



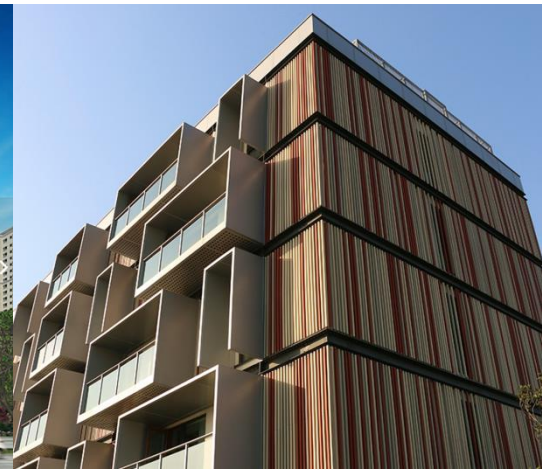
GREEN BUILDINGS RETURN ON INVESTMENT: MIDDLE EAST AND NORTH AFRICA



Creating Markets, Creating Opportunities

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EGYPT: GREEN BUILDINGS RETURN ON INVESTMENT



Creating Markets, Creating Opportunities

EGYPT - ROI NEEDED TO REACH EDGE STANDARD



	Incremental Cost	Payback Period in Years	Utility Savings / month
Homes	\$240	2	\$10 /unit
Hotels	\$226,000	2	\$8,500
Shopping Centers	\$77,400	1	\$6,100
Offices	\$211,000	1	26,500
Schools	\$14,000	3	\$430
Hospitals	\$160,500	2	\$7,200
Light Industry	\$200,000	6.5	\$2,500



HOMES – EGYPT CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Unit	Average Unit Area	Bedrooms / Unit	Floors	Units
Low Income	80m ²	2	10	50



Energy Measures – 23% Savings through:

- Energy-Saving Light Bulbs - Internal Spaces
- Reflective Paint/Tiles for Roof - Solar Reflectivity



Water – 21% Savings through:

- Low-Flow Showerheads
- Low-Flow Faucets for Washbasins
- Dual Flush for Water Closets

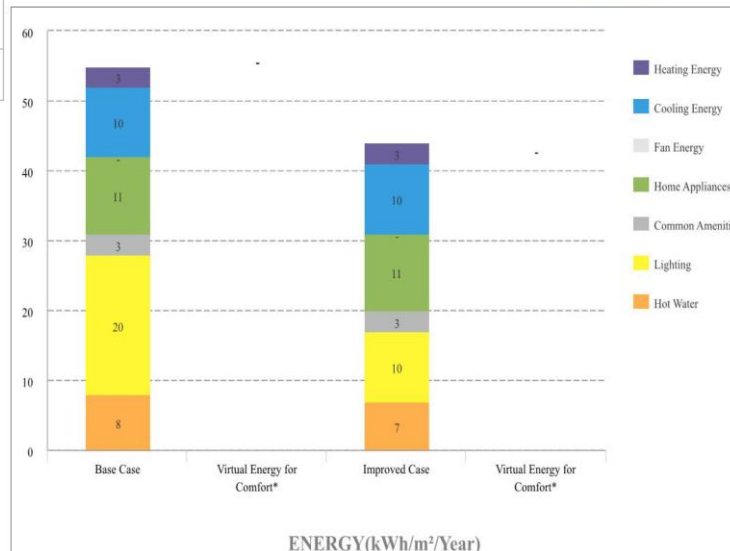


Materials – 22% Savings through:

- Concrete Filler Slab

Energy Efficiency Measures 23.52%

ENERGY SAVINGS Meets EDGE Energy Standard



PROJECT METRICS

Incremental Cost
\$ 240

Utility Costs Savings
\$ 10 / month

Payback in Years
2

Operational CO₂
Savings
\$ 0.5 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 33% Savings through:

- Reduced window to wall ratio.
- Reflective paint for external walls,
- External shading devices, energy-efficient ceiling fans,
- Energy-saving light bulbs in internal spaces/commons areas
- Solar hot water collectors.



Water – 39% Savings through:

- Low-flow plumbing fixtures.
- Dual-flush water closets.
- Black water treatment and recycling system.
- Rainwater harvesting systems



Materials – 23% Savings through:

- 150mm in-situ reinforced internal and external walls.



VBHC – Vaibhava Bangalore (India)

In-country certified project to replace related example once an EDGE project is certified.

HOTELS – EGYPT CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Hotel	Floors Above Ground	Total Guest Units	Internal Area
4 Star Hotel	8	200	15,600 m ²



Energy Measures – 21% Savings through:

- External Shading Devices - Annual Average Shading Factor
- Insulation of Roof - U Value of 0.44
- Energy-Saving Light Bulbs - Internal Spaces



Water – 22% Savings through:

- Low-Flow Showerheads and Faucets Guestrooms
- Low-Flow Faucets in Guest Rooms
- Dual Flush for Water Closets in Guest Rooms
- Water-Efficient Front Loading Washing Machine
- Water-Efficient Urinals in all Other Bathrooms

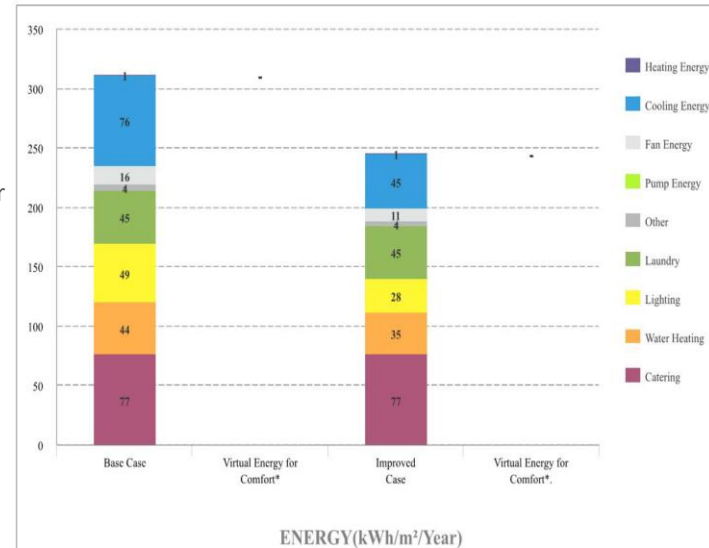


Materials – 37% Savings through:

- Composite In-Situ Concrete and Steel Deck

Energy Efficiency Measures 21.17%

ENERGY SAVINGS Meets EDGE Energy Standard



PROJECT METRICS

Incremental Cost
\$226,000

Utility Costs Savings
\$ 8,500 / month

Payback in Years
2

Operational CO₂
Savings
\$ 400 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 22% Savings through:

- Reduced window to wall ratio
- Insulation of roof,
- Low-E coated glass
- High-efficiency boiler for hot water
- Air conditioning with air cooled screw chiller, variable speed drives pumps
- Sensible heat recovery from exhaust air



Water – 24% Savings through:

- Low-Flow Faucets in Kitchens and Bathrooms
- Single Flush and Flush Valve for Water Closets
- Water-Efficient Urinals
- Aerators and Auto Shut-off Faucet in Bathrooms



Materials – 22% Savings through:

- Medium-weight hollow concrete blocks for internal and external walls
- Terrazzo tile flooring.



Radisson Blu Hotel – Exchange Complex (Ghana)

In-country certified project to replace related example once an EDGE project is certified.

SHOPPING CENTERS – EGYPT CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Site Area	Car Parking	Landscaped Area	Amenities
15,000 m ²	Indoor Car Parking	1,000,000 m ²	Supermarket, Food Court



Energy Measures – 20% Savings through:

- Reflective Paint/Tiles for Roof -Solar Reflectivity
- Insulation of Roof: U-Value of 0.442
- Variable Refrigerant Flow (VRF) Cooling System



Water – 22% Savings through:

- Dual Flush for Water Closets in all Bathrooms
- Single Flush/Flush Valve



Materials – 22% Savings through:

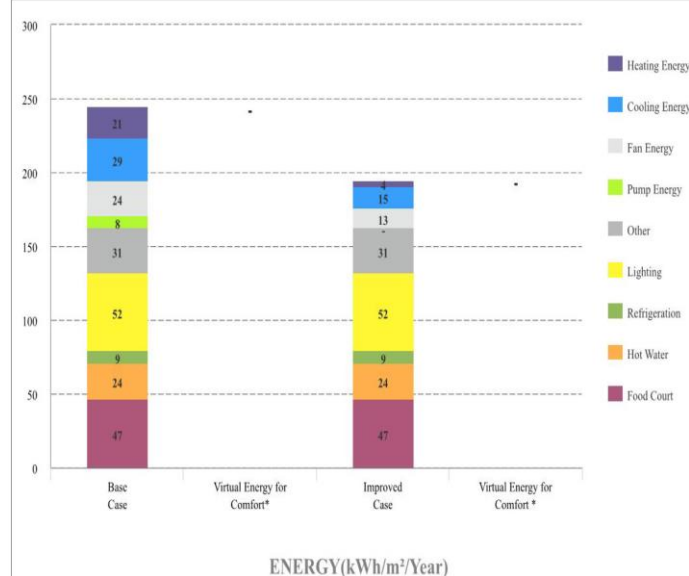
- Composite In-Situ Concrete and Steel Deck

Energy Efficiency measures 20.27%

Energy Savings

Meets EDGE energy standard

PROJECT METRICS



Incremental Cost
\$ 77,400

Utility Costs Savings
\$ 6,100 / month

Payback in Years
1

Operational CO₂
Savings
\$ 300 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 29% Savings through:

- Reduced Window to Wall Ratio, Reflective Paint for Roof
- Variable Refrigerant Volume (VRV) Cooling System
- Energy Saving Lighting, Solar Photovoltaics



Water – 49% Savings through:

- Low-Flow Plumbing Fixtures
- Aerators and Auto Shut-off Faucet in All Washrooms
- Rainwater Harvesting System



Materials – 36% Savings through:

- In-Situ Reinforced Concrete Floor Slabs
- Steel (zinc or galvanized iron) sheets on steel rafters for roof
- Steel profile cladding for external walls



SAVEMAX SUPER GROSIR CIBUBUR (INDONESIA)

In-country certified project to replace related example once an EDGE project is certified.

OFFICES – EGYPT CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Gross Internal Area	Floors Above Grade	Floors Below Grade	Floor-to-Floor Height
5000m ²	3	2	3.5m



Energy Measures – 25% Savings through:

- Low-E Coated Glass - U-Value of 3 W/m² K and SHGC
- Reduced Window To Wall Ratio
- Energy-Saving Light Bulbs - Internal Spaces



Water – 23% Savings through:

- Low-Flow Faucets in Bathrooms - 2 lt./min
- Dual flush for water closets in bathrooms
- Single Flush/Flush Valve

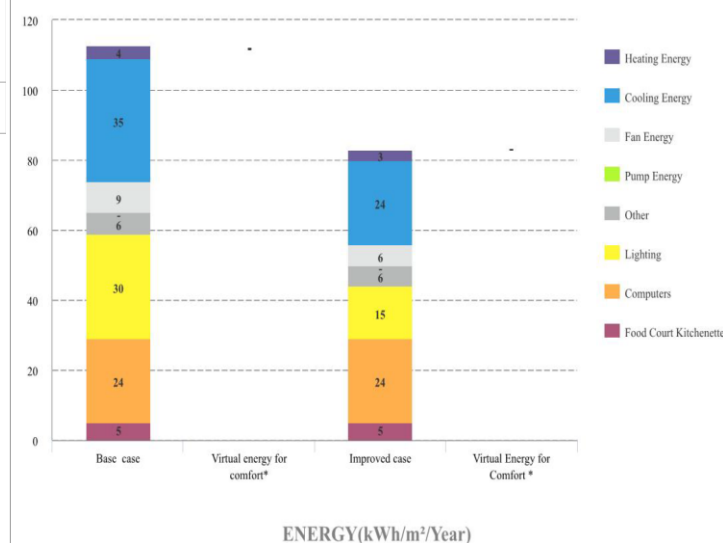


Materials – 30% Savings through:

- Composite In-Situ Concrete and Steel Deck

Energy Efficiency Measures 25.38%

ENERGY SAVINGS Meets EDGE Energy Standard



PROJECT METRICS

Incremental Cost
\$211,000

Utility Costs Savings
\$26,500 / month

Payback in Years
0.6

Operational CO₂
Savings
\$ 130 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 30% Savings through:

- Reflective paint and tiles for roof.
- Insulation of roof, low-E coated glass.
- Variable refrigerant volume cooling system.
- Energy-saving light bulbs for internal and external spaces.



Water – 70% Savings through:

- Low-flow faucets in kitchens and bathrooms.
- Dual-flush water closets.
- Rainwater harvesting system, and grey water treatment.



Materials – 45% Savings through:

- Curtain walling for external walls, autoclaved aerated concrete blocks for internal walls, and finished concrete floor with a small percentage of stone tiles.



Daan Mogot Baru Office Park

In-country certified project to replace related example once an EDGE project is certified.

HOSPITALS – EGYPT CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Unit	Gross Internal Area	Occupancy Rate	Floors	Beds
Multi Specialty	9,700m ²	70%	7	100



Energy Measures – 24% Savings through:

- Earth Air Tunnel System to Pre-Cool/Pre-Heat Supply Air Cooling/Heating Air Intake
- Energy-Saving Light Bulbs - Internal Spaces



Water – 23% Savings through:

- Dual Flush for Water Closets in all Bathrooms
- Low-Flow Faucets in all Bathrooms
- Single Flush/Flush Valve



Materials – 28% Savings through:

- Composite In-Situ Concrete and Steel Deck

Energy Efficiency Measures 24.30%

ENERGY SAVINGS Meets EDGE Energy

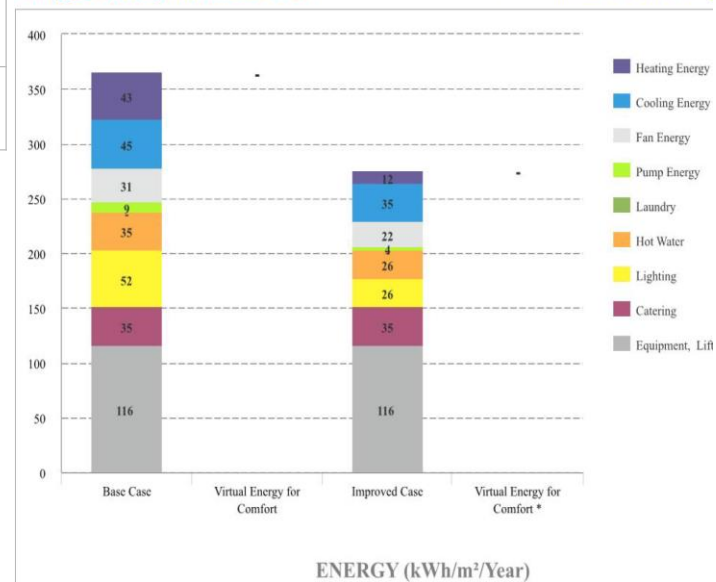
PROJECT METRICS

Incremental Cost
\$ 160,500

Utility Costs Savings
\$ 7,200 / month

Payback in Years
2

Operational CO₂
Savings
\$ 370 tCO₂/Year



RELEVANT CERTIFIED PROJECT



Energy Measures – 56% Savings through:

- Reduced Window To Wall Ratio
- Insulation Of Roof And External Walls
- Low E-coated Glass
- Air Conditioning With Air Cooled Chiller
- Energy-saving Lighting Systems For Internal And External Spaces
- Solar Hot Water Collectors and Solar Photovoltaics



Water – 33% Savings through:

- Low-flow Faucets In Bathrooms And Dual-flush Water Closets



Materials – 42% Savings through:

- Aluminum Sheets On Steel Rafters For Roof Construction
- 3-D Wire Panel With "Shot-crete" On Both Sides For External 7 Internal Walls
- Ceramic Tile Flooring



MBU at Komfo Anokye Teaching Hospital (Ghana)

In-country certified project to replace related example once an EDGE project is certified.

SCHOOLS – EGYPT CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Unit	Gross Internal Area	Occupancy Rate	Floors	Beds
Multi Specialty	9,700m ²	70%	7	100



Energy Measures – 22% Savings through:

- Reflective Paint/Tiles for Walls- Solar Reflectivity
- Reflective Paint/Tiles for Roof -Solar Reflectivity
- External Shading Devices - Annual Average Shading Factor



Water – 20% Savings through:

- Low-Flow Showerheads
- Low-Flow Faucets
- Dual Flush for Water Closets



Materials – 25% Savings through:

- Composite In-Situ Concrete and Steel Deck

PROJECT METRICS

Incremental Cost
\$14,300

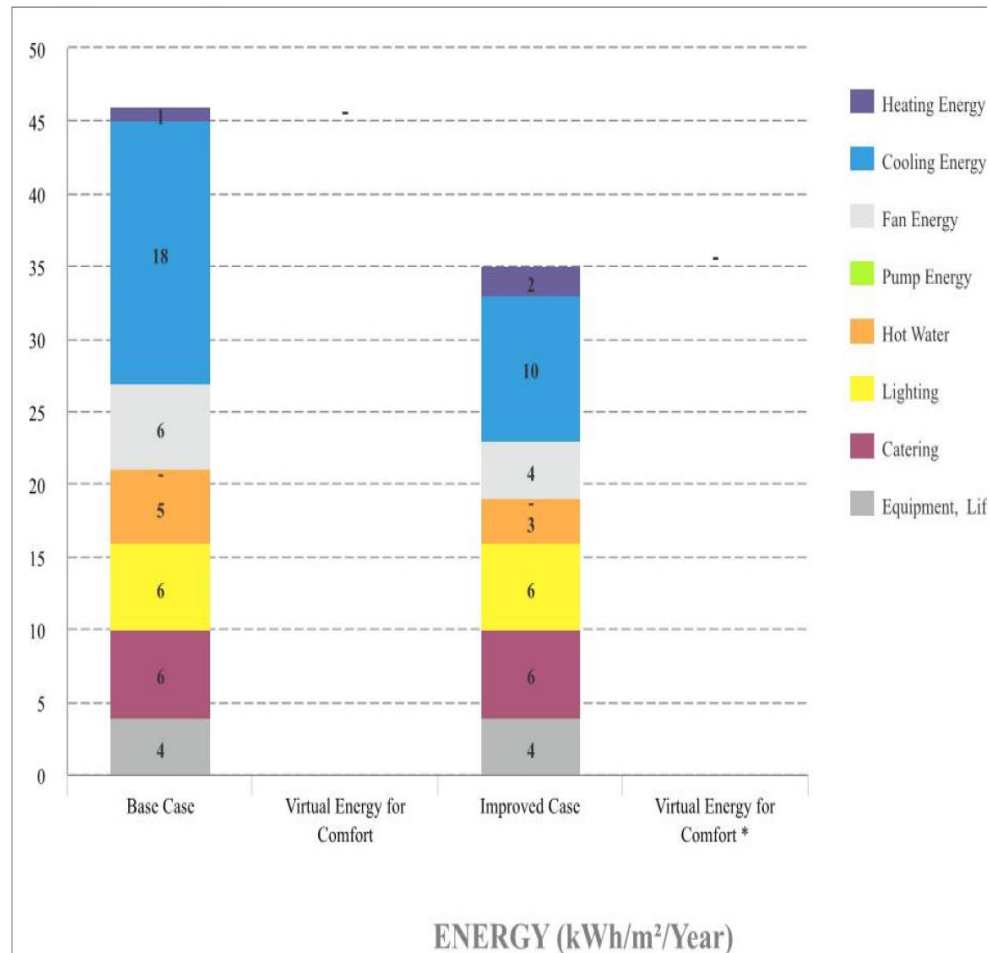
Utility Costs Savings
\$ 400 / month

Payback in Years
3

Operational CO₂
Savings
\$ 20 tCO₂/Year

Energy Efficiency Measures 22.3%

ENERGY SAVINGS Meets EDGE Energy



LIGHT INDUSTRY – EGYPT CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Site Area	Car Parking	Landscaped Area	Amenities
15,000 m ²	Indoor Car Parking	1,000,000 m ²	Supermarket, Food Court



Energy Measures – 25% Savings through:

- Solar Photovoltaics - 25% of Total Energy Demand



Water – 24% Savings through:

- Dual Flush for Water Closets in all Bathrooms
- Single Flush/Flush Valve
- Water-Efficient Urinals in all Bathrooms



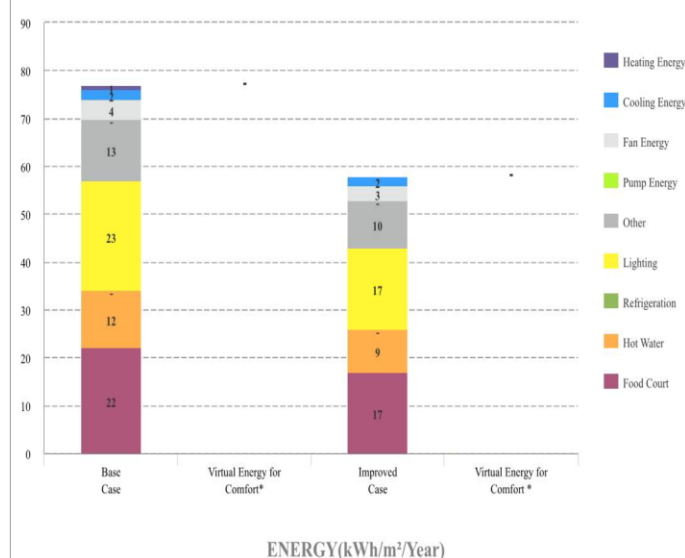
Materials – 22% Savings through:

- Composite Slim with Steel I-Beams

Energy Efficiency measures 25.07%

Energy Savings

Meets EDGE energy standard



PROJECT METRICS

Incremental Cost
\$ 200,000

Utility Costs Savings
\$ 2,500 / month

Payback in Years
6

Operational CO₂
Savings
\$ 120 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 27% Savings through:

- Reduced window to wall ratio
- Reflective paint and tiles for the roof.
- Energy-saving lighting in internal areas.
- Skylights to provide daylight to 50% of top floor areas.



Water – 26% Savings through:

- Dual flush water closets in bathrooms.



Materials – 27% Savings through:

- Steel sheets on steel rafters for roof construction and finished concrete flooring.



TPARK Banglee 4 (Thailand)

In-country certified project to replace related example once an EDGE project is certified.



JORDAN: GREEN BUILDINGS RETURN ON INVESTMENT



Creating Markets, Creating Opportunities

JORDAN - ROI NEEDED TO REACH EDGE STANDARD



	Incremental Cost	Payback Period in Years	Utility Savings / month
Homes	\$240 /unit	1.5	\$10/unit
Hotels	\$225,000	1	1
Shopping Centers	\$62,500	1	\$8,800
Offices	\$44,000	0.5	\$8,000
Schools	\$14,600	2	\$200
Hospitals	\$160,000	2	\$6,500
Light Industry	\$190,000	1	\$26,500





HOMES – JORDAN CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Unit	Average Unit Area	Bedrooms / Unit	Floors	Units
Low Income	80m ²	2	10	50



Energy Measures – 21% Savings through:

- Energy-Saving Light Bulbs - Internal Spaces



Water – 21% Savings through:

- Low-Flow Showerheads
- Low-Flow Faucets for Washbasins
- Dual Flush for Water Closets

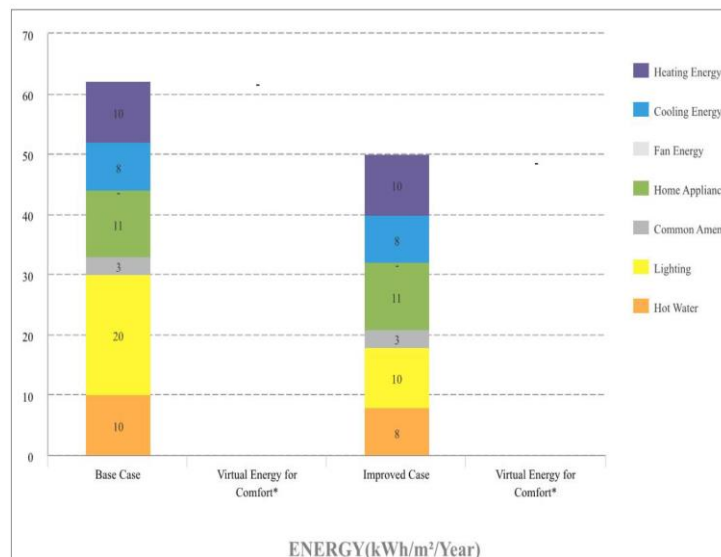


Materials – 24% Savings through:

- Composite In-Situ Concrete and Steel Deck

Energy Efficiency Measures 20.86%

ENERGY SAVINGS Meets EDGE Energy Standard



PROJECT METRICS

Incremental Cost
\$250

Utility Costs Savings
\$ 10 / month

Payback in Years
1.5

Operational CO₂
Savings
\$ 1 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 82% Savings through:

- Reduced window to wall ratio.
- insulation of roof and external walls
- Higher performance glass
- Energy-saving lighting systems for internal and external spaces



Water – 31% Savings through:

- Low-flow faucets in kitchens and bathrooms
- Dual-flush water closets.



Materials – 47% Savings through:

- Concrete filler slab for roof construction.
- Autoclaved aerated concrete blocks for internal and external walls.
- UPVC window frames.



Ecoloft Jababeka Cikarang (Indonesia)

In-country certified project to replace related example once an EDGE project is certified.

HOTELS – JORDAN CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Hotel	Floors Above Ground	Total Guest Units	Internal Area
4 Star Hotel	8	200	15,000 m ²



Energy Measures – 20% Savings through:

- External Shading Devices - Annual Average Shading Factor
- Insulation of Roof - U Value
- Energy-Saving Light Bulbs - External and Internal Spaces



Water – 22% Savings through:

- Low-Flow Showerheads and Faucets Guestrooms
- Low-Flow Faucets in Guest Rooms
- Dual Flush for Water Closets in Guest Rooms
- Water-Efficient Front Loading Washing Machine
- Water-Efficient Urinals in all Other Bathrooms

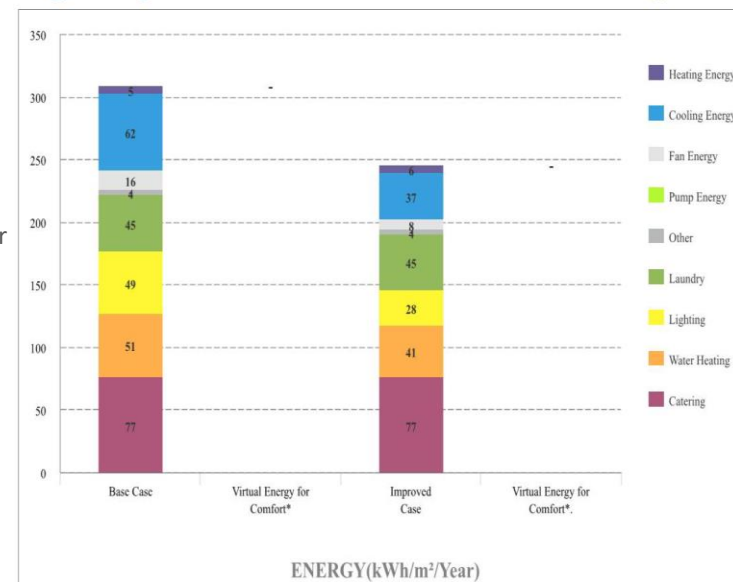


Materials – 37% Savings through:

- Composite In-Situ Concrete and Steel Deck

Energy Efficiency Measures 20.28%

ENERGY SAVINGS Meets EDGE Energy Standard



PROJECT METRICS

Incremental Cost
\$ 226,500

Utility Costs Savings
\$ 14,300 / month

Payback in Years
1

Operational CO₂
Savings
\$ 570 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 23% Savings through:

- Reduced window to wall ratio
- Insulation of external walls
- Low-E coated glass
- High-efficiency boiler for hot water
- Air conditioning with air cooled screw chiller



Water – 28% Savings through:

- Low-Flow Faucets in Kitchens and Bathrooms
- Single Flush and Flush Valve for Water Closets
- Water-Efficient Urinals
- Aerators and Auto Shut-off Faucet in Bathrooms



Materials – 51% Savings through:

- Facing brick and hollow concrete blocks for external walls



AC Hotel by Marriott Veracruz (Mexico)

In-country certified project to replace related example once an EDGE project is certified.

SHOPPING CENTERS – JORDAN CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Site Area	Car Parking	Landscaped Area	Amenities
15,000 m ²	Indoor Car Parking	1,000,000 m ²	Supermarket, Food Court



Energy Measures – 25% Savings through:

- Solar Photovoltaics - 25% of Total Energy Demand



Water – 24% Savings through:

- Dual Flush for Water Closets
- Single Flush/Flush Valve
- Water-Efficient Urinals in all Bathrooms



Materials – 22% Savings through:

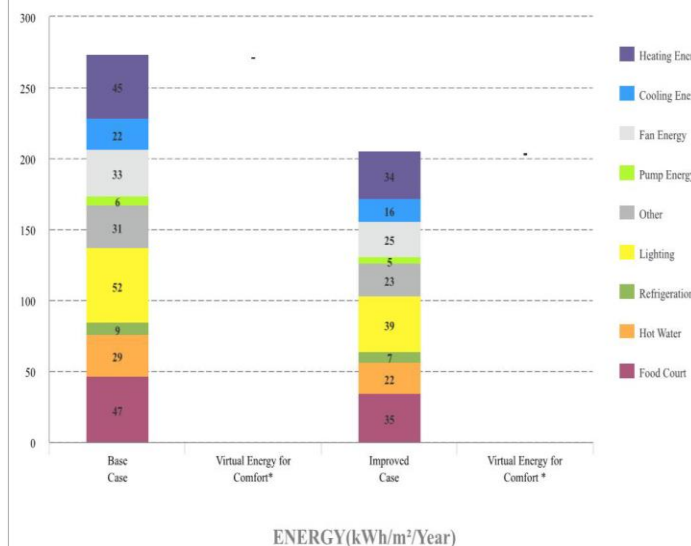
- Composite Slim Slabs with Steel I-Beams

Energy Efficiency measures 25.04%

Energy Savings

Meets EDGE energy standard

PROJECT METRICS



Incremental Cost
\$62,500

Utility Costs Savings
\$ 8,800 / month

Payback in Years
0.6

Operational CO₂
Savings
\$ 600 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 58% Savings through:

- Reduced Window to Wall Ratio, Reflective Paint for Roof
- Insulation of roof and walls
- Energy-efficient VRV cooling system
- Variable frequency drives in air handling units
- Sensible heat recovery from exhaust air



Water – 41% Savings through:

- Dual flush for water closets
- Water-efficient urinals
- Aerators and auto-shut-off faucets in all bathrooms
- Water-efficient kitchen faucets.



Materials – 44% Savings through:

- Hollow core precast slab for floors.
- Steel-clad sandwich panel for roof construction
- Steel-clad sandwich panel



Vilnius Fabijoniskes by Lidl (Lithuania)

In-country certified project to replace related example once an EDGE project is certified.



BUILDING DETAILS

Gross Internal Area	Floors Above Grade	Floors Below Grade	Floor-to-Floor Height
5000m ²	3	2	3.5m



Energy Measures – 20% Savings through:

- Reflective Paint for External Walls -Solar Reflectivity
- External Shading Devices - Annual Average Shading
- Insulation of Roof
- Insulation of External Walls
- Natural Ventilation with Operable Windows and No



Water – 23% Savings through:

- Low-Flow Faucets in Bathrooms
- Dual flush for water closets in bathrooms
- Single Flush/Flush Valve

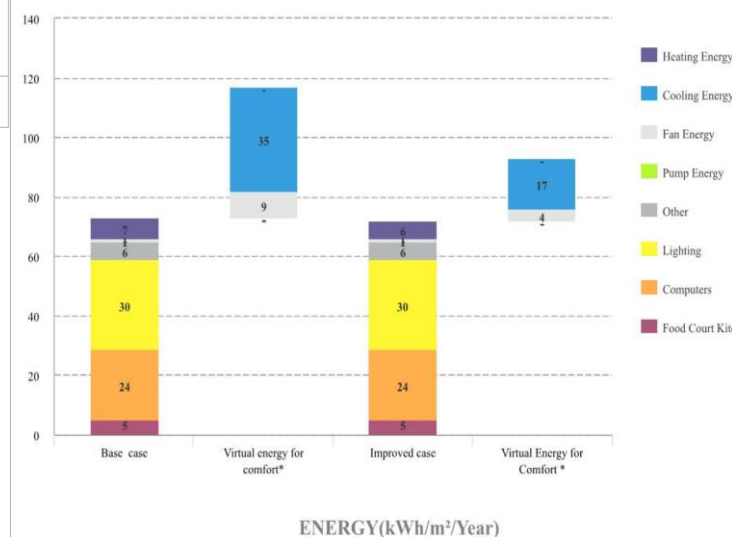


Materials – 30% Savings through:

- Composite In-Situ Concrete and Steel Deck

Energy Efficiency Measures 20.44%

ENERGY SAVINGS Meets EDGE Energy Star **PROJECT METRICS**



Incremental Cost
\$ 44,100

Utility Costs Savings
\$ 8,000 / month

Payback in Years
5

Operational CO₂
Savings
\$ 110 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 41% Savings through:

- Reduced window to wall ratio
- External shading
- Air conditioning with air-cooled chiller and a high COP
- Variable speed drives pumps
- Energy-efficient lighting system.



Water – 29% Savings through:

- Low-flow faucets
- Dual flush water closets.



Materials – 34% Savings through:

- Concrete filler slabs for floors
- Solid dense concrete blocks for walls



Tohme Rizk Office Building (Lebanon)

In-country certified project to replace related example once an EDGE project is certified.

SCHOOLS – JORDAN CASE STUDY & CERTIFIED PROJECT



BUILDING DETAILS

Type of Unit	Gross Internal Area	Occupancy Rate	Floors	Beds
Multi Specialty	9,700m ²	70%	7	100



Energy Measures – 21% Savings through:

- Insulation of External Walls
- Natural Ventilation for Corridors
- Natural Ventilation for Classrooms



Water – 21% Savings through:

- Low-Flow Showerheads
- Low-Flow Faucets
- Dual Flush for Water Closets



Materials – 26% Savings through:

- Composite In-Situ Concrete and Steel Deck

PROJECT METRICS

Incremental Cost
\$ 14,600

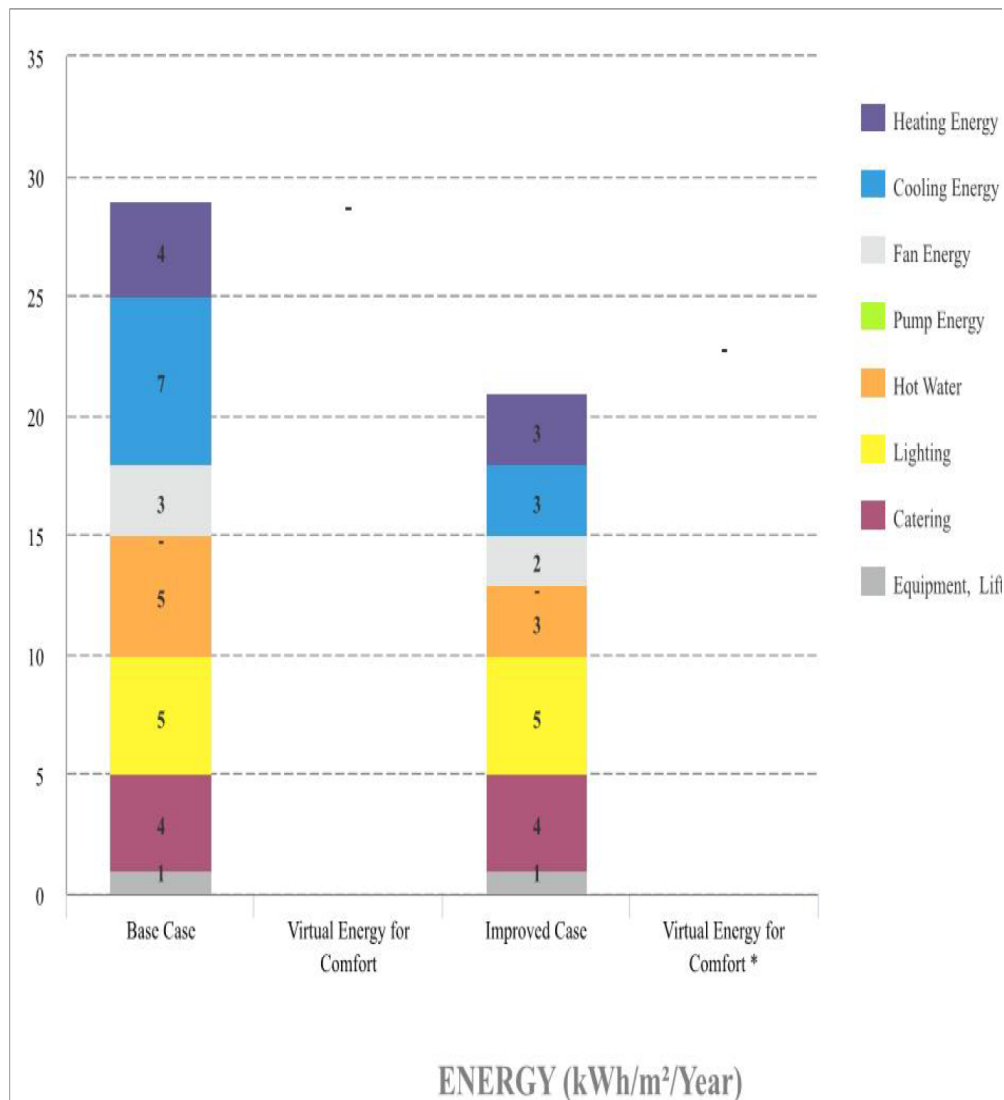
Utility Costs Savings
\$ 190 / month

Payback in Years
2

Operational CO₂
Savings
\$ 20 tCO₂/Year

Energy Efficiency Measures 20.8%

ENERGY SAVINGS Meets EDGE Energy



HOSPITALS – JORDAN CASE STUDY & CERTIFIED PROJECT



BUILDING DETAILS

Type of Unit	Gross Internal Area	Occupancy Rate	Floors	Beds
Multi Specialty	9,700m ²	70%	7	100



Energy Measures – 25% Savings through:

- Earth Air Tunnel System to Pre-Cool/Pre-Heat Supply Air Cooling/Heating Air Intake
- Energy-Saving Light Bulbs - Internal Spaces



Water – 26% Savings through:

- Dual Flush for Water Closets in all Bathrooms
- Single Flush/Flush Valve
- Low-Flow Faucets in all Bathrooms

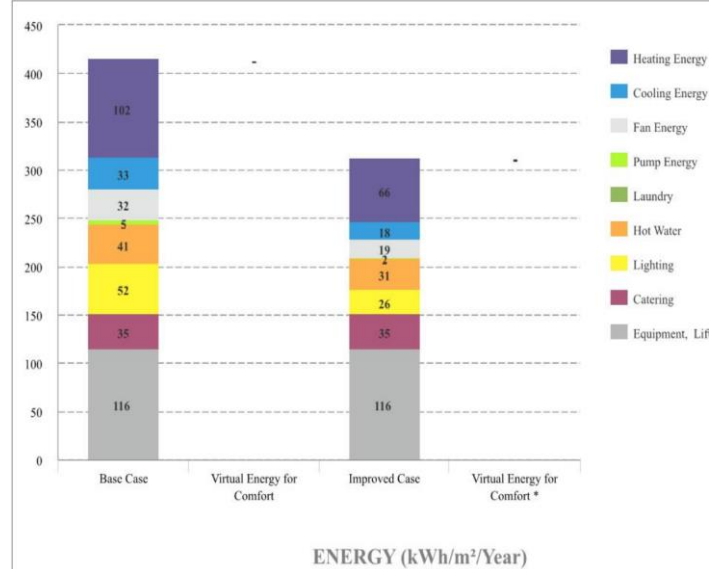


Materials – 28% Savings through:

- Composite In-Situ Concrete and Steel Deck

Energy Efficiency Measures 24.71%

ENERGY SAVINGS Meets EDGE Energy



PROJECT METRICS

Incremental Cost
\$ 158,700

Utility Costs Savings
\$ 6,500 / month

Payback in Years
2

Operational CO₂
Savings
\$ 600 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 21% Savings through:

- Reduced Window To Wall Ratio
- Insulation Of Roof And External Walls
- Higher thermal performance glass
- Air economizers
- Energy-efficient air conditioning with air-cooled chiller



Water – 25% Savings through:

- Low-flow Faucets In Bathrooms
- Dual-flush Water Closets
- Water-efficient faucets for kitchen sinks.



Materials – 26% Savings through:

- Aluminum Sheets On Steel Rafters For Roof Construction
- 3-D Wire Panel With “Shot-crete” On Both Sides For External And Internal Walls
- Ceramic Tile Flooring



Keserwan Medical Center (Lebanon)

In-country certified project to replace related example once an EDGE project is certified.

LIGHT INDUSTRY – JORDAN CASE STUDY & CERTIFIED PROJECT



BUILDING DETAILS

Site Area	Car Parking	Landscaped Area	Amenities
15,000 m ²	Indoor Car Parking	1,000,000 m ²	Supermarket, Food Court



Energy Measures – 25% Savings through:

- Solar Photovoltaics - 25% of Total Energy Demand



Water – 24% Savings through:

- Dual Flush for Water Closets
- Single Flush/Flush Valve
- Water-Efficient Urinals in all Bathrooms



Materials – 22% Savings through:

- Composite Slim Slabs with Steel I-Beams

Energy Efficiency measures 25.07%

Energy Savings

Meets EDGE energy stand

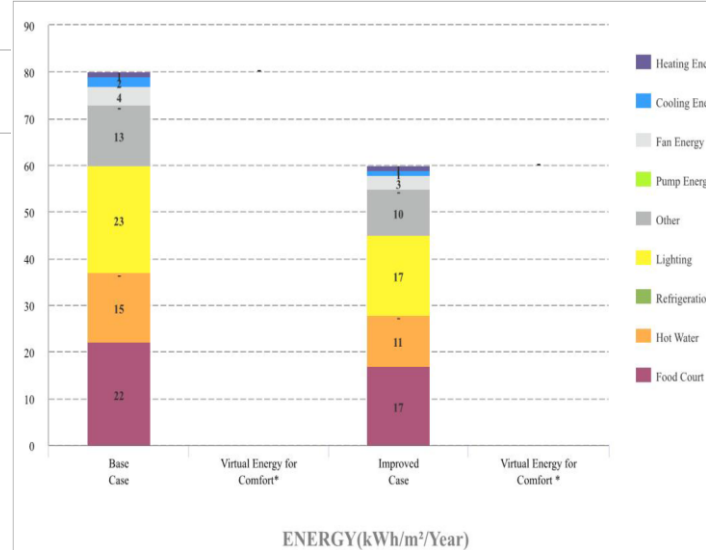
PROJECT METRICS

Incremental Cost
\$ 190,000

Utility Costs Savings
\$ 26,500 / month

Payback in Years
1

Operational CO₂
Savings
\$ 180 tCO₂/Year



RELEVANT CERTIFIED PROJECT



Energy Measures – 23% Savings through:

- Reduced Window to Wall Ratio.
- Reflective Paint for Roof
- Insulation of roof and walls
- Variable frequency drives in air handling units



Water – 22% Savings through:

- Low-flow faucets in kitchens and bathrooms.
- Black water treatment and recycling system.



Materials – 28% Savings through:

- Thinner in-situ reinforced concrete slab with less steel rebar for floor slabs and roof construction.



Song Hau Surface Water Plant (Vietnam)

In-country certified project to replace related example once an EDGE project is certified.



MOROCCO: GREEN BUILDINGS RETURN ON INVESTMENT



Creating Markets, Creating Opportunities



MOROCCO - ROI NEEDED TO REACH EDGE STANDARD

	Incremental Cost	Payback Period in Years	Utility Savings / month
Homes	\$240 /unit	1.5	\$10 /unit
Hotels	\$213,000	1	\$5,200
Shopping Centers	\$13,000	0.1	\$10,500
Offices	\$34,000	2	\$1,400
Schools	\$20,300	6	\$150
Hospitals	\$170,000	2	\$8,000
Light Industry	\$200,000	3	\$5,700





HOMES – MOROCCO CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Unit	Average Unit Area	Bedrooms / Unit	Floors	Units
Low Income	80m ²	2	10	50



Energy Measures – 23% Savings through:

- Energy-Saving Light Bulbs - Internal Spaces



Water – 21% Savings through:

- Low-Flow Showerheads - 8 lt./min
- Low-Flow Faucets for Washbasins - 6 lt./min
- Dual Flush for Water Closets

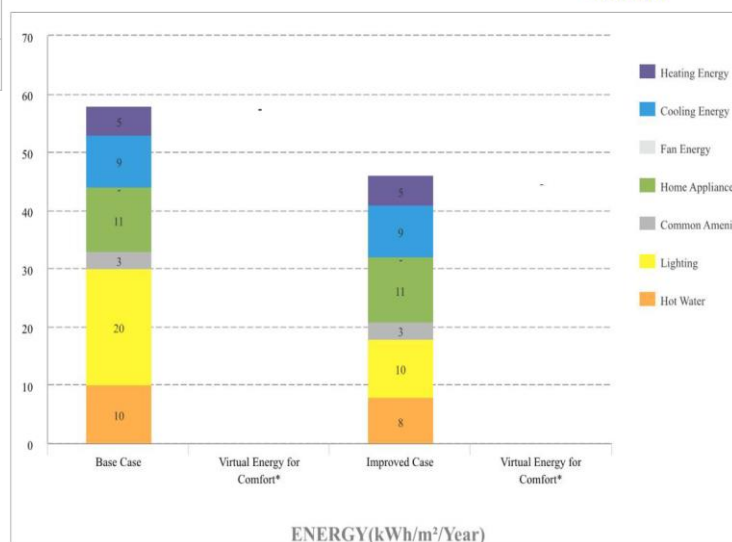


Materials – 24% Savings through:

- Composite In-Situ Concrete and Steel Deck

Energy Efficiency Measures 22.46%

ENERGY SAVINGS Meets EDGE Ener Standard **PROJECT METRICS**



Incremental Cost
\$250

Utility Costs Savings
\$ 10 / month

Payback in Years
2

Operational CO₂
Savings
\$ 1 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 21% Savings through:

- Reduced window to wall ratio.
- Reflective paint for external walls.
- External shading devices.
- Insulation of roof and external walls.
- Energy-saving light bulbs for internal spaces.



Water – 24% Savings through:

- Low-flow plumbing fixtures for washbasins.
- Water closets and shower-heads.



Materials – 24% Savings through:

- In-situ reinforced wall concrete.
- Medium weight hollow concrete blocks.
- Laminated wooden flooring and ceramic tile.



The Link 345 (Vietnam)

In-country certified project to replace related example once an EDGE project is certified.

HOTELS – MOROCCO CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Hotel	Floors Above Ground	Total Guest Units	Internal Area
4 Star Hotel	8	200	15,600 m ²



Energy Measures – 20% Savings through:

- External Shading Devices - Annual Average Shading Factor
- Energy-Saving Light Bulbs - Internal Spaces



Water – 22% Savings through:

- Low-Flow Showerheads and Faucets Guestrooms
- Low-Flow Faucets in Guest Rooms
- Dual Flush for Water Closets in Guest Rooms
- Water-Efficient Front Loading Washing Machine
- Water-Efficient Urinals in all Other Bathrooms



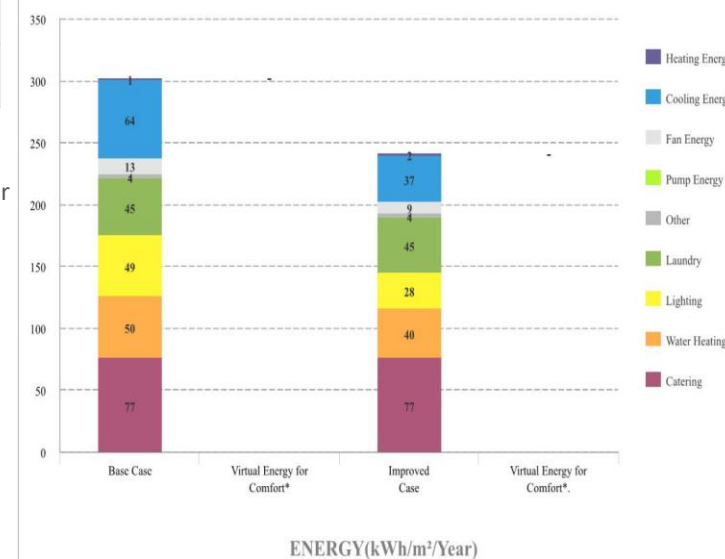
Materials – 37% Savings through:

- Composite In-Situ Concrete and Steel Deck

Energy Efficiency Measures 20.20%

ENERGY SAVINGS Meets EDGE Energy Standard

PROJECT METRICS



Incremental Cost
\$ 214,000

Utility Costs Savings
\$ 5,200 / month

Payback in Years
2

Operational CO₂
Savings
\$ 500 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 60% Savings through:

- Reduced window to wall ratio
- External shading devices
- Energy-efficient variable refrigerant volume cooling system
- Heat pump for hot water
- Energy-saving lighting in internal and external areas and solar photovoltaics



Water – 26% Savings through:

- Low-Flow Faucets in Kitchens and Bathrooms
- Low-flow showerheads
- Low-flow faucets in guest rooms



Materials – 34% Savings through:

- In-situ reinforced concrete for floors and roof
- Cored bricks with internal & external plaster for internal & external walls



Eco Green Boutique Hotel (Vietnam)

In-country certified project to replace related example once an EDGE project is certified.

SHOPPING CENTERS – MOROCCO CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Site Area	Car Parking	Landscaped Area	Amenities
15,000 m ²	Indoor Car Parking	1,000,000 m ²	Supermarket, Food Court



Energy Measures – 23% Savings through:

- Variable Refrigerant Flow (VRF) Cooling System
- Energy-Saving Light Bulbs - Sales Area



Water – 21% Savings through:

- Dual Flush for Water Closets
- Single Flush/Flush Valve



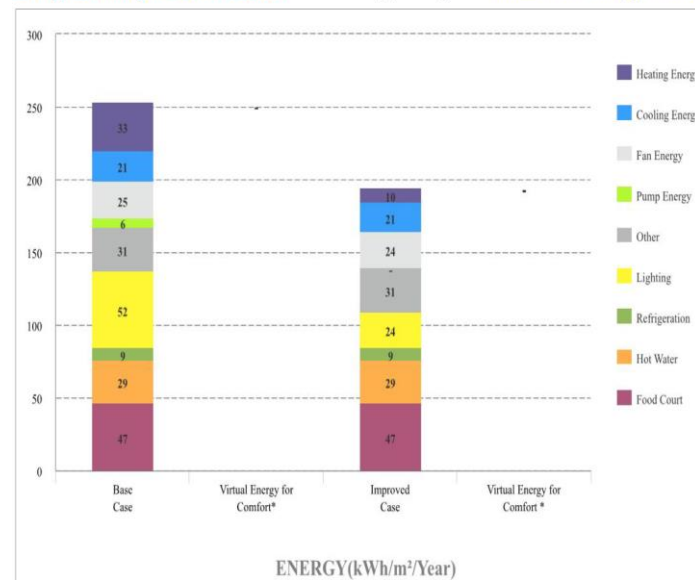
Materials – 27% Savings through:

- Composite In-Situ Concrete and Steel Deck

Energy Efficiency measures 22.63%

Energy Savings

Meets EDGE energy standard



PROJECT METRICS

Incremental Cost
\$ 13,000

Utility Costs Savings
\$10,500 / month

Payback in Years
0.1

Operational CO₂
Savings
\$ 480 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 29% Savings through:

- Reduced Window to Wall Ratio, Reflective Paint for Roof
- insulated roofs and external walls
- Occupancy sensors in bathrooms
- Energy-saving lighting in sales areas corridors and common areas, and external spaces.



Water – 24% Savings through:

- Single flush for water closets
- Water-efficient urinals
- Aerators and auto-shut-off faucets in all bathrooms



Materials – 23% Savings through:

- Steel sheets on steel rafters roof construction
- Cement fibre boards on metal studs for all external walls
- In-situ reinforced external walls



Retail at Santa Verde (Costa Rica)

In-country certified project to replace related example once an EDGE project is certified.

OFFICES – MOROCCO CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Gross Internal Area	Floors Above Grade	Floors Below Grade	Floor-to-Floor Height
5000m ²	3	2	3.5m



Energy Measures – 22% Savings through:

- Reflective Paint for External Walls -Solar Reflectivity
- External Shading Devices - Annual Average Shading Factor
- Reduced Window To Wall Ratio
- Variable Refrigerant Flow (VRF) System



Water – 23% Savings through:

- Low-Flow Faucets in Bathrooms
- Dual flush for water closets in bathrooms



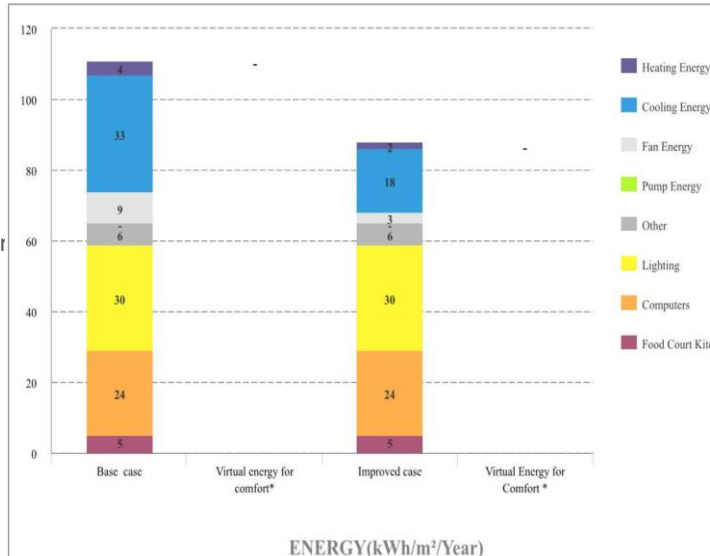
Materials – 30% Savings through:

- Composite In-Situ Concrete and Steel Deck

Energy Efficiency Measures 21.59%

ENERGY SAVINGS Meets EDGE Energy Sta

PROJECT METRICS



Incremental Cost
\$ 34,300

Utility Costs Savings
\$ 1,400 / month

Payback in Years
2

Operational CO₂
Savings
\$ 70 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 32% Savings through:

- External shading
- Roof insulation
- Variable refrigerant volume cooling system
- Energy-saving lighting system
- Solar photovoltaics



Water – 54% Savings through:

- Low-Flow Faucets in Kitchens and Bathrooms
- Water-Efficient Urinals and Water Closets



Materials – 38% Savings through:

- Concrete filler slabs for floors
- Solid dense concrete blocks for external walls.



DIPOA (Costa Rica)

In-country certified project to replace related example once an EDGE project is certified.

SCHOOLS – MOROCCO CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Unit	Gross Internal Area	Occupancy Rate	Floors	Beds
Multi Specialty	9,700m ²	70%	7	100



Energy Measures – 20% Savings through:

- Reflective Paint/Tiles for Walls- Solar Reflectivity
- Insulation of External Walls: U-Value
- Natural Ventilation for Corridors and Classrooms



Water – 20% Savings through:

- Variable Refrigerant Flow Cooling Systems
- Water-Efficient Dishwashers and Bathroom Faucets
- Pre-rinse Valve for Rinsing Operation



Materials – 25% Savings through:

- Composite In-Situ Concrete and Steel Deck

PROJECT METRICS

Incremental Cost
\$ 20,300

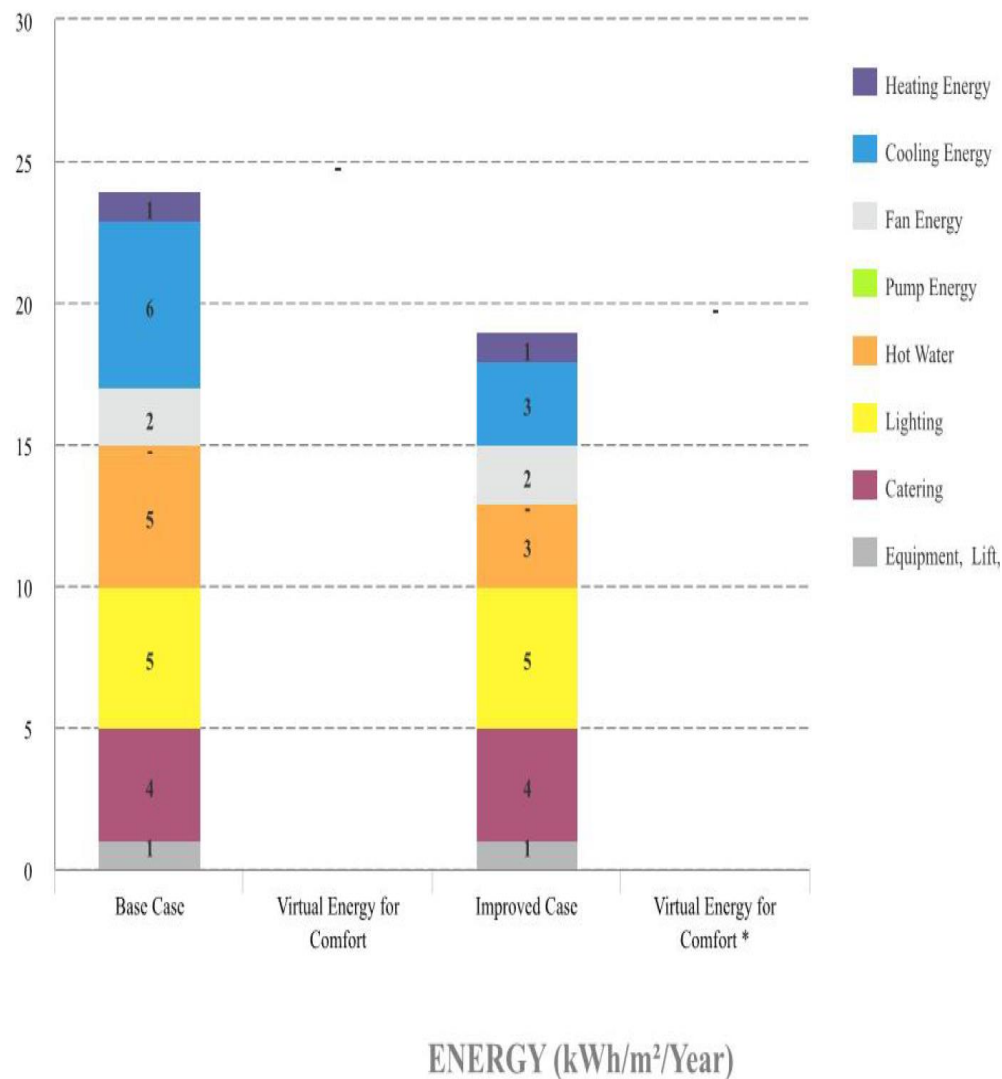
Utility Costs Savings
\$ 250 / month

Payback in Years
6

Operational CO₂
Savings
\$ 15 tCO₂/Year

Energy Efficiency Measures 20.2%

ENERGY SAVINGS Meets EDGE Energy



BUILDING DETAILS

Type of Unit	Gross Internal Area	Occupancy Rate	Floors	Beds
Multi Specialty	9,700m ²	70%	7	100



Energy Measures – 21% Savings through:

- Low-E Coated Glass
- Earth Air Tunnel System to Pre-Cool/Pre-Heat Supply Air Cooling/Heating Air Intake
- Energy-Saving Light Bulbs - Internal and External Spaces



Water – 25% Savings through:

- Low-Flow Faucets in all Bathrooms
- Dual Flush for Water Closets in all Bathrooms
- Single Flush/Flush Valve

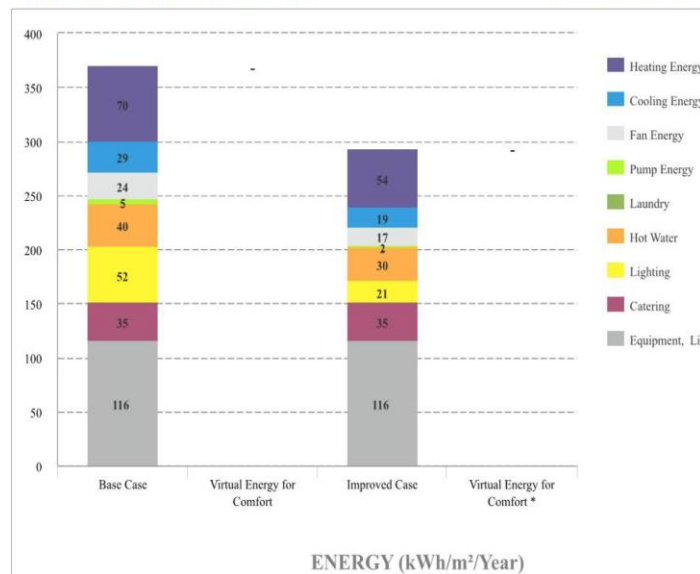


Materials – 28% Savings through:

- Composite In-Situ Concrete and Steel Deck

Energy Efficiency Measures 20.54%

ENERGY SAVINGS Meets EDGE Energy



PROJECT METRICS

Incremental Cost
\$ 170,000

Utility Costs Savings
\$ 8,000 / month

Payback in Years
2

Operational CO₂
Savings
\$ 400 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 37% Savings through:

- Reduced Window To Wall Ratio
- Reflective paint for external walls
- Insulation of roof and external walls
- Natural ventilation for corridors
- Variable refrigerant volume cooling system



Water – 39% Savings through:

- Low-flow Faucets In Bathrooms
- Single-flush and flush valves for water closets
- water-efficient landscaping, and a rainwater harvesting system.



Materials – 39% Savings through:

- Steel sheets on steel rafters for roof construction
- Medium weight hollow concrete blocks for internal and external walls
- Finished concrete flooring



Sede de EBAIS de La Ribera de Belén (Costa Rica)

In-country certified project to replace related example once an EDGE project is certified.

LIGHT INDUSTRY – MOROCCO CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Site Area	Car Parking	Landscaped Area	Amenities
15,000 m ²	Indoor Car Parking	1,000,000 m ²	Supermarket, Food Court



Energy Measures – 25% Savings through:

- Solar Photovoltaics - 25% of Total Energy Demand



Water – 24% Savings through:

- Dual Flush for Water Closets
- Water-Efficient Urinals in all Bathrooms - 2 lt./flush



Materials – 27% Savings through:

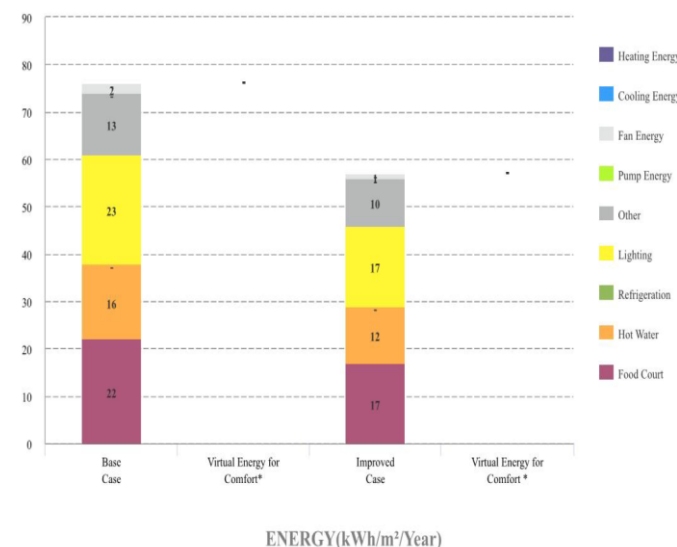
- Composite In-Situ Concrete and Steel Deck

Energy Efficiency measures 25.07%

Energy Savings

Meets EDGE energy standard

PROJECT METRICS



Incremental Cost
\$ 200,000

Utility Costs Savings
\$5,700 / month

Payback in Years
3

Operational CO₂
Savings
\$ 270 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 38% Savings through:

- Reduced Window to Wall Ratio, Reflective Paint for Roof
- insulated roofs and external walls
- Occupancy sensors in bathrooms
- Energy-saving lighting in sales areas corridors and common areas, and external spaces.



Water – 23% Savings through:

- Single flush for water closets
- Water-efficient urinals
- Aerators and auto-shut-off faucets in all bathrooms



Materials – 63% Savings through:

- Steel sheets on steel rafters roof construction
- Cement fibre boards on metal studs for all external walls
- plasterboards on metal studs for internal walls



LatAm Parque Logistico (Peru)

In-country certified project to replace related example once an EDGE project is certified.



PAKISTAN: GREEN BUILDINGS RETURN ON INVESTMENT



Creating Markets, Creating Opportunities



PAKISTAN - ROI NEEDED TO REACH EDGE STANDARD

	Incremental Cost	Payback Period in Years	Utility Savings / month
Homes	\$240	4.5	\$4 /unit
Hotels	\$220,000	4	\$5,100
Shopping Centers	\$34,000	1	\$4,300
Offices	39,000	4	\$750
Schools	\$10,100	6	\$140
Hospitals	\$88,000	2	\$3,700
Light Industry	\$42,500	2.5	\$1,400



HOMES – PAKISTAN CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Unit	Average Unit Area	Bedrooms / Unit	Floors	Units
Low Income	80m ²	2	10	50



Energy Measures – 20% Savings through:

- Energy-Saving Light Bulbs - Internal Spaces



Water – 21% Savings through:

- Low-Flow Showerheads - 8 lt./min
- Low-Flow Faucets for Washbasins - 6 lt./min
- Dual Flush for Water Closets - 6 lt./first flush and 3 lt./second flush

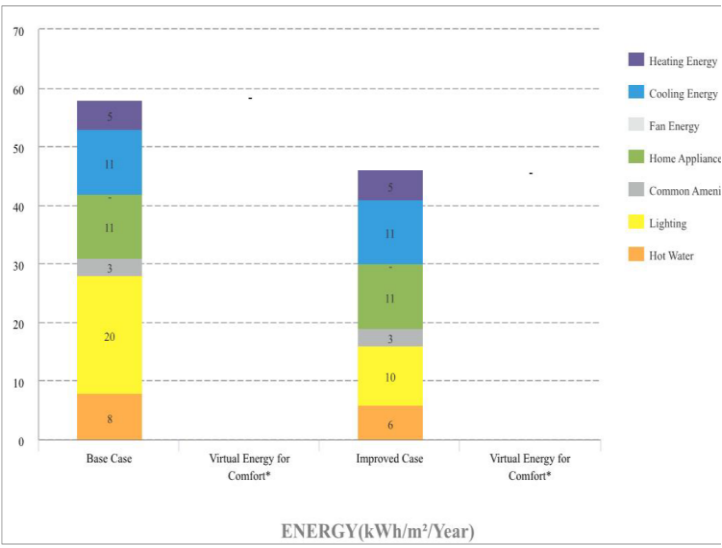


Materials – 24% Savings through:

- Composite In-Situ Concrete and Steel Deck

Energy Efficiency Measures 21.47%

ENERGY SAVINGS Meets EDGE Ene Standard



PROJECT METRICS

Incremental Cost
\$ 250

Utility Costs Savings
\$ 4 / month

Payback in Years
4.5

Operational CO₂ Savings
\$ 0.5 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 22% Savings through:

- solar hot water collectors supplying 80% of annual hot water demand.
- External shading
- lighting controls for corridors and outdoors



Water – 21% Savings through:

- Low-flow plumbing fixtures.
- Dual-flush water closets.



Materials – 54% Savings through:

- In-situ concrete with greater than 30% pulverized fly ash
- Medium weight hollow concrete blocks for external and internal walls



Canopus - Constelação (Brazil)

In-country certified project to replace related example once an EDGE project is certified.

HOTELS – PAKISTAN CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Hotel	Floors Above Ground	Total Guest Units	Internal Area
4 Star Hotel	8	200	15,600 m ²



Energy Measures – 21% Savings through:

- External Shading Devices - Annual Average Shading Factor
- Insulation of Roof - U Value
- Energy-Saving Light Bulbs - Internal Spaces



Water – 22% Savings through:

- Low-Flow Showerheads and Faucets Guestrooms
- Low-Flow Faucets in Guest Rooms
- Dual Flush for Water Closets in Guest Rooms
- Water-Efficient Front Loading Washing Machine
- Water-Efficient Urinals in all Other Bathrooms

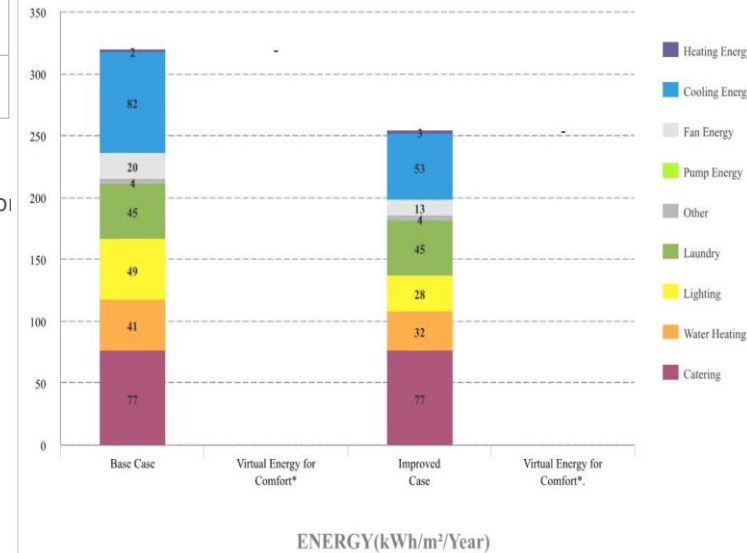


Materials – 37% Savings through:

- Composite In-Situ Concrete and Steel Deck

Energy Efficiency Measures 20.40%

ENERGY SAVINGS Meets EDGE Energy Standard



PROJECT METRICS

Incremental Cost
\$ 220,000

Utility Costs Savings
\$ 5,100 / month

Payback in Years
3.5

Operational CO₂
Savings
\$ 500 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 21% Savings through:

- Reduced window to wall ratio
- External shading devices
- Insulation of roof and external walls
- Natural ventilation in corridors
- Air conditioning with air cooled screw chiller
- Energy-saving light bulbs for internal and external spaces



Water – 21% Savings through:

- Low-Flow Faucets in Kitchens and Bathrooms
- Single Flush and Flush Valve for Water Closets
- Water-Efficient Urinals
- Aerators and Auto Shut-off Faucet in Bathrooms



Materials – 37% Savings through:

- Micro concrete tiles on steel rafters for roof construction
- Stone profile cladding and autoclaved aerated concrete blocks



Springhill Condotel at Jimbaran Hijau (Indonesia)

In-country certified project to replace related example once an EDGE project is certified.

SHOPPING CENTERS – PAKISTAN CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Site Area	Car Parking	Landscaped Area	Amenities
15,000 m ²	Indoor Car Parking	1,000,000 m ²	Supermarket, Food Court



Energy Measures – 21% Savings through:

- Insulation of Roof, Natural Ventilation
- Reflective Paint/Tiles for Roof -Solar Reflectivity
- Variable Refrigerant Flow (VRF) Cooling System



Water – 23% Savings through:

- Dual Flush for Water Closets
- Single Flush/Flush Valve



Materials – 27% Savings through:

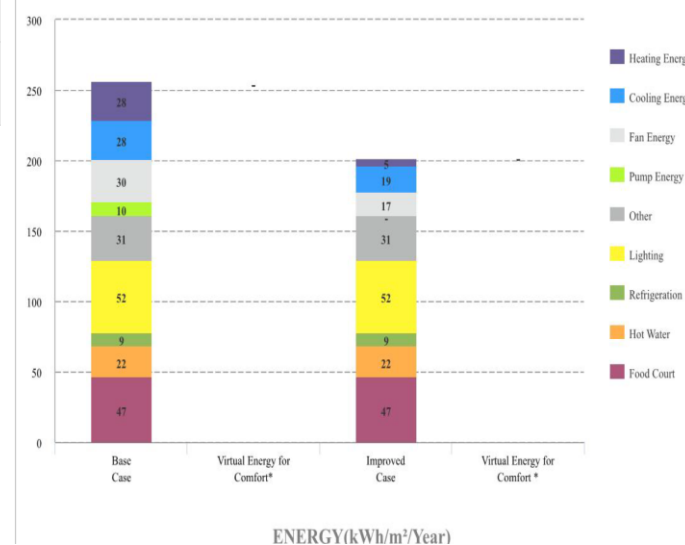
- Composite In-Situ Concrete and Steel Deck

Energy Efficiency measures 20.82%

Energy Savings

Meets EDGE energy standard

PROJECT METRICS



Incremental Cost
\$ 35,000

Utility Costs Savings
\$ 4,300 / month

Payback in Years
1

Operational CO₂
Savings
\$ 400 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 37% Savings through:

- Reduced Window to Wall Ratio, Reflective Paint for Roof.
- Reflective paint and tiles for roof.
- Insulation of roof and external walls.
- Variable frequency drives in AHUs
- CO2 sensor/demand-controlled ventilation for fresh air



Water – 53% Savings through:

- Dual flush water closets.
- Water-efficient urinals.
- Aerators and auto shut-off faucets.



Materials – 30% Savings through:

- Corrugated zinc sheets for roof construction.
- Steel profile cladding for external walls.
- Solid dense concrete blocks for internal walls.



Kaufland (Bulgaria)

In-country certified project to replace related example once an EDGE project is certified.

OFFICES – PAKISTAN CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Gross Internal Area	Floors Above Grade	Floors Below Grade	Floor-to-Floor Height
5000m ²	3	2	3.5m



Energy Measures – 23% Savings through:

- Variable Refrigerant Flow (VRF) System
- Reduced Window To Wall Ratio
- External Shading Devices - Annual Average Shading Factor
- Reflective Paint/Tiles for Roof -Solar Reflectivity



Water – 23% Savings through:

- Low-Flow Faucets in Bathrooms
- Dual flush for water closets in bathrooms



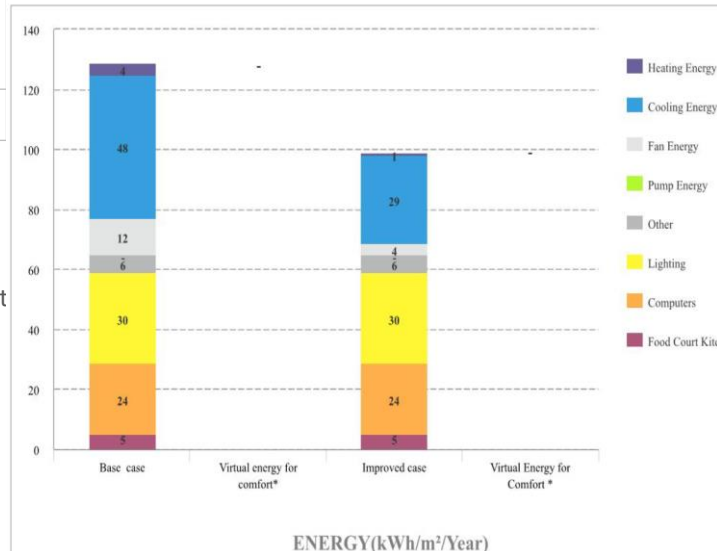
Materials – 30% Savings through:

- Composite In-Situ Concrete and Steel Deck

Energy Efficiency Measures 22.59%

ENERGY SAVINGS Meets EDGE Energy Star

PROJECT METRICS



Incremental Cost
\$ 40,000

Utility Costs Savings
\$ 750 / month

Payback in Years
4.5

Operational CO₂
Savings
\$ 70 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 33% Savings through:

- Reduced window to wall ratio
- Higher thermal performance glass
- Variable refrigerant volume (VRV) cooling system
- Sensible heat recovery from exhaust air
- Energy saving light-bulbs in internal and external spaces.



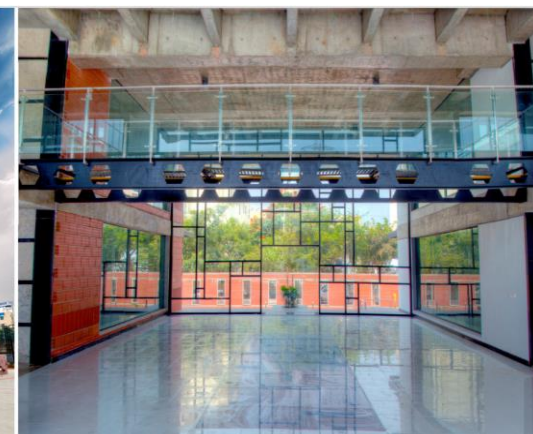
Water – 68% Savings through:

- Low-flow plumbing fixtures
- Dual-flush water closets
- Black water treatment and recycling system.



Materials – 32% Savings through:

- Honeycomb clay blocks for external walls
- uPVC window frames



Quasitum Intelisoft India Pvt. Ltd. (India)

In-country certified project to replace related example once an EDGE project is certified.

SCHOOLS – PAKISTAN CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Unit	Gross Internal Area	Occupancy Rate	Floors	Beds
Multi Specialty	9,700m ²	70%	7	100



Energy Measures – 20% Savings through:

- Insulation of External Walls: U-Value
- Natural Ventilation for Corridors
- Natural Ventilation for Classrooms



Water – 20% Savings through:

- Low-Flow Showerheads
- Low-Flow Faucets
- Dual Flush for Water Closets



Materials – 25% Savings through:

- Composite In-Situ Concrete and Steel Deck

PROJECT METRICS

Incremental Cost
\$ 10,000

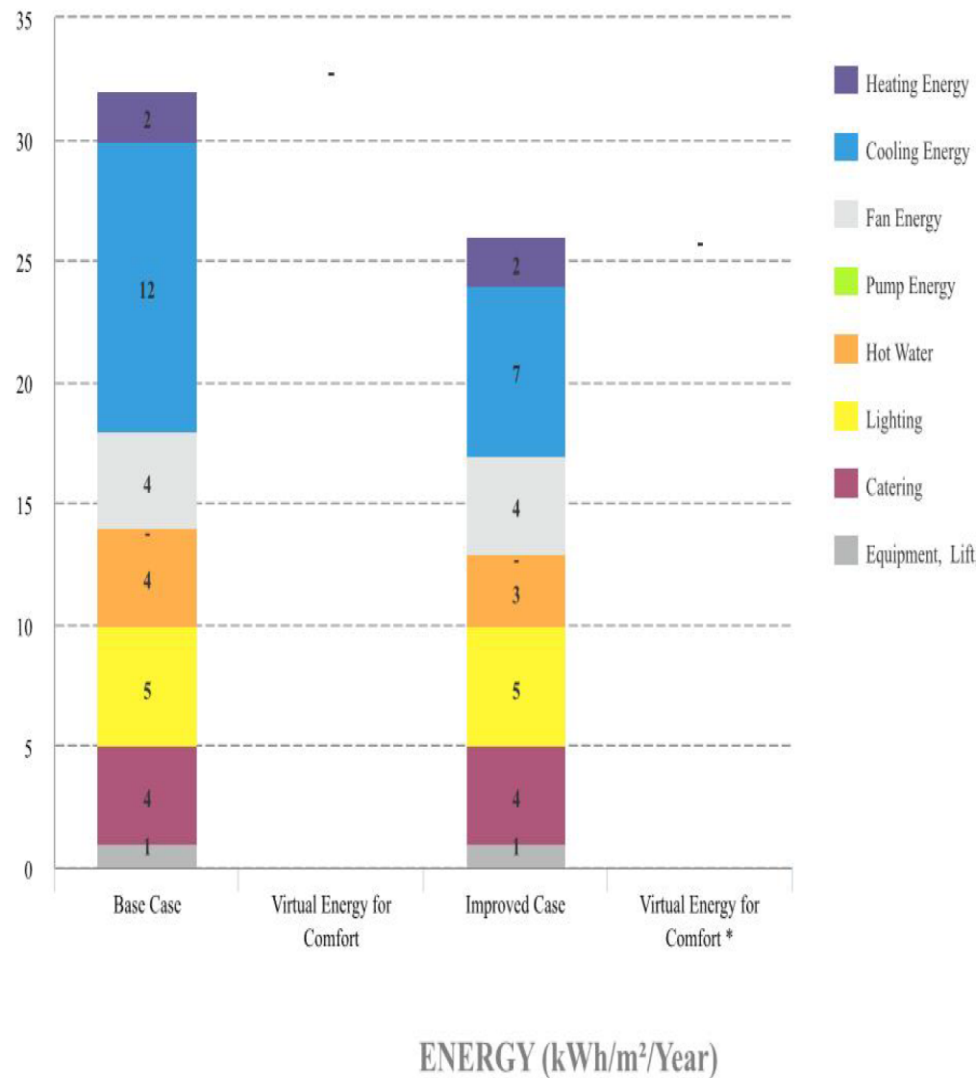
Utility Costs Savings
\$ 140 / month

Payback in Years
6

Operational CO₂
Savings
\$ 20 tCO₂/Year

Energy Efficiency Measures 20.5%

ENERGY SAVINGS Meets EDGE Energy



HOSPITALS – PAKISTAN CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Type of Unit	Gross Internal Area	Occupancy Rate	Floors	Beds
Multi Specialty	9,700m ²	70%	7	100



Energy Measures – 22% Savings through:

- Earth Air Tunnel System to Pre-Cool/Pre-Heat Supply Air Cooling/Heating Air Intake



Water – 22% Savings through:

- Low-Flow Faucets in all Bathrooms
- Dual Flush for Water Closets in all Bathrooms
- Single Flush/Flush Valve



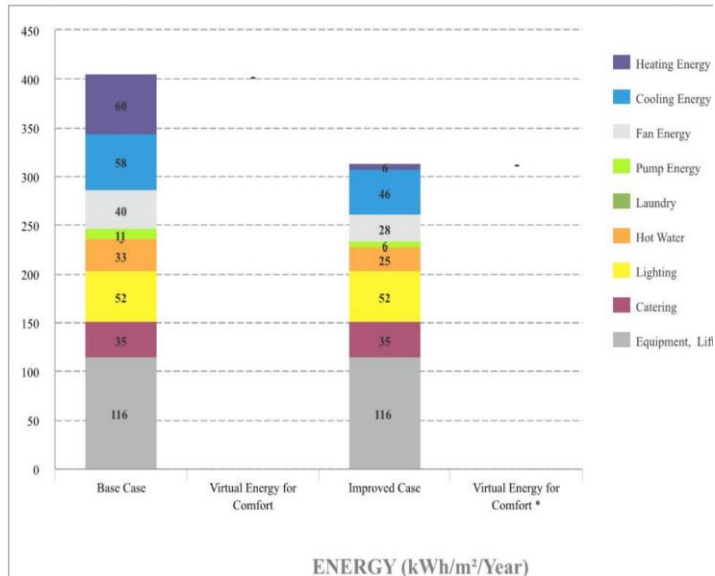
Materials – 28% Savings through:

- Composite In-Situ Concrete and Steel Deck

Energy Efficiency Measures 22.35%

ENERGY SAVINGS Meets EDGE Energy

PROJECT METRICS



Incremental Cost
\$ 88,000

Utility Costs Savings
\$ 3,700 / month

Payback in Years
2

Operational CO₂
Savings
\$ 450 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 32% Savings through:

- Reduced Window To Wall Ratio
- Reflective paint for external walls
- Insulation of roof and external walls
- Occupancy sensors in bathrooms
- Solar photovoltaics.



Water – 35% Savings through:

- Low-flow faucets in kitchens and bathrooms
- Single-flush and flush valve for water closets
- Water-efficient urinals, faucets and landscaping
- Rainwater harvesting system.



Materials – 43% Savings through:

- Steel sheets on steel rafters for roof construction
- Medium weight hollow concrete blocks for internal and external walls



Sede de EBAIS de Escobal de Belén (Costa Rica)

In-country certified project to replace related example once an EDGE project is certified.

LIGHT INDUSTRY – PAKISTAN CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Site Area	Car Parking	Landscaped Area	Amenities
15,000 m ²	Indoor Car Parking	1,000,000 m ²	Supermarket, Food Court



Energy Measures – 20% Savings through:

- Variable Frequency Drives in AHUs
- Energy Saving Light Bulbs -Internal Areas
- Energy-Saving Light Bulbs - Food Court
- Energy-Saving Light Bulbs - External Spaces
- Solar Hot Water Collectors - 50% of Hot Water Demand



Water – 24% Savings through:

- Dual Flush for Water Closets
- Single Flush/Flush Valve
- Water-Efficient Urinals in all Bathrooms



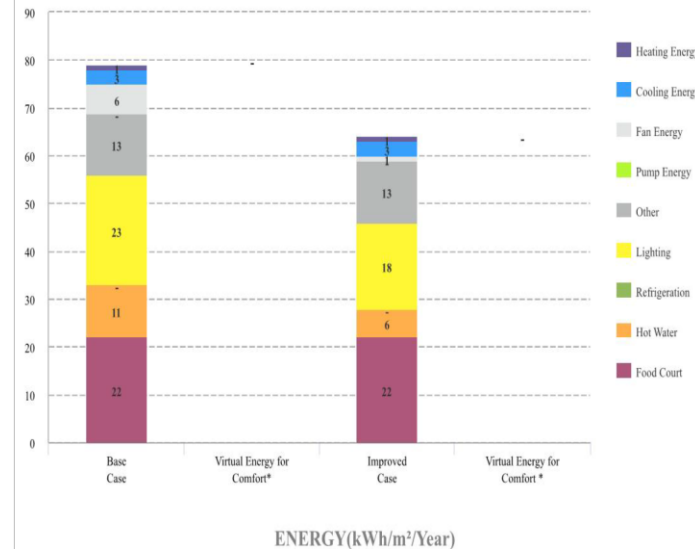
Materials – 81% Savings through:

- Composite In-Situ Concrete and Steel Deck

Energy Efficiency measures 20.12%

Energy Savings

Meets EDGE energy standard



PROJECT METRICS

Incremental Cost
\$ 42,560

Utility Costs Savings
\$ 1,400 / month

Payback in Years
2.5

Operational CO₂
Savings
\$ 100 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 27% Savings through:

- Reduced window to wall ratio
- Reflective paint and tiles for the roof.
- Energy-saving lighting in internal areas.
- Skylights to provide daylight to 50% of top floor areas.



Water – 26% Savings through:

- Dual flush water closets in bathrooms.



Materials – 27% Savings through:

- Steel sheets on steel rafters for roof construction and finished concrete flooring.



TPARK Banglee 4 (Thailand)

In-country certified project to replace related example once an EDGE project is certified.



METHODOLOGY, NOTES, ACKNOWLEDGMENTS



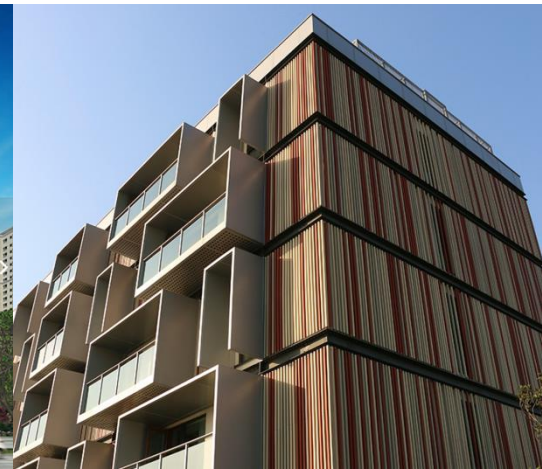
RESEARCH OBJECTIVE: MOST EFFECTIVE INTERVENTIONS TO REACH THE EDGE STANDARD

Reach 20% savings across the Energy, Water, and Materials categories in the most cost effective manner.

Analyzed focus countries in order to understand the environment and geographic impact on interventions.

Analyzed six sectors in each country – Homes, Hospitals, Hotels, Schools, Offices, and Retail – for best interventions unique to the sector and country in question in order to obtain EDGE certification.

By utilizing EDGE, we sought the most effective interventions in the passive building design phase that would in turn lead to the lowest possible payback and lowest cost for investors and builders.



OVERVIEW OF EDGE: A SOFTWARE, STANDARD, AND GREEN BUILDING CERTIFICATION SYSTEM



20%



The EDGE application helps to determine the most cost-effective options for designing green within a local climate context. Free on-line application is available from www.edgebuildings.com.

A building has reached the EDGE standard when it achieves 20% reduction in each of the 3 categories: energy, water, and embedded energy in materials.

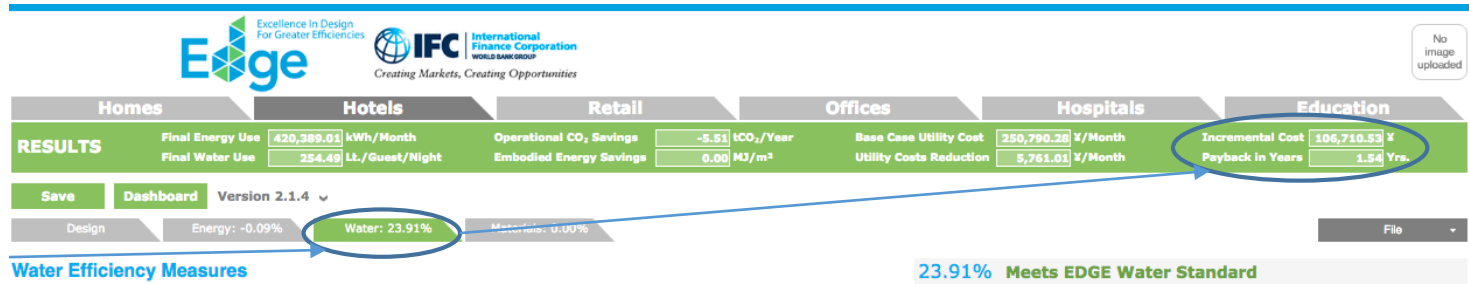
Third party certification verifies the resource efficiency savings so they can be credibly communicated between investors, developers, and buyers.

RESEARCH METHODOLOGY

The most cost effective interventions were determined through an iterative process using the EDGE application.

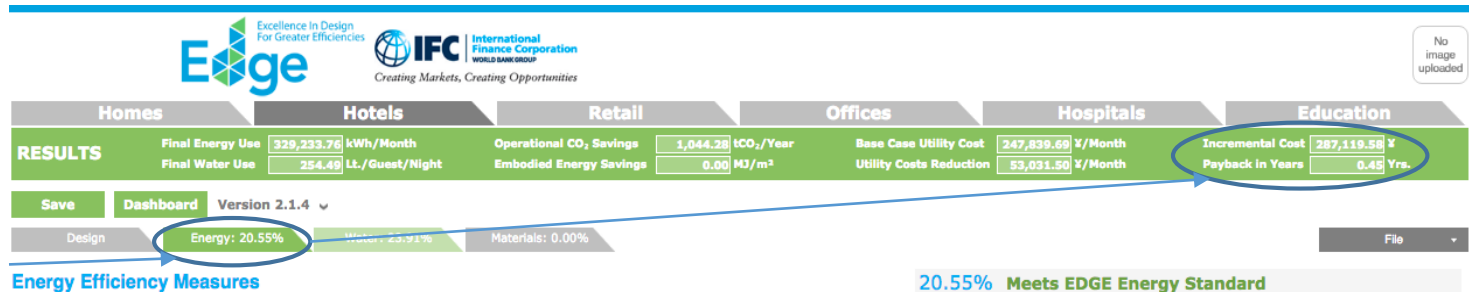
1

Determine top water measures that allow to pass the 20% minimum at the lowest Cost & Payback. Water was chosen first because it is tied to energy savings.



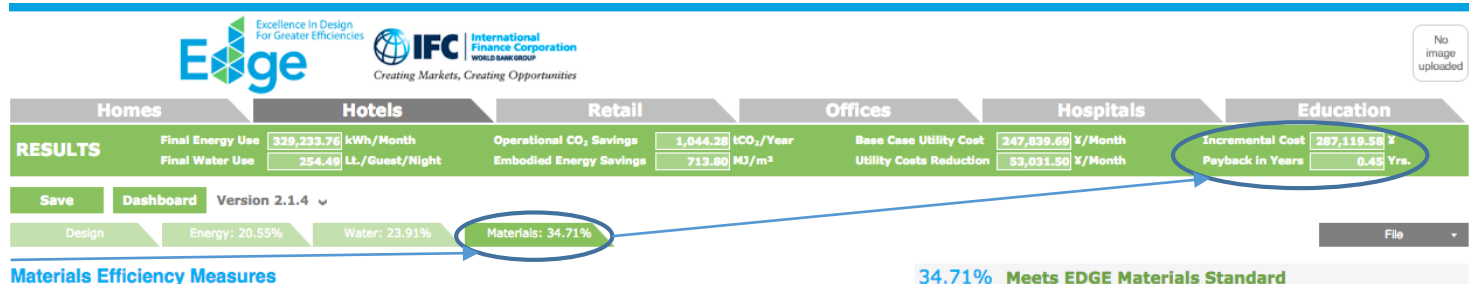
2

Once determined, proceed with next measure (energy) and repeat the process. Note: Water and energy measures may directly impact multiple categories.



3

Proceed to test materials measures and review the final Incremental Cost & Payback in Years.

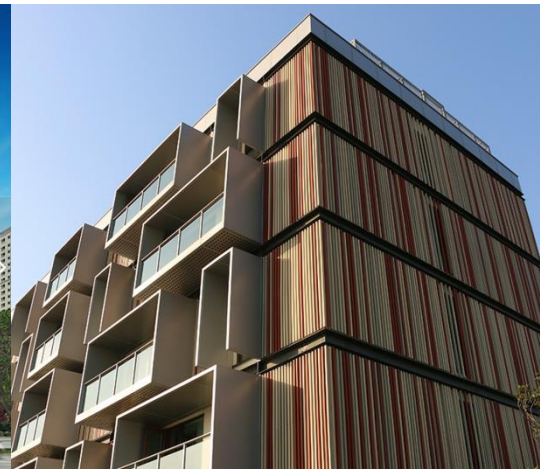


4

Repeat.

NOTES

- Case studies and certified projects are given for **illustrative purposes** only.
- Case studies included several assumptions in the building design, as per EDGE default values.
- Since case studies were chosen for the capital city only, the key takeaways for a country may be different in countries with varying climactic conditions across geographic regions.
- Education and Light Industrial are **new sectors** added to the EDGE application, have few certified buildings.
- Investors and developers of buildings should **use the dynamic EDGE software** with inputs specific to their respective building and climactic conditions, and then choose green interventions that **best address their specific needs**.
- IFC is **collecting additional data**, including operational savings of certified buildings – the operational data will be forthcoming, as will the ROI analysis for other regions.
- This research is part of ongoing series provided by IFC – in-depth country studies are available from: <https://www.edgebuildings.com/marketing/research/>



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