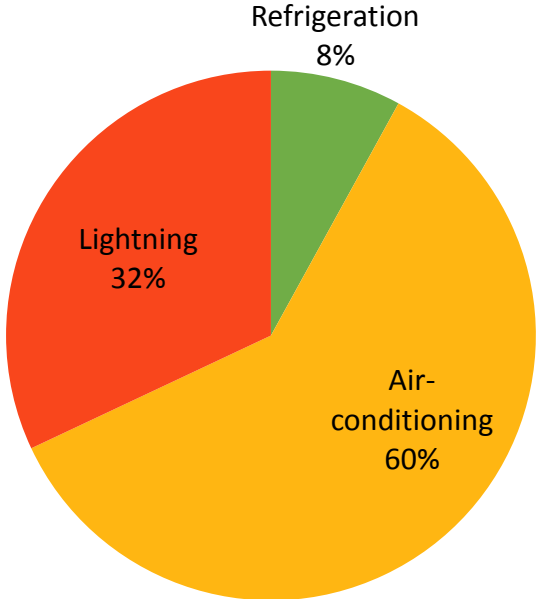
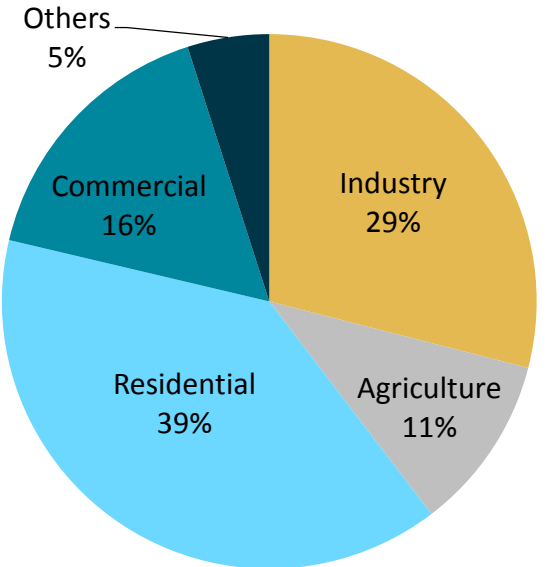


ENERGY CONSUMPTION PATTERNS OF BUILDINGS

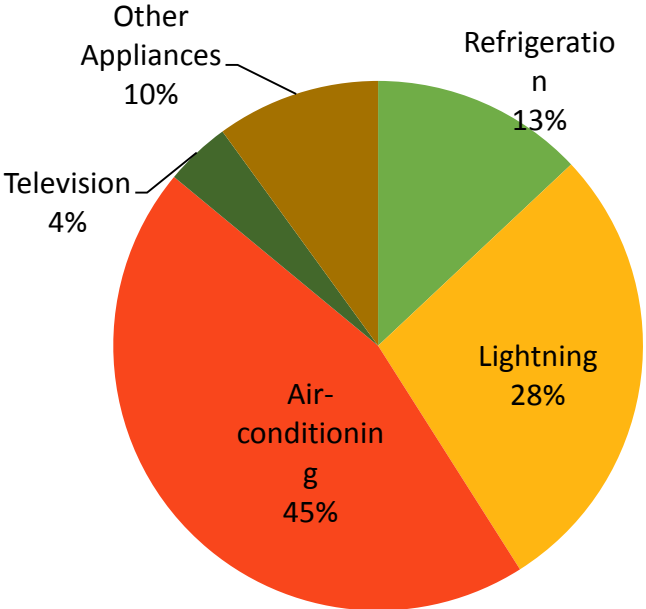
Electricity Consumption
2015 - 985 TWh



Electricity Consumption
2047 - 4711 TWh

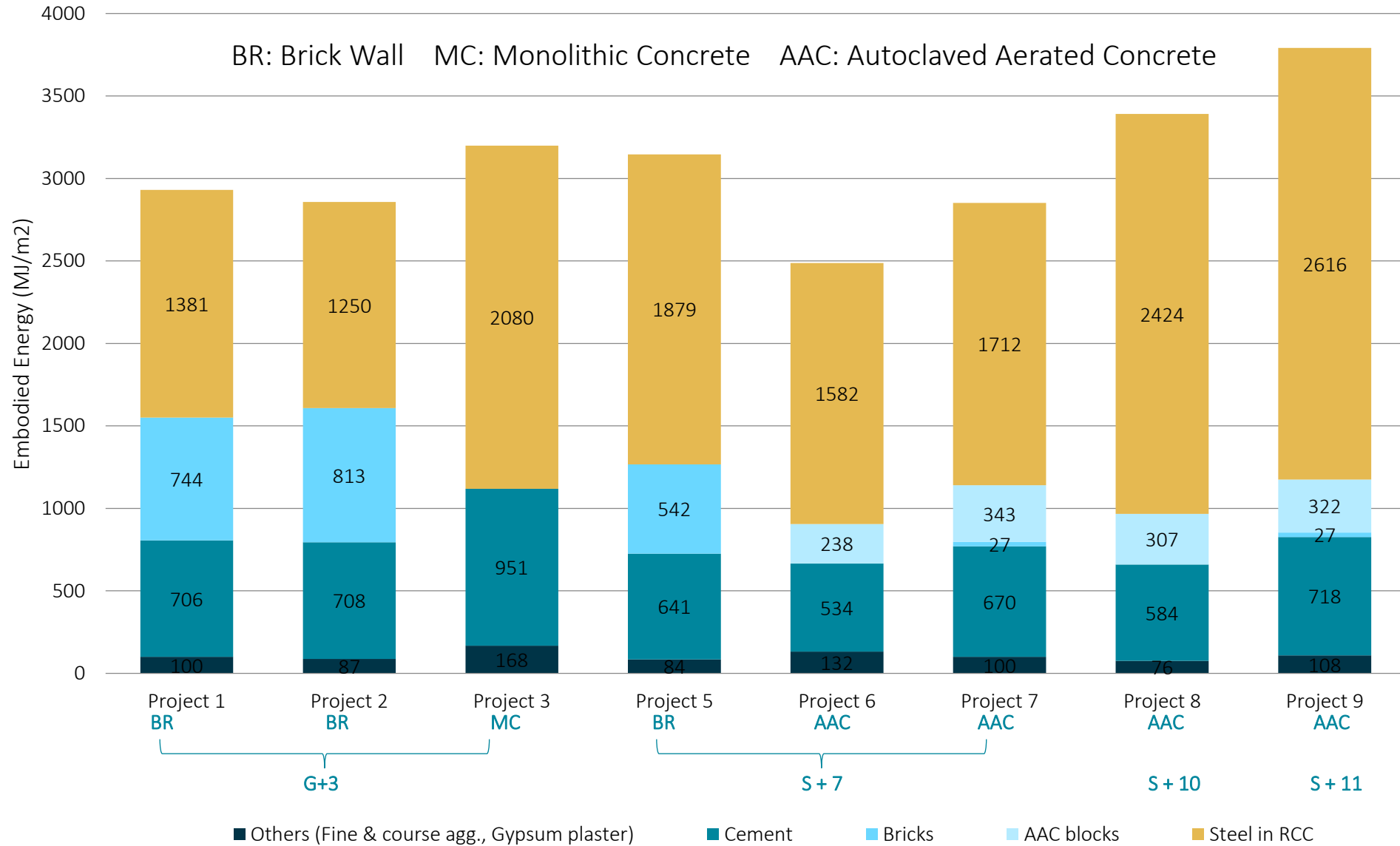


Typical **commercial building** estimated average electricity consumption



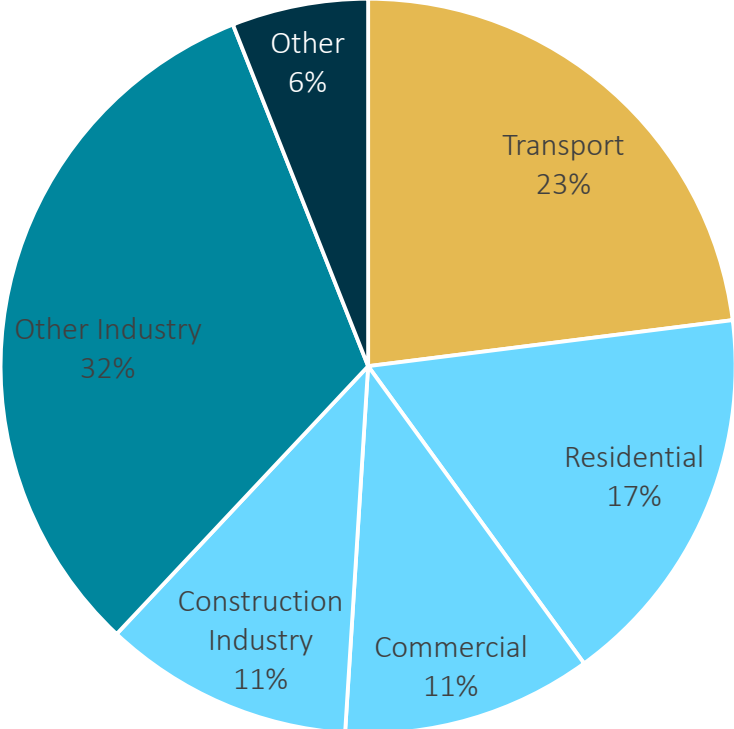
Typical **residential building** estimated average electricity consumption

EMBODIED ENERGY PATTERNS FOR BUILDING MATERIALS

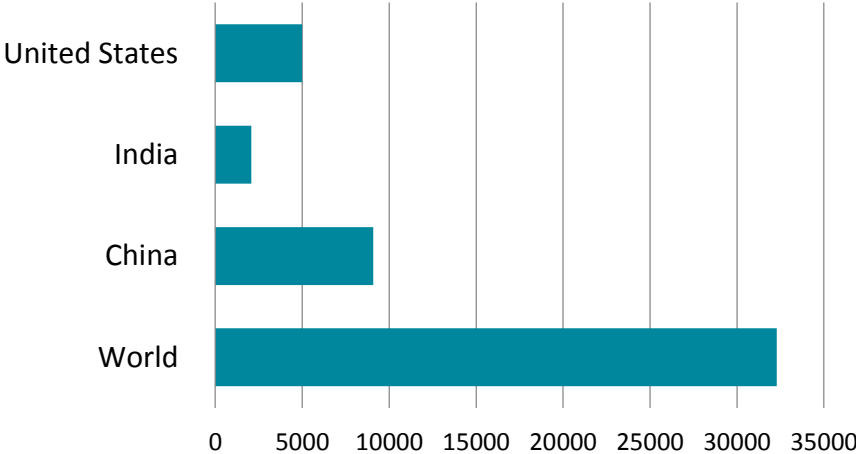


INDIA'S BUILDING SECTOR EMISSIONS

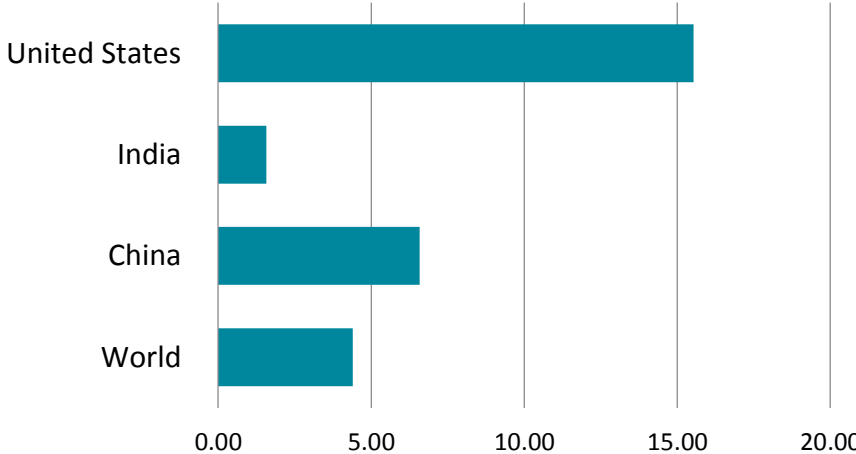
Global CO₂ emissions by sector



CO₂ emissions (Mt of CO₂)



CO₂ emissions/ capita



Source: Global Status Report 2018,

IMPACTS OF NON-GREEN BUILDINGS

Non-green buildings have major negative impacts !!!

Degradation of Natural Eco-systems



Source: iucn.org

Unhealthy Indoor Spaces & Rising Healthcare Costs



Source: World Bank

Scarcity of Resources & Higher Operational Costs



Source: telegraph.co.uk

KEY POLICIES & INTERVENTIONS FOR SCALING UP GREEN BUILDINGS

- **Expedited Permitting**
 - Fast Tracking of Environmental Clearance (EC) for green certified projects
- **Reduced Permitting**
 - Reduced GST on green certified projects & sustainable materials
- **Reduced stamp duty & Property Tax Incentive**
- **Height bonus or Extra FAR**
- **Green Building Legislation**
- **Grants**
- **Loan Programs**

IFC's GREEN BUILDING MARKET TRANSFORMATION STRATEGY



DEFINITION OF A GREEN BUILDING



BETTER
PERFORMANCE
THAN THE
LOCAL BASELINE

&



CERTIFIABLY GREEN
AS VERIFIED BY
AN INDEPENDENT
THIRD PARTY

&



QUANTIFIED
IMPACT REPORTING

HOW CAN YOU CHOOSE THE MOST COST-EFFECTIVE OPTIONS TO DESIGN GREEN? AND HOW WILL END USERS RECOGNIZE THE VALUE?



THE SOLUTION IS EDGE

① FREE SOFTWARE



② ACHIEVABLE STANDARD



③ VERIFIED GREEN LABEL



THE FREE SOFTWARE SHOWS HOW TO CUT BACK ON THE RESOURCE INTENSITY OF A BUILDING'S DESIGN



THE EDGE STANDARD FOCUSES ON THREE CATEGORIES OF **RESOURCE EFFICIENCY**



EDGE CERTIFICATION VERIFIES THE GREEN BENEFITS

THIS CERTIFIES THAT
**Clubview Residential Development
Unit 1**
HAS ACHIEVED AN
EDGE PRELIMINARY CERTIFICATE

CERTIFICATE NUMBER
LP4-ZAF-15129665500123-1-P

Exemplifying achievement in
the following areas:

- 25%**
Energy Savings
- 24%**
Water Savings
- 54%**
Less Embodied
Energy in Materials

Edge Excellence In Design
For Greater Efficiencies

DEVELOPED BY
Kale Developments

CERTIFIED BY
Green Building Council South Africa


Brian Wilkinson, CEO
Date of Issue: 11/1/2015

 **GREEN BUILDING COUNCIL SOUTH AFRICA**

 **WORLD BANK GROUP**
THE WORLD BANK IFC International Finance Corporation

THIS CERTIFIES THAT
Clubview Residential Development, Unit 1
Von Willich Avenue, Clubview
Centurion
Pretoria, Gauteng 0110
South Africa

DEVELOPED BY
Kale Developments

HAS ACHIEVED AN
EDGE PRELIMINARY CERTIFICATE

CERTIFICATE NUMBER
LP4-ZAF-15129665500123-1-P

WAS AUDITED BY
Iminathi Danjuma
EDGE Software Version: 2.0.0

CERTIFIED BY
Green Building Council South Africa


Brian Wilkinson, CEO

 **GREEN BUILDING COUNCIL SOUTH AFRICA**

www.edgebuildings.com

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The EDGE standard requires 20% efficiencies in energy, water and materials compared to a local benchmark. Predicted energy is not a guarantee of future performance. Energy savings may be associated with virtual energy for comfort depending on the presence of heat/gain cooling systems. Virtual energy does not contribute savings to utility bills.

This certificate is issued by the Certifier based on the audit by the Auditor, and is subject to the terms and conditions of the Certifier. Contact edge@ifc.org if the above measures are not consistent with your observations on the project.

 **WORLD BANK GROUP**
THE WORLD BANK IFC International Finance Corporation



Edge Excellence In Design
For Greater Efficiencies

ENERGY MEASURES
Reduced Window to Wall Ratio
Natural Ventilation
Heat Pump for Hot Water
Energy-Saving Light Bulbs - Internal Spaces
Lighting Controls for Common Areas & Outdoors
Smart Meters

WATER MEASURES
Low-Flow Faucets for Kitchen Sinks
Dual Flush for Water Closets

MATERIALS
External Walls: Solid Dense Concrete Blocks
Internal Walls: Solid Dense Concrete Blocks

THE EDGE APP IS FREE & AVAILABLE ONLINE AT WWW.EDGEBUILDINGS.COM

World Bank Group [US] | edgebuildings.com

Apps Edge EDGE Auditors list Hotel Industry To S... MyGov Innovation |... Ragini's Work - On...

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SIX BUILDING TYPOLOGIES MAY BE EVALUATED IN EDGE

The screenshot displays the IFC EDGE software interface. On the left, a sidebar menu lists six building typologies: Homes, Hospitality, Retail, Offices (highlighted in blue), Hospitals, and Education. The main dashboard area shows a 'Preliminary' status and a 'DASHBOARD' button. Below this, a table of performance metrics is displayed:

Metric	Value	Unit
Final Water Use	263.25	m ³ /Month
Operational CO ₂ Savings	351.95	tCO ₂ /Year
Embodied Energy Savings	729.71	MJ/m ²
Base Case Utility Cost	777,890.50	Rs/Month
Utility Cost Reduction	363,750.00	Rs/Month

Below the metrics table, three green checkmarks indicate savings percentages: 46.33% (Water), 76.36% (Water), and 28.96% (Materials). A 'HIDE RESULTS' button is visible on the right. The bottom section of the interface contains a form for project details, including fields for 'Address Line1', 'Address Line2', 'City' (filled with 'Kadi'), and 'State/ Province'.

USER FRIENDLY INTERFACE

MENU



[Switch to the old interface](#)



Expanded View

English ▾

Home



Spondon Bhagwati ▾

Offices

Preliminary

DASHBOARD

Version 2.1.5 ▾

File ▾

SAVE

Final Energy Use

46,581.75

kWh/Month

Final Water Use

263.25

m³/Month

Operational CO₂ Savings

356.68

tCO₂/Year

Embodied Energy Savings

732.04

MJ/m²

Base Case Utility Cost

777,890.50

Rs/Month

Utility Cost Reduction

368,530.00

Rs/Month



Design



Energy 46.96%



Water 76.36%



Materials 29.05%

HIDE RESULTS ^

Project Details

Project Name*

[Redacted]



Address Line1

Number of Distinct Buildings*

1

Address Line2

Number of EDGE Subproject(s) associated

2

City

Kadi

Total Project Floor Area (m²)

State/ Province

ENERGY EFFICIENCY PARAMETERS

MENU



[Switch to the old interface](#)

Expanded View

English ▾

Home



Spondon Bhagowati ▾

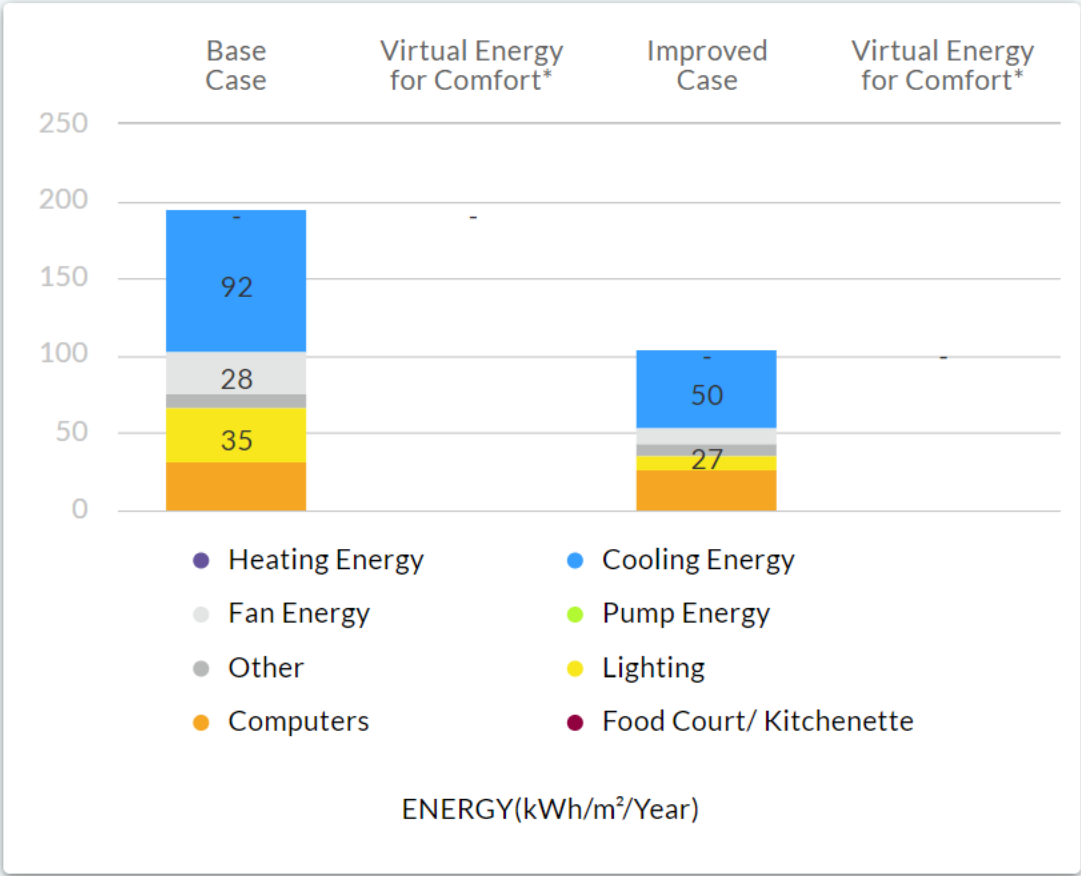
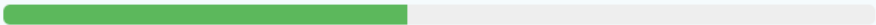
Energy Efficiency Measures

Choose energy efficiency measures to achieve savings of at least 20%.

- OFE01* Reduced Window to Wall Ratio - WWR of 30%
- OFE02 Reflective Paint/Tiles for Roof - Solar Reflectivity (albedo) of 0.7
- OFE03 Reflective Paint for External Walls - Solar Reflectivity (albedo) of 0.7
- OFE04 External Shading Devices - Annual Average Shading Factor (AAS...

AASF
- OFE05 Insulation of Roof : U-value of 0.447

46.33% Meets EDGE Energy Standard



KEY ENERGY EFFICIENCY STRATEGIES FOR EDGE COMPLIANCE

- **Optimized Window to Wall Ratio (WWR)**
- **External shading devices for glazing**
- **High thermal performance glazing**
- **Reflective paints /tiles for roofs**
- **Energy-efficient lighting**
- **Lighting controls**
- **Renewable energy**

MATERIALS EFFICIENCY PARAMETERS

MENU



[Switch to the old interface](#)

Expanded View

English ▾

Home

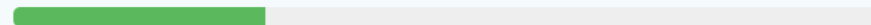


Spondon Bhagowati ▾

Materials Efficiency Measures

Choose building material options to achieve savings of at least 20%, indicating thickness.

28.96% Meets EDGE Material Standard



Floor Slabs

In-Situ Reinforced Concrete Slab ▾

OFM01*

Thickness (mm)	Steel Rebar (kg/m ²)
<input type="text" value="150"/>	<input type="text" value="25"/>

Roof Construction

Type 1

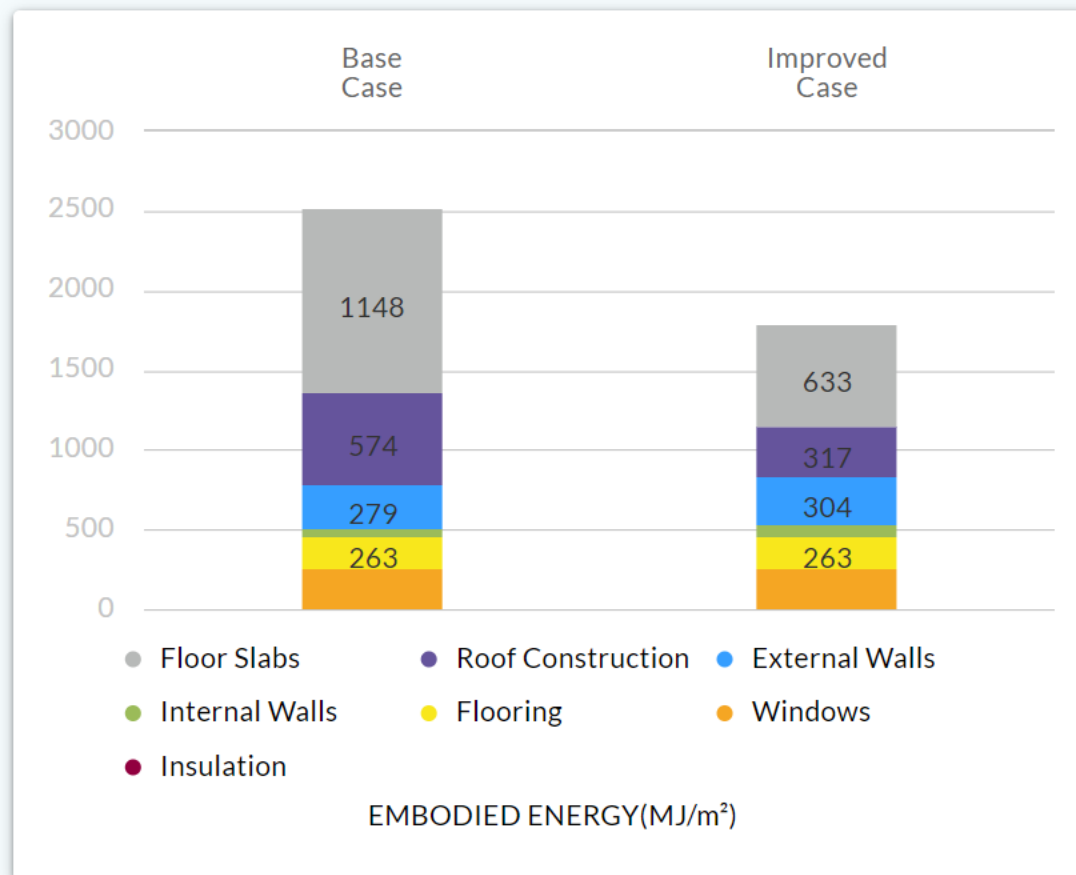
In-Situ Reinforced Concrete Slab ▾

OFM02*

Proportion %	Thickness (mm)	Steel Rebar (kg/m ²)
<input type="text" value="100"/>	<input type="text" value="150"/>	<input type="text" value="25"/>

External Walls

Type 1



KEY MATERIAL EFFICIENCY STRATEGIES FOR EDGE COMPLIANCE

- **Optimized RCC structure**
- **Materials containing recycled content**
- **Locally available materials**

WATER EFFICIENCY PARAMETERS

MENU



[Switch to the old interface](#)



Expanded View

English ▾

Home



Spondon Bhagowati ▾

Water Efficiency Measures

Choose water efficiency measures to achieve savings of at least 20%.

✓ OFW01* Low-Flow Faucets in All Bathrooms - 2 L/min ⋮

L/min

✓ OFW02* Dual Flush for Water Closets in All Bathrooms - 2 L/first flush a... ⋮

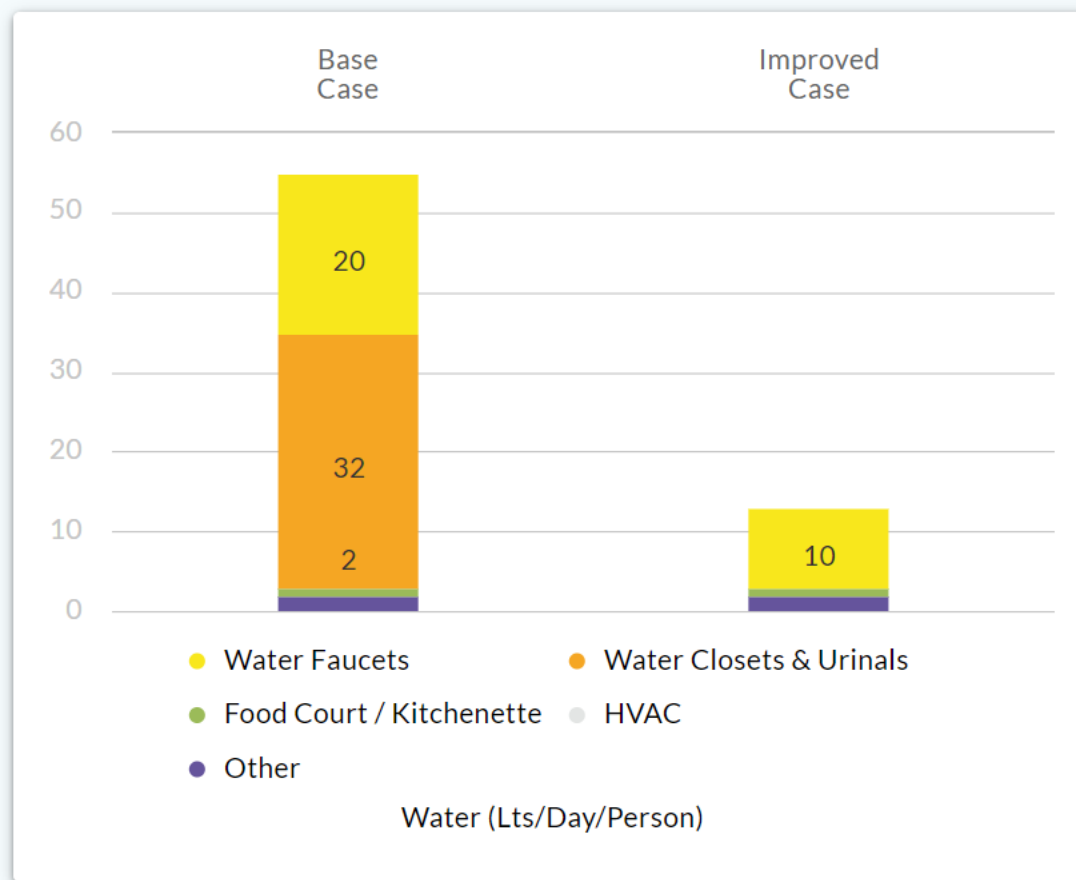
Single Flush/Flush Valve

1st - L/flush

2nd - L/flush

✓ OFW03* Water-Efficient Urinals in All Other Bathrooms - 2 L/flush ⋮

76.36% Meets EDGE Water Standard



KEY ENERGY EFFICIENCY STRATEGIES FOR EDGE COMPLIANCE

- **Low-flow taps and showers**
- **Dual-flush**
- **Recycling and Reuse of waste water for daily usage like flushing, landscaping etc.**
- **Rainwater harvesting and use**

OTHER RESULTS WHICH MAY BE DERIVED FROM THE EDGE TOOL

Offices

Preliminary

DASHBOARD

Version 2.1.5

File

SAVE

Final Energy Use

47,129.19

kWh/Month

Final Water Use

263.25

m³/Month

Operational CO₂ Savings

351.95

tCO₂/Year

Embodied Energy Savings

729.71

MJ/m²

Base Case Utility Cost

777,890.50

Rs/Month

Utility Cost Reduction

363,750.00

Rs/Month

Design

Energy 46.33%

Water 76.36%

Materials 28.96%

HIDE RESULTS

Final Energy Use

Final Water Use

Operational CO₂ savings

Embodied energy savings

Base Case Utility costs

Utility Cost Reduction

Offices

Preliminary

DASHBOARD

Version 2.1.5

File

SAVE

Utility Cost Reduction

363,750.00

Rs/Month

Incremental Cost

2,357,186.46

Rs

Payback in Years

0.54

Yrs.

Energy Savings

488.34

MWh/Year

Water Savings

7,371.00

m³/Year

Total Subproject Floor Area

5,400.00

m²

Design

Energy 46.33%

Water 76.36%

Materials 28.96%

HIDE RESULTS

Incremental Cost

Payback in Years

Energy Savings

Water Savings

EACH CERTIFIED PROJECT RECEIVES A PROJECT STUDY.



~33% ENERGY SAVINGS



~29% WATER SAVINGS



~23% EMBODIED ENERGY SAVINGS

VBHC VAIBHAVVA



GREEN MEASURES

- Reduced window to wall ratio
- Energy-efficient lighting & fans
- Reflective paints on the roof
- Low-flow fixtures
- Recycled black water for flushing
- Optimized RCC structure

EACH CERTIFIED PROJECT RECEIVES A PROJECT STUDY.



~21% ENERGY SAVINGS



~23% WATER SAVINGS



~30% EMBODIED ENERGY SAVINGS

SAMHI's Fairfield by Marriott



GREEN MEASURES

- Reduced window to wall ratio
- Low-E coated glass
- Energy-saving light bulbs
- Air conditioning with water cooled screw chiller
- Variable speed drives
- Dual flush water closets in all bathrooms
- Black water treatment and recycling system
- Optimized RCC structure
- Laminated wooden flooring

EACH CERTIFIED PROJECT RECEIVES A PROJECT STUDY.



27% ENERGY SAVINGS



26% WATER SAVINGS



25% EMBODIED ENERGY SAVINGS

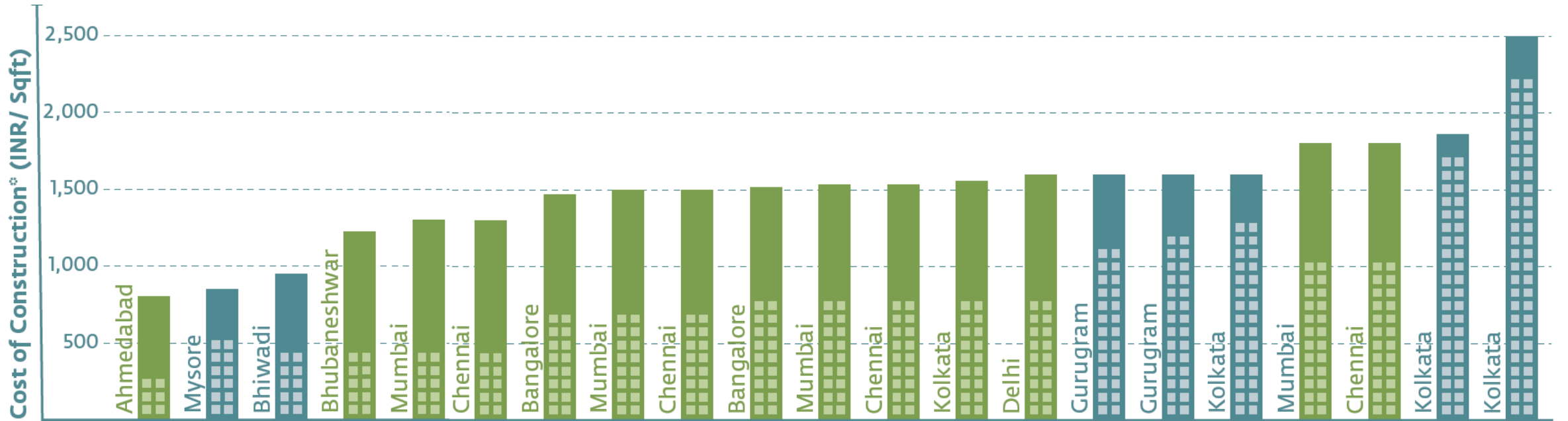
TPARK BANGPLEE 4, THAILAND



GREEN MEASURES

- Reduced window to wall ratio
- Low-E coated glass
- Energy-saving light bulbs
- Energy-efficient Air Conditioning systems
- Dual flush water closets in all bathrooms
- Black water treatment and recycling system

GREEN RESIDENTIAL BUILDINGS DO NOT COST MORE



Green Homes
 Non-green Homes

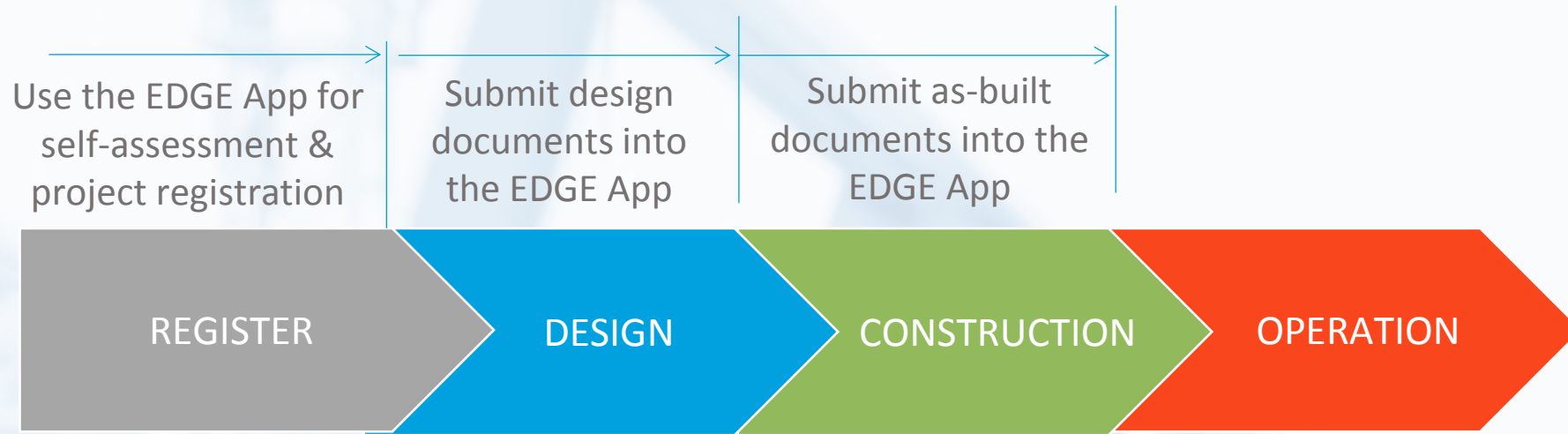
Number of floors (2 windows represent 1 floor)

*Cost of construction does not include land acquisition or infrastructure costs

EDGE DEMONSTRATION



CERTIFICATION WORKFLOW FOR EDGE



PRELIMINARY EDGE CERTIFICATE

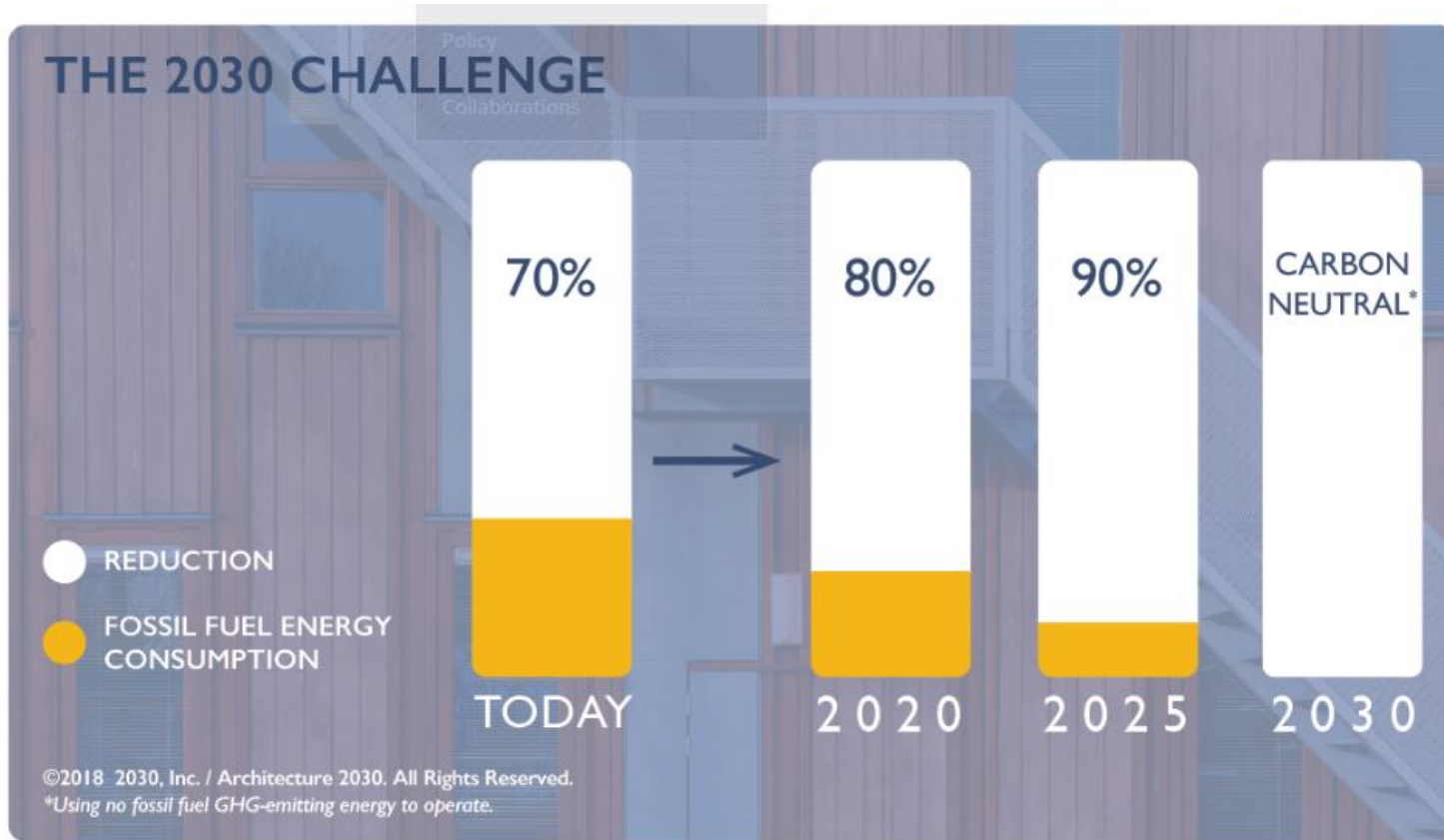
- EDGE co-marketing and project study for sales promotion
- Preliminary Certificate serves as **proof of compliance** for the investor

FINAL EDGE CERTIFICATION

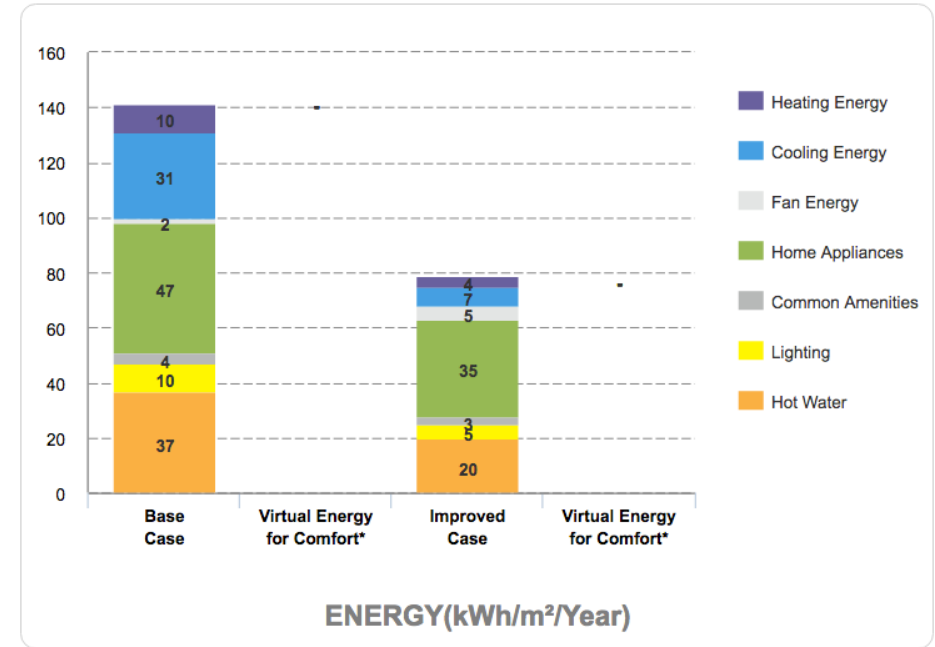
- Final proof of compliance
- Impact reporting for the project
- Model unit showcase opportunity



EDGE IS A JOURNEY TOWARD NET ZERO CARBON

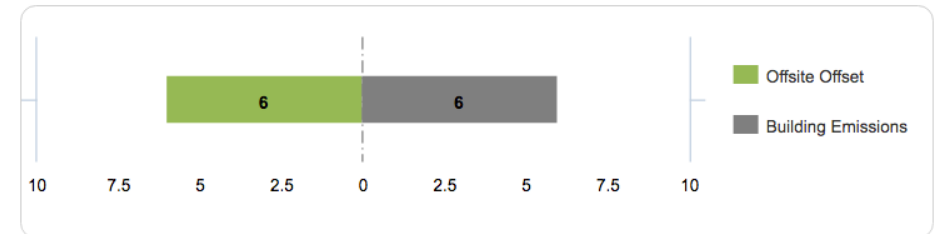


45.65% Meets EDGE Energy Standard



Show the Carbon Savings

0.00 tCO₂/Year Meets Zero Net Carbon Standard



HOW EDGE IS UNIQUE



FINANCIAL CALCULATOR



EASY IMPACT REPORTING



SIMPLIFIED COMPLIANCE



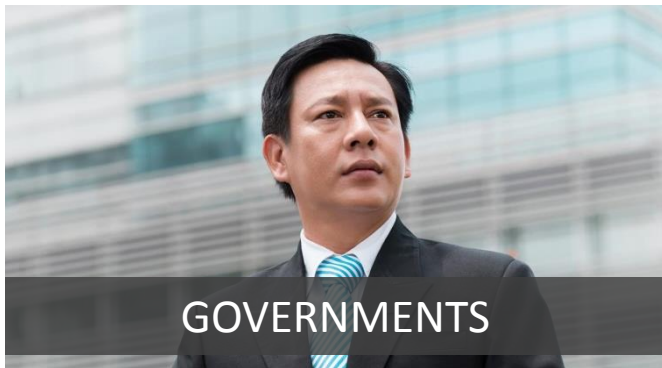
COST-EFFECTIVE



REDUCED PROCESSING



WORLD BANK GROUP BRAND



GREEN BUILDINGS
FOR A SMARTER WORLD

EDGE ACKNOWLEDGMENTS

The following major donors have demonstrated their generous support of the EDGE program:



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs,
Education and Research EAER
State Secretariat for Economic Affairs SECO



UK Government

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The European Union; the Ministry of Finance of Japan; the Hungarian Export Import Bank; the Canada Climate Change Program and the Department of Foreign Affairs, Trade and Development Canada; the Royal Ministry of Foreign Affairs of Denmark and the Danish Green Growth Fund; the Federal Ministry of Finance of Austria; and the Ministry of Foreign Affairs of Finland. In addition, the support of the GEF-IFC Earth Fund Platform and the Energy Sector Management Assistance Program (ESMAP) of the World Bank helped seed EDGE.

