



## GREEN BUILDINGS RETURN ON INVESTMENT: LATIN AMERICA REGIONAL TAKE AWAYS

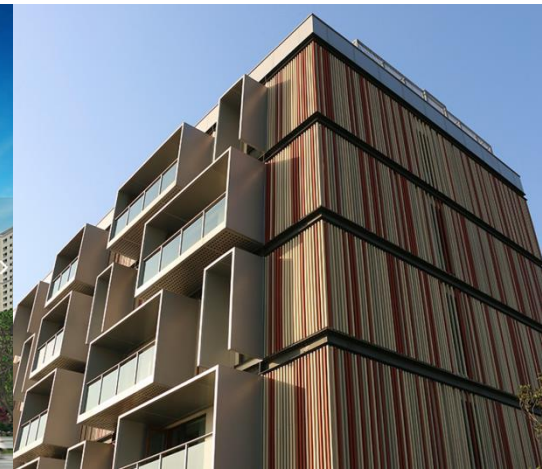


**International  
Finance Corporation**  
WORLD BANK GROUP

*Creating Markets, Creating Opportunities*

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## ARGENTINA: GREEN BUILDINGS RETURN ON INVESTMENT



*Creating Markets, Creating Opportunities*



## ARGENTINA – ROI ON MEASURES NEEDED TO ACHIEVE THE EDGE STANDARD

	Incremental Cost	Utility Savings / month	Payback Period in Years
Homes	\$185/Unit	\$6/Unit	2.7
Hotels	\$221,930	\$8,725	2.1
Shopping Centers	\$156,300	\$7,000	1.9
Offices	\$57,100	\$1,330	3.6
Schools	\$17,740	\$200	7.5
Hospitals	\$452,580	\$5,820	6.5
Light Industry	\$70,440	\$2,470	2.4





## BUILDING DETAILS

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



### Energy Measures – 25% Savings through:

- Energy Saving Light Bulbs



### Water – 21% Savings through:

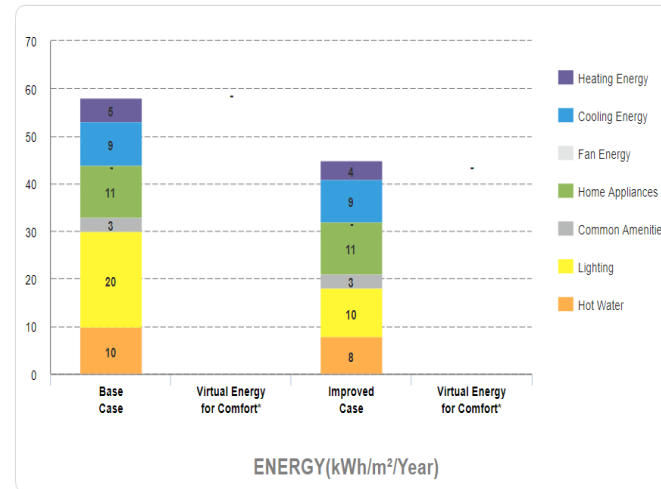
- Low-Flow Showerheads
- Low-Flow Faucets for Washbasins & Kitchen Sinks
- Dual Flush for Water Closets



### Materials – 28% Savings through:

- Hollow Core Precast Floor Slab
- Honey Comb Clay Wall With Internal External Plaster External Wall

25.07% Meets EDGE Energy Standard



## PROJECT METRICS

Incremental Cost

\$185/unit

Utility Cost Savings

\$6/month/unit

Payback in Years

2.7

Operational CO<sub>2</sub> Savings

1.73 tCO<sub>2</sub>/Year/unit

## RELEVANT CERTIFIED PROJECT



### Energy Measures – 27% Savings through:

- Reduced Window To Wall Ratio
- Reflective Paint For Roof And Walls
- External Shading Device
- Roof Insulation
- Energy-saving Light Bulbs For Internal, External , And Common Spaces



### Water – 30% Savings through:

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



### Materials – 35% Savings through:

- In-situ trough concrete slab for floor slabs
- Concrete filler slab with polystyrene blocks for roof construction
- Honeycomb clay blocks with internal and external plaster for external walls
- Honeycomb clay blocks with plaster on both sides for internal walls.



**EDIFICIO VERONA (COLOMBIA)**

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

# HOTELS – ARGENTINA CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

Type of Hotel	Floors Above Ground	Total Guest Units	Internal Area
4 Star Hotel	8	200	15,599 m <sup>2</sup>



### Energy Measures – 24% Savings through:

- External Shading Device
- Insulation of Roof and External Wall
- Variable Refrigeration Flow and Air Condition
- High Efficient Water Boiler
- Energy Saving Light Bulb



### Water – 37% Savings through:

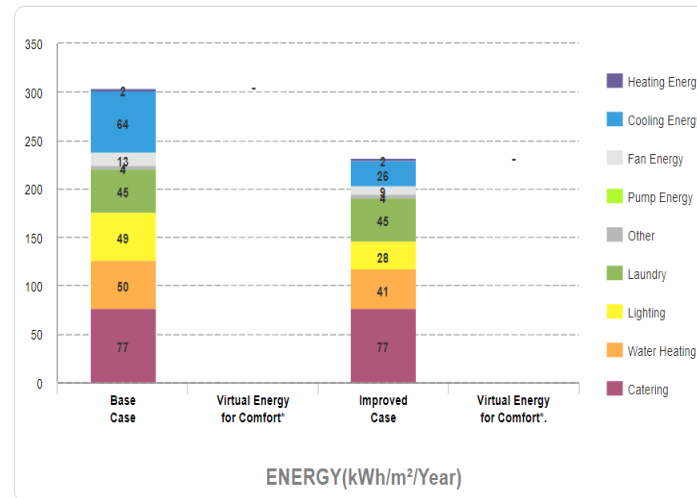
- Low-Flow Showerheads and Faucets Guestrooms
- Dual-Flush in Guest Room
- Water Efficient Landscape and Urinals



### Materials – 30% Savings through:

- Composite Slim Slabs with Steel I-Beam Floor

23.88% Meets EDGE Energy Standard



## PROJECT METRICS

Incremental Cost

\$221,930

Utility Cost Savings

\$8,725/month

Payback in Years

2.1

Operational CO<sub>2</sub> Savings

1700 tCO<sub>2</sub>/Year

## RELEVANT CERTIFIED PROJECT



### Energy Measures – 47% Savings through:

- External Shading Device
- Insulation of Roof and External Walls
- Higher thermal performance glass
- Energy efficient air conditioning with air-cooled screw chiller
- Sensible heat recovery from exhaust air and solar hot water collector
- Energy-Saving Light Bulbs



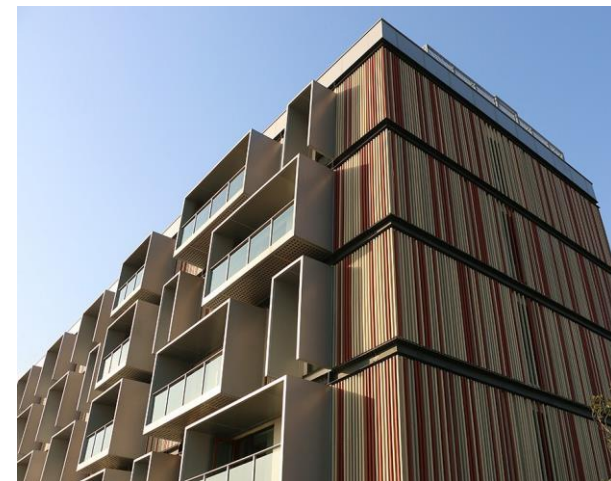
### Water – 42% Savings through:

- Low-Flow showerhead and faucet
- Dual Flush Water Closets in all guest rooms
- rainwater harvesting system
- grey water treatment and recycling system.



### Materials – 34% Savings through:

- Solid dense concrete blocks for internal and external walls
- laminated wooden flooring
- timber window frames



## BRUCK PASSIVE HOUSE HOTEL (CHINA)

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

# SHOPPING CENTERS – ARGENTINA CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

Site Area	Car Parking	Floors Above Ground	Amenities
15,000 m <sup>2</sup>	Indoor Car Parking	1	Supermarket, Food Court



### Energy Measures – 24% Savings through:

- Insulation of Roof and External Wall
- Variable Refrigeration Flow Cooling System
- Air Conditioning with Air Cooled Screw Chiller



### Water – 31% Savings through:

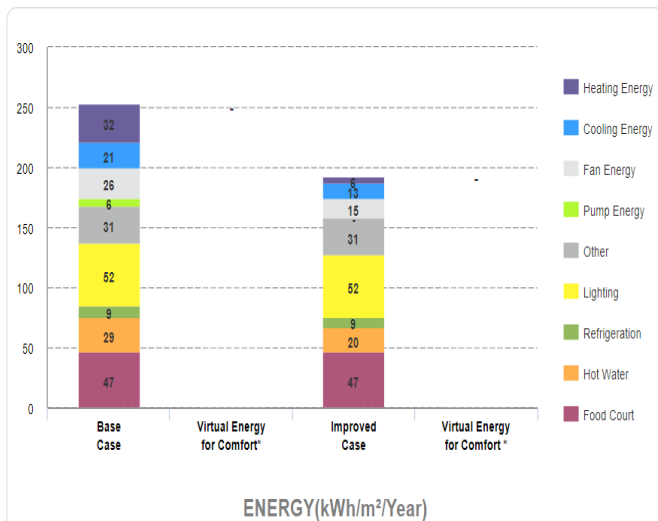
- Dual Flush for Water Closets
- Aerator and Auto Shut-off Faucet



### Materials – 24% Savings through:

- Concrete Hollow Filler Slab

23.39% Meets EDGE energy standard



## PROJECT METRICS

Incremental Cost

\$156,300

Utility Cost Savings

\$7,000/month

Payback in Years

1.9

Operational CO<sub>2</sub> Savings

1370 tCO<sub>2</sub>/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 Sheets on Steel Rafters Roof
- Steel Profile Cladding for External Walls; Autoclaved Aerated Concrete for Internal and External Walls



## RETAIL AT SANTA VERDE (COSTA RICA)

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 <sup>2</sup>	3	2	3.5m



### Energy Measures – 33% Savings through:

- Variable Refrigerant Flow System
- Air Conditioning with Water Screwed Chiller
- Energy Saving Lightbulb



### Water – 20% Savings through:

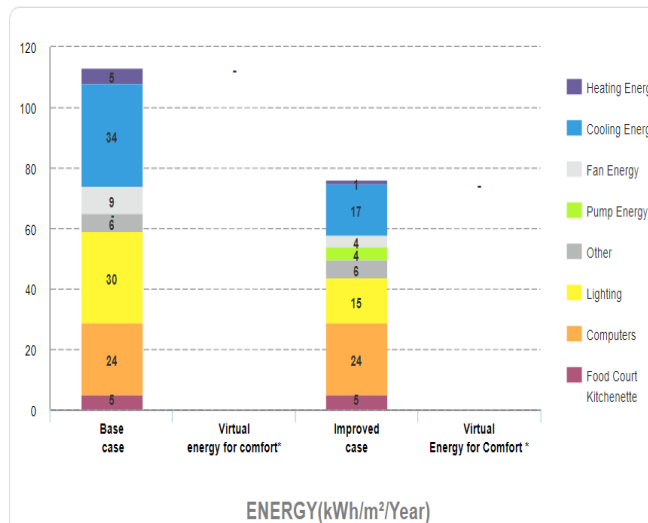
- Water-efficient bathroom urinals
- Dual flush for water closets in bathrooms
- Low Flow Faucet in bathroom
- Water Efficient Faucet in Kitchen



### Materials – 27% Savings through:

- Concrete Filler Floor Slabs

33.39% Meets EDGE Energy Standard



## PROJECT METRICS

Incremental Cost

\$57,100

Utility Cost Savings

\$1,330/month

Payback in Years

3.6

Operational CO<sub>2</sub> Savings

180 tCO<sub>2</sub>/Year

## RELEVANT CERTIFIED PROJECT



### Energy Measures – 38% Savings through:

- Reduced Window to Wall Ratio
- Reflective paint for roof and walls
- Roof and wall insulation
- Energy-Saving Light Bulbs for Internal and External Spaces



### Water – 23% Savings through:

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



### Materials – 63% Savings through:

- Reuse of existing floor slabs and external walls with steel profile cladding
- Plasterboards on metal studs for internal walls,
- Steel sheets on steel rafters for the roof, and ceramic tile.



**Centro de Desarrollo Emprendedor y Laboral (CeDEL)**



# SCHOOLS – ARGENTINA CASE STUDY

## BUILDING DETAILS

Occupancy Density	Operational Hours	Working Days	Holidays / Year
3	6	5	60



Energy Measures – 21% Savings through:

- Reduce Window to Wall Ratio
- External Shading Device
- Natural Ventilation for Corridors



Water – 30% Savings through:

- Low Flow Faucet
- Water-Efficient Urinals
- Dual Flush Water Closet
- Water Efficient Faucet for Kitchen Sink



Materials – 23% Savings through:

- Concrete Filler Floor Slabs

## PROJECTED PROJECT METRICS

Incremental Cost

\$17,740

Utility Cost Savings

\$200/month

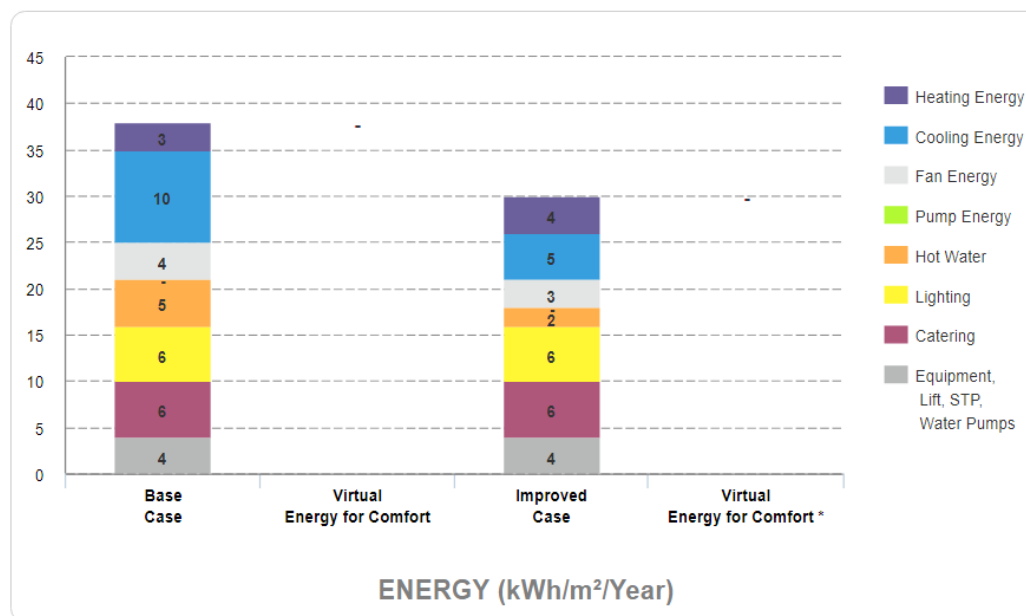
Payback in Years

7.5 Years

Operational CO2 Savings

72 tCO<sub>2</sub>/Year

21.4% Meets EDGE Energy Standard



Education is a new sector in the EDGE application.  
Relevant certified project to be included as soon as case study is published.

# HOSPITALS – ARGENTINA CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

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



### Energy Measures – 32% Savings through:

- Variable Refrigerant Flow Cooling Systems
- Energy Saving Light Bulbs - Internal & External Spaces
- Insulation of Roof and External Wall
- Air Conditioning with Air and Water Screwed Chiller



### Water – 37% Savings through:

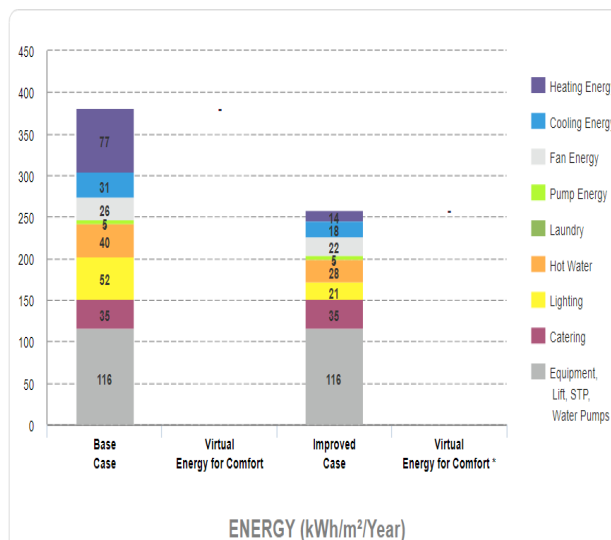
- Low Flow Faucet in Bathroom
- Dual Flush for Water Closet in all Bathrooms
- Water Efficient Urinals and Faucet in Kitchen



### Materials – 27% Savings through:

- In-Situ Trough Concrete Floor Slabs

32.16% Meets EDGE Energy Standard



## PROJECT METRICS

Incremental Cost

\$452,580

Utility Cost Savings

\$5,820/month

Payback in Years

6.5

Operational CO<sub>2</sub> Savings

1240 tCO<sub>2</sub>/Year

## RELEVANT CERTIFIED PROJECT



### Energy Measures – 32% Savings through:

- Reduced window to wall ratio, natural ventilation for corridors
- reflective paint for external walls, insulation of roof and external walls
- energy-saving lighting systems
- 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
- finished concrete flooring



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– ARGENTINA CASE STUDY

## BUILDING DETAILS

Floors Above Ground	Shifts in a day (8 hour, 6 workday)	Gross Internal Area
1	1	15,000 m <sup>2</sup>



Energy Measures – 25% Savings through:

- Skylights
- Occupancy Sensors in Bathrooms
- Reflective Paint for Roof and External Walls
- High Efficiency Boiler for Water Heating



Water – 35% Savings through:

- Dual Flush, Water-Efficient Urinals
- Aerator and Auto Shut-off Faucets



Materials – 20% Savings through:

- In-Situ Waffle Concrete Roof Slab

## PROJECTED PROJECT METRICS

Incremental Cost

\$70,440

Utility Cost Savings

\$2,470

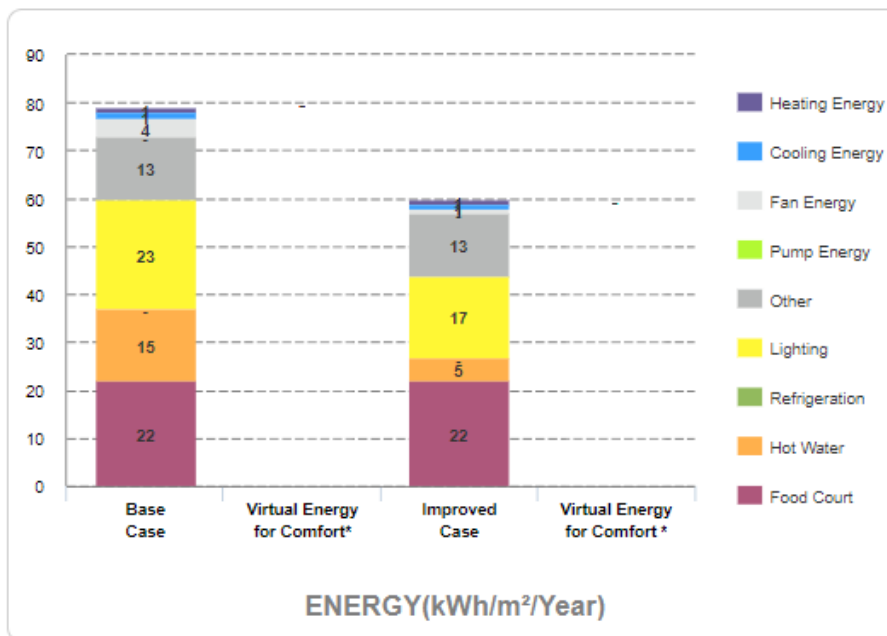
Payback in Years

2.4 Years

Operational CO2 Savings

143 tCO<sub>2</sub>/Year

25.25% Meets EDGE energy standard





## BRAZIL: GREEN BUILDINGS RETURN ON INVESTMENT



*Creating Markets, Creating Opportunities*





## BRAZIL – ROI ON MEASURES NEEDED TO ACHIEVE THE EDGE STANDARD

	Incremental Cost	Utility Savings / month	Payback Period in Years
Homes	\$840/Unit	\$12 / Unit	5.9
Hotels	\$180,500	\$11,735	1.3
Shopping Centers	\$443,000	\$12,700	2.9
Offices	\$50,900	\$1,870	2.3
Schools	\$46,375	\$635	6
Hospitals	\$119,000	\$8,075	1.3
Light Industry	\$350,470	\$5,730	5.1



# HOMES – BRAZIL CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

Type of Unit	Average Unit Area	Bedrooms / Unit	Floors	Units
Mid Income	80m <sup>2</sup>	2	10	50



### Energy Measures – 25% Savings through:

- External Shading Device
- Reduce Window to Wall Ratio
- Energy Saving Light Bulbs
- Ceiling Fans in all Habitable Rooms



### Water – 24% Savings through:

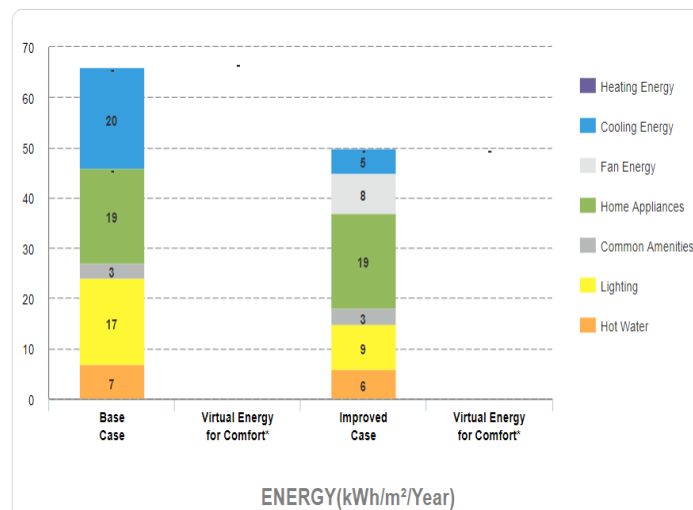
- Low-Flow Showerheads
- Low-Flow Faucets for Washbasins & Kitchen Sinks
- Dual Flush for Water Closets



### Materials – 28% Savings through:

- Pre-Cast Concrete Panel for External Wall
- Composite Slim Slabs with Steel I-Beam Floor

24.96% Meets EDGE Energy Standard



## PROJECT METRICS

Incremental Cost

\$840/unit

Utility Cost Savings

\$12/month/unit

Payback in Years

5.9

Operational CO<sub>2</sub> Savings

1.85 tCO<sub>2</sub>/Year/unit

## RELEVANT CERTIFIED PROJECT



### Energy Measures – 23% Savings through:

- Reduced Window To Wall Ratio
- Energy-saving Lighting And Lighting Controls For Common Areas And Outdoor Spaces.



### Water – 23% Savings through:

- Low-Flow Showerheads
- Low-Flow Faucets
- Dual Flush Water Closet



### Materials – 57% Savings through:

- In-situ Reinforced Concrete For Floors And Roofs
- Medium Weight Hollow Concrete Blocks For Internal And External Walls.



**JULIO PRESTES (BRAZIL)**



# HOTELS – BRAZIL CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

Type of Hotel	Floors Above Ground	Total Guest Units	Internal Area
4 Star Hotel	8	200	15,599 m <sup>2</sup>



### Energy Measures – 23% Savings through:

- External Shading Device
- Air Conditioning Water Cooled Chiller
- Energy Saving Light Bulb



### Water – 21% Savings through:

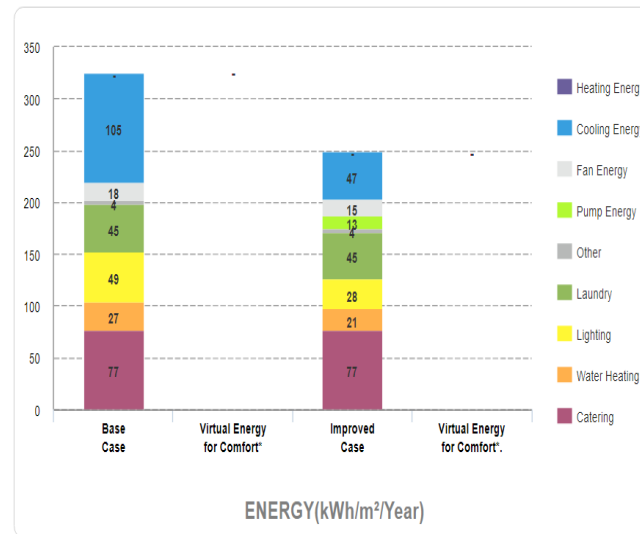
- Low-Flow Showerheads and Faucets Guestrooms
- Water Efficient Urinal
- Aerator and Auto Shut-off Faucet in non-guest area
- Duel Flush Water Closet



### Materials – 28% Savings through:

- In-Situ Concrete with >25% GGBS Flooring

23.71% Meets EDGE Energy Standard



## PROJECT METRICS

Incremental Cost

\$180,500

Utility Cost Savings

\$11,735/month

Payback in Years

1.3

Operational CO<sub>2</sub> Savings

1650 tCO<sub>2</sub>/Year

## RELEVANT CERTIFIED PROJECT



### Energy Measures – 32% Savings through:

- Reduced Window To Wall Ratio, Low-e Coated Glass
- Reflective Paint For External Walls
- Insulation Of Roof And External Walls
- Natural Ventilation For Corridors
- Energy-saving Lighting Systems
- 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
- Finished Concrete Flooring.



## THE 101 YOGYAKARTA TUGU (INDONESIA)

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

# SHOPPING CENTERS – BRAZIL CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

Site Area	Car Parking	Floors Above Ground	Amenities
15,000 m <sup>2</sup>	Indoor Car Parking	1	Supermarket, Food Court



### Energy Measures – 37% Savings through:

- Insulation of Roof
- Air Conditioning with Air Cooled Screw Chiller
- Solar Photovoltaics Replacing 25% of energy



### Water – 42% Savings through:

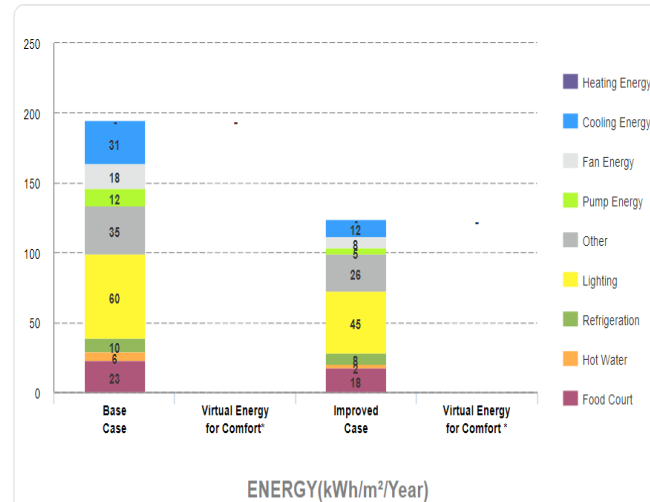
- Dual Flush for Water Closets
- Water Efficient Urinals
- Aerator and Auto Shut-off Faucet



### Materials – 39% Savings through:

- In-Situ Concrete with >25% GGBS for Floor and Roof

36.94% Meets EDGE energy standard



## PROJECT METRICS

Incremental Cost

\$443,000

Utility Cost Savings

\$12,700/month

Payback in Years

2.9

Operational CO<sub>2</sub>

Savings

785 tCO<sub>2</sub>/Year

## RELEVANT CERTIFIED PROJECT



### Energy Measures – 29% Savings through:

- Reduced Window to Wall Ratio, Reflective Paint for Roof
- insulation of roof and external walls
- variable refrigerant volume cooling system
- energy-saving lighting system for external spaces, sales, corridors, common areas skylights.



### Water – 27% Savings through:

- Low-flow faucets in kitchens and bathrooms
- dual-flush water closets, water-efficient urinals
- aerators and auto shut-off faucets in all bathrooms.



### Materials – 36% Savings through:

- Steel sheets on steel rafters for roof construction
- medium weight hollow concrete blocks and steel profile cladding for external walls
- medium weight hollow concrete blocks for internal walls
- finished concrete floor.



**BMB 001 CAMBUCI – OBRAMAX (BRAZIL)**

# OFFICES – BRAZIL CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

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



### Energy Measures – 24% Savings through:

- Air Conditioning With Water Cooled Chiller
- Variable Refrigerant Flow Cooling System



### Water – 22% Savings through:

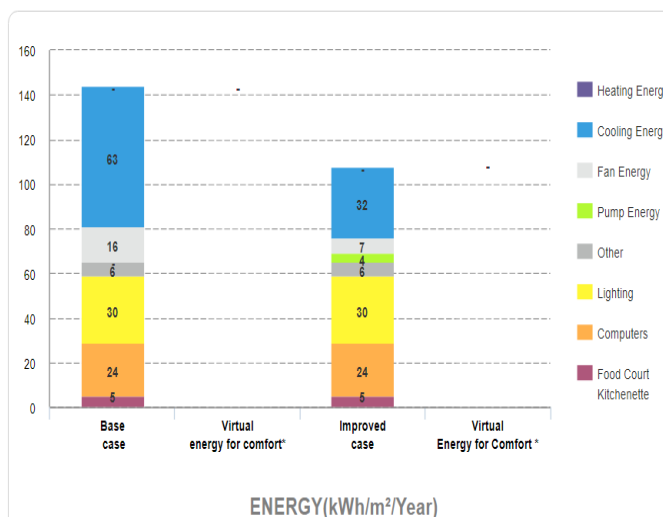
- Grey Water Treatment and Recycle System
- Rainwater Harvesting System on 50% of Roof Area
- Water-Efficient Bathroom Urinals and Faucets for Kitchen Sinks
- Dual Flush for Water Closets in Bathrooms
- Low Flow Water Faucet in Bathroom



### Materials – 35% Savings through:

- In-Situ Concrete with >25% GGBS Floor Slabs

24.38% Meets EDGE Energy Standard



## PROJECT METRICS

Incremental Cost

\$50,900

Utility Cost Savings

\$1,870/month

Payback in Years

2.3

Operational CO<sub>2</sub>

Savings

230 tCO<sub>2</sub>/Year

## RELEVANT CERTIFIED PROJECT



### Energy Measures – 32% Savings through:

- Reduced window to wall ratio
- reflective paint and tiles for roof and external walls
- external shading devices
- insulation of roof
- energy-saving lighting system for internal spaces.



### Water – 24% Savings through:

- Low-Flow Faucets in Kitchens and Bathrooms
- dual-flush water closets



### Materials – 43% Savings through:

- Aluminum-clad sandwich panel for roof construction
- in-situ reinforced wall and honeycomb clay blocks with internal and external plaster for external walls
- honeycomb clay blocks with plaster on both sides and plasterboards on metal studs for internal walls
- ceramic tile flooring
- aluminium window frames.



## ALTURIA (COLOMBIA)

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



# SCHOOLS – BRAZIL CASE STUDY

## BUILDING DETAILS

Occupancy Density	Operational Hours	Working Days	Holidays / Year
3	6	5	60



### Energy Measures – 28% Savings through:

- Variable Refrigeration Flow Cooling System
- Air Conditioning with Air or Water Chiller
- Insulation of Roof and External Wall



### Water – 22% Savings through:

- Dual Flush Water Closet
- Low Flow Faucet
- Water-Efficient Urinals
- Water-Efficient Faucets for Kitchen Sinks



### Materials – 20% Savings through:

- Composite Slim Slab with Steel I-Beam Floor

## PROJECTED PROJECT METRICS

Incremental Cost

\$46,375

Utility Cost Savings

\$635/month

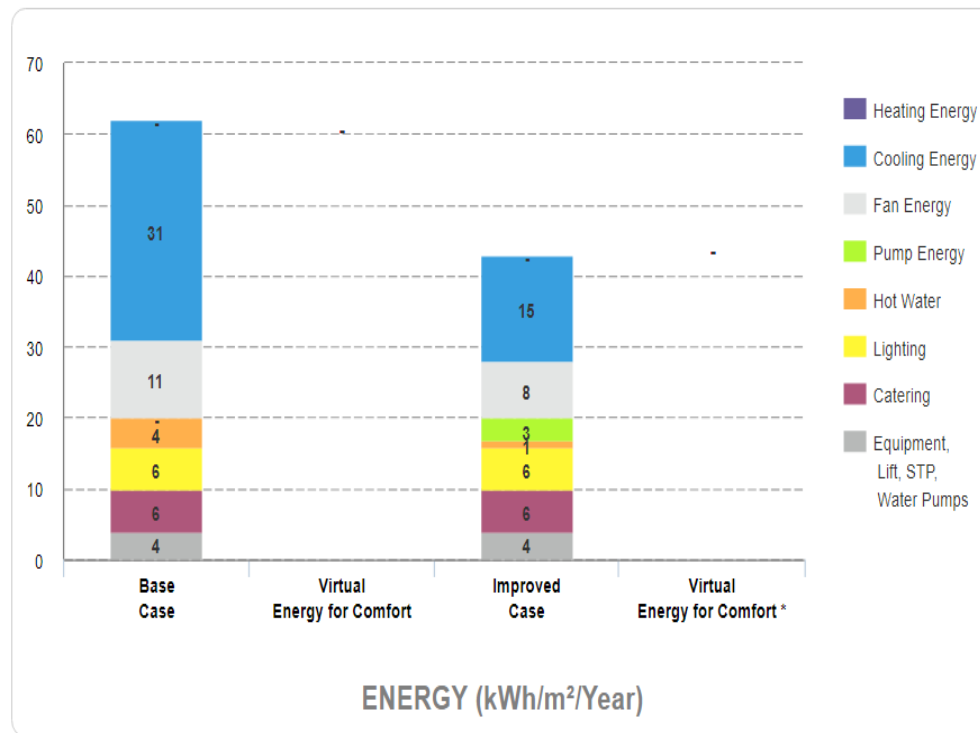
Payback in Years

6 Years

Operational CO2 Savings

97 tCO<sub>2</sub>/Year

27.7% Meets EDGE Energy Standard



Education is a new sector in the EDGE application.  
Relevant certified project to be included as soon as case study is published.

# HOSPITALS – BRAZIL CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

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



### Energy Measures – 26% Savings through:

- Variable Refrigerant Flow Cooling Systems
- Energy Saving Light Bulbs - Internal & External Spaces
- Air Conditioning with Air or Water Chiller
- Sensible Heat Recovery from Exhausted Air



### Water – 32% Savings through:

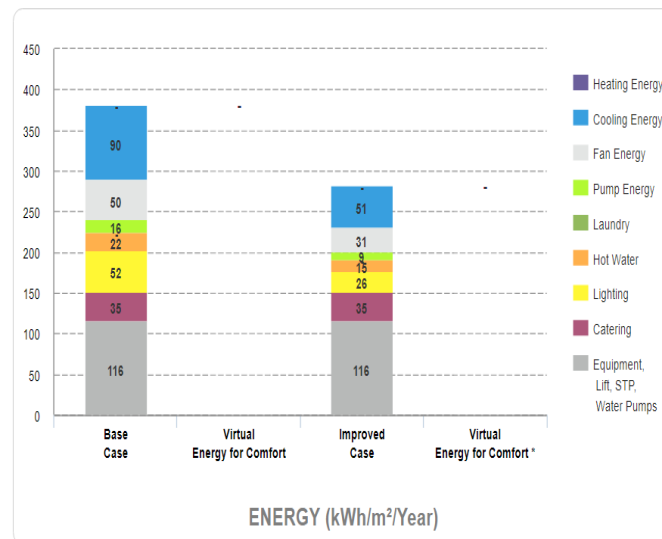
- Low Flow Faucet in all Bathroom
- Dual Flush Water Closet
- Water Efficient Urinal and Kitchen Faucet



### Materials – 25% Savings through:

- Concrete Filler Floor Slabs

25.80% Meets EDGE Energy Standard



## PROJECT METRICS

Incremental Cost

\$119,000

Utility Cost Savings

\$8,075/month

Payback in Years

1.3

Operational CO<sub>2</sub> Savings

1210 tCO<sub>2</sub>/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
- 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 And Internal Walls
- Ceramic Tile Flooring



## KOMFO ANOKYE HOSPITAL (GHANA)

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

# LIGHT INDUSTRY– BRAZIL CASE STUDY

## BUILDING DETAILS

Floors Above Ground	Shifts in a day (8 hour, 6 workday)	Gross Internal Area
1	1	15,000 m <sup>2</sup>



Energy Measures – 34% Savings through:

- Insulation of Roof and External Wall
- Air Conditioning with Air or Water Cooled Chiller
- Solar Photovoltaics for 25% of Energy Consumption



Water –43% Savings through:

- Dual Flush Water Closet
- Water-Efficient Urinals and Kitchen Sink
- Auto Shut-off, Efficient Faucets



Materials – 24% Savings through:

- Concrete Filler Floor Slab

## PROJECTED PROJECT METRICS

Incremental Cost

\$350,470

Utility Cost Savings

\$5,730/month

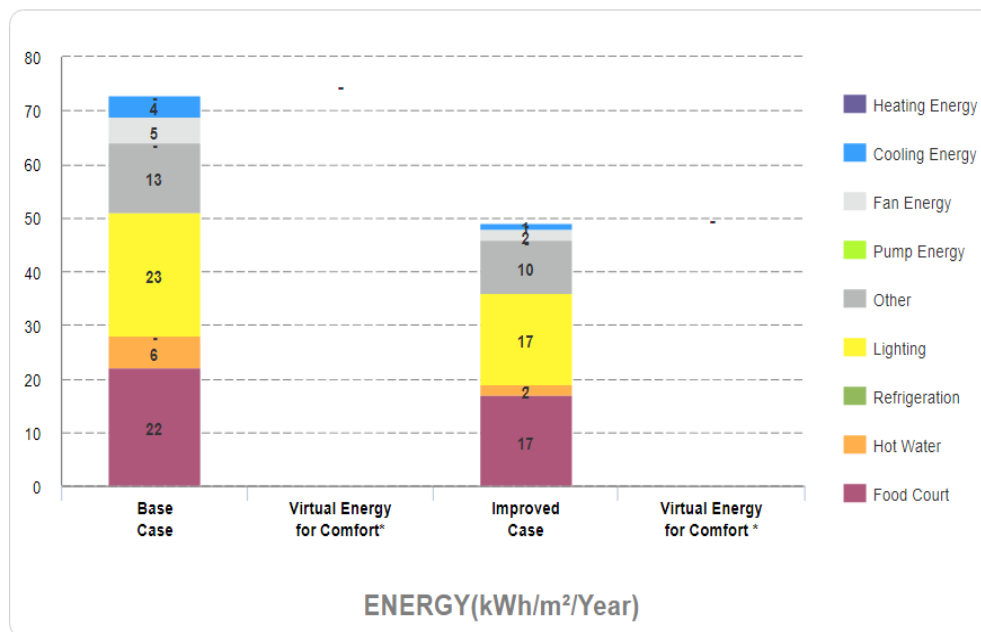
Payback in Years

5.1 Years

Operational CO<sub>2</sub> Savings

315 tCO<sub>2</sub>/Year

33.82% Meets EDGE energy standard







## COLOMBIA: GREEN BUILDINGS RETURN ON INVESTMENT



*Creating Markets, Creating Opportunities*



## COLOMBIA – ROI ON MEASURES NEEDED TO ACHIEVE THE EDGE STANDARD

	Incremental Cost	Utility Savings / month	Payback Period in Years
Homes	\$630/Unit	\$20/Unit	2.9
Hotels	\$159,900	\$7,900	1.7
Shopping Centers	\$201,300	\$8,735	1.9
Offices	\$29,880	\$830	3
Schools	\$20,700	\$225	8
Hospitals	\$256,700	\$8,420	2.5
Light Industry	\$78,340	\$2,320	2.8



# HOMES – COLOMBIA CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

Type of Unit	Average Unit Area	Bedrooms / Unit	Floors	Units
High Income	80m <sup>2</sup>	2	10	50



### Energy Measures – 21% Savings through:

- Low-E Coated Glass
- Energy Saving Light Bulbs in All Areas
- Natural Ventilation
- Ceiling Fans in all Habitable Rooms
- Energy Efficient Refrigerators and Clothes Washing Machines



### Water – 24% Savings through:

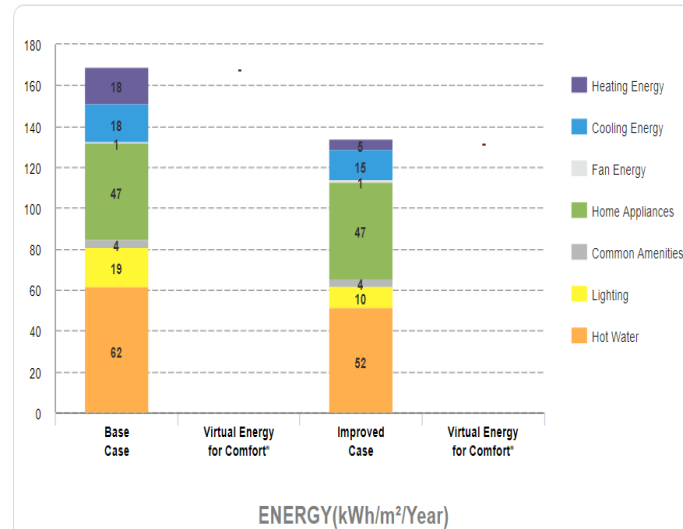
- Low-Flow Showerheads
- Low-Flow Faucets for Washbasins & Kitchen Sinks
- Dual Flush for Water Closets



### Materials – 35% Savings through:

- Concrete Filler Floor Slab

21.43% Meets EDGE Energy Standard



## PROJECT METRICS

Incremental Cost

\$630/unit

Utility Cost Savings

\$18/month/unit

Payback in Years

2.9

Operational CO<sub>2</sub> Savings

2.3 tCO<sub>2</sub>/Year/unit

## RELEVANT CERTIFIED PROJECT



### Energy Measures – 28% Savings through:

- Reduced Window to Wall Ratio
- external shading devices
- energy-saving lighting system for internal spaces, common areas and external spaces
- lighting controls for common areas and outdoors.



### Water – 52% Savings through:

- Low-Flow Faucets in Kitchen and Bathroom
- Dual-flush Water Closets



### Materials – 47% Savings through:

- In-situ trough concrete slab for floor slabs and roof construction
- exposed cored bricks with internal plaster for external walls
- honeycomb clay blocks with plaster on both sides for internal walls.



EDIFICIO BIEL (COLOMBIA)



# HOTELS – COLOMBIA CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

Type of Hotel	Floors Above Ground	Total Guest Units	Internal Area
4 Star Hotel	8	200	15,599 m <sup>2</sup>



### Energy Measures – 23% Savings through:

- External Shading Device
- Variable Refrigerator Flow Cooling System
- Air Conditioning with Water Cooled Chiller
- Energy Saving Light Bulbs for Internal Space



### Water – 20% Savings through:

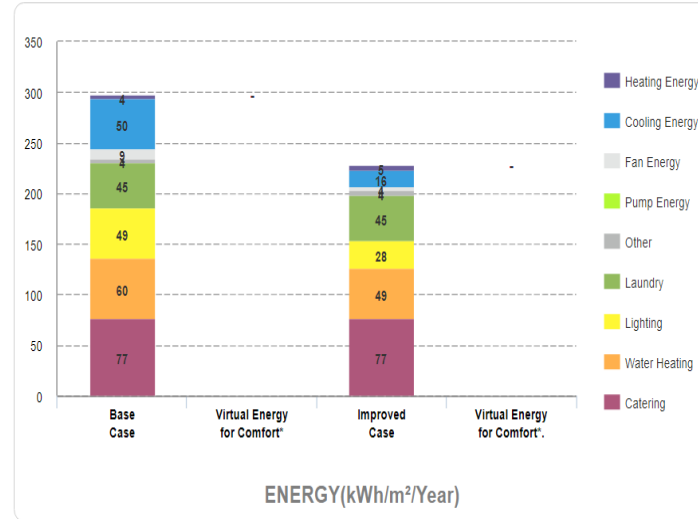
- Low-Flow Showerheads and Faucets Guestrooms
- Dual Flush Water Closet
- Water Efficient Urinal



### Materials – 33% Savings through:

- Concrete Filler Floor Slabs

23.20% Meets EDGE Energy Standard



## PROJECT METRICS

Incremental Cost

\$159,900

Utility Cost Savings

\$7,900/month

Payback in Years

1.7

Operational CO<sub>2</sub> Savings

763 tCO<sub>2</sub>/Year

## RELEVANT CERTIFIED PROJECT



### Energy Measures – 23% Savings through:

- Reduced Window To Wall Ratio, Low-e Coated Glass
- Air Conditioning With Air Cooled Screw Chiller
- Low-e Coated Glass, Variable Speed Drives On The Fans Of Cooling Towers
- Variable Speed Drives Pumps,
- Energy-saving Light Bulbs For Back-of-house And Heat Pumps.



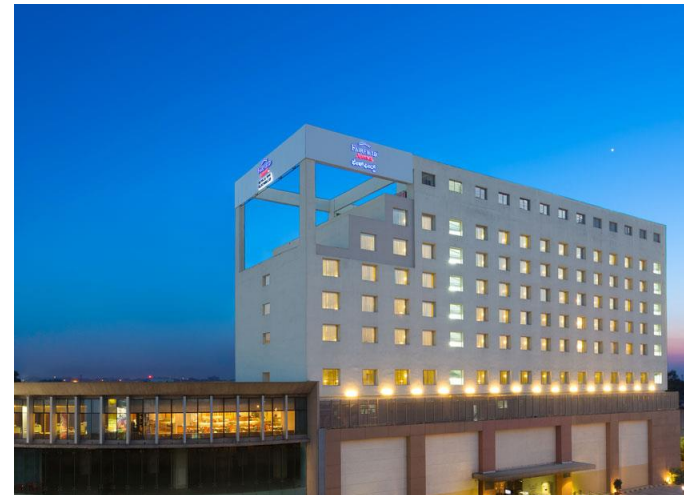
### Water – 28% Savings through:

- Black Water Treatment And Recycling System.
- Dual Flush Water Closets In All Bathrooms



### Materials – 51% Savings through:

- 150mm In-situ Reinforced Concrete Slab For Floors And Roof
- 200mm Solid Dense Concrete Blocks For Internal And External Walls
- And Laminated Wooden Flooring.



**SAMHI – FAIRFIELD BY MARRIOTT (INDIA)**

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

# SHOPPING CENTERS – COLOMBIA CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

Site Area	Car Parking	Floors Above Ground	Amenities
15,000 m <sup>2</sup>	Indoor Car Parking	1	Supermarket, Food Court



### Energy Measures – 29% Savings through:

- Insulation of Roof and External Wall
- Air Conditioning with Air Cooled Screw Chiller
- Variable Refrigerant Flow Cooling System



### Water – 35% Savings through:

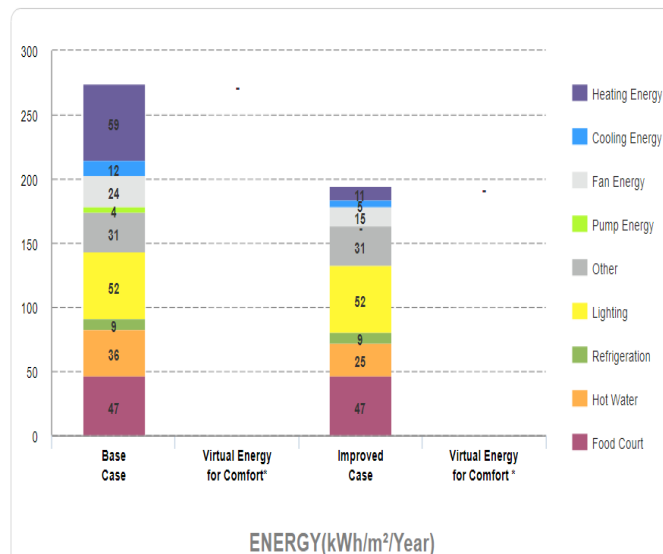
- Dual Flush for Water Closets
- Water Efficient Urinal
- Aerator and Auto Shut-off Faucet



### Materials – 24% Savings through:

- Concrete Filler Roof Slab

28.89% Meets EDGE energy standard



## PROJECT METRICS

Incremental Cost

\$201,300

Utility Cost Savings

\$8,735/month

Payback in Years

1.9

Operational CO<sub>2</sub> Savings

655 tCO<sub>2</sub>/Year

## RELEVANT CERTIFIED PROJECT



### Energy Measures – 58% Savings through:

- Reduced Window To Wall Ratio and Insulation of Roof and Walls
- Energy-efficient VRF Cooling System
- Variable Frequency Drives In Air Handling Units
- Sensible Heat Recovery From Exhaust Air
- CO2 Sensor/Demand Controlled Ventilation For Fresh Air Intake
- Energy-saving Lighting and Occupancy Sensors In Bathrooms.



### Water – 41% Savings through:

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



### Materials – 44% Savings through:

- Hollow core precast slab for floors
- steel-clad sandwich panel for roof construction, autoclaved aerated concrete blocks for external walls
- autoclaved aerated concrete blocks and plasterboards on metal studs with insulation for internal walls, and finished concrete flooring.



## VILNIUS FABIJONISKES BY LIDL (LITHUANIA)

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



# OFFICES – COLOMBIA CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

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



### Energy Measures – 21% Savings through:

- Air Conditioning with Water Chiller
- Variable Refrigerant Flow Cooling System
- Occupancy Sensor



### Water – 35% Savings through:

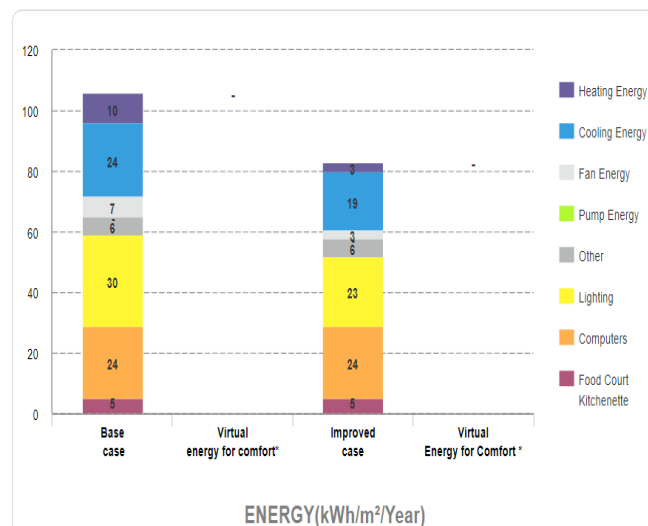
- Water-efficient bathroom urinals and faucets for kitchen sinks
- Dual flush for water closets in bathrooms
- Low Flow Bathroom Faucet



### Materials – 22% Savings through:

- In-Situ Concrete with > 25% GGBS Floor Slabs

21.28% Meets EDGE Energy Standard



## PROJECT METRICS

Incremental Cost

\$29,880

Utility Cost Savings

\$830/month

Payback in Years

3

Operational CO<sub>2</sub> Savings

88.5 tCO<sub>2</sub>/Year

## RELEVANT CERTIFIED PROJECT



### Energy Measures – 32% Savings through:

- Reduced window to wall ratio
- reflective paint and tiles for roof and external walls
- external shading devices
- insulation of roof
- energy-saving lighting system for internal spaces.



### Water – 24% Savings through:

- Low-Flow Faucets in Kitchens and Bathrooms
- dual-flush water closets



### Materials – 43% Savings through:

- Aluminum-clad sandwich panel for roof construction
- in-situ reinforced wall and honeycomb clay blocks with internal and external plaster for external walls
- honeycomb clay blocks with plaster on both sides and plasterboards on metal studs for internal walls
- ceramic tile flooring
- aluminium window frames.



**ALTURIA (COLOMBIA)**



# SCHOOLS – COLOMBIA CASE STUDY

## BUILDING DETAILS

Occupancy Density	Operational Hours	Working Days	Holidays / Year
3	6	5	60



Energy Measures – 22% Savings through:

- Low-E Coated Glass
- Energy Efficient Ceiling Fan
- Insulation of Roof



Water – 31% Savings through:

- Low Flow Faucet and Showerhead
- Dual Flush Water Closet
- Water-Efficient Urinals
- Water-Efficient Faucets for Kitchen Sinks



Materials – 20% Savings through:

- Composite Slim Slab with Steel I-Beam Floor Slab

## PROJECTED PROJECT METRICS

Incremental Cost

\$20,700

Utility Cost Savings

\$225/month

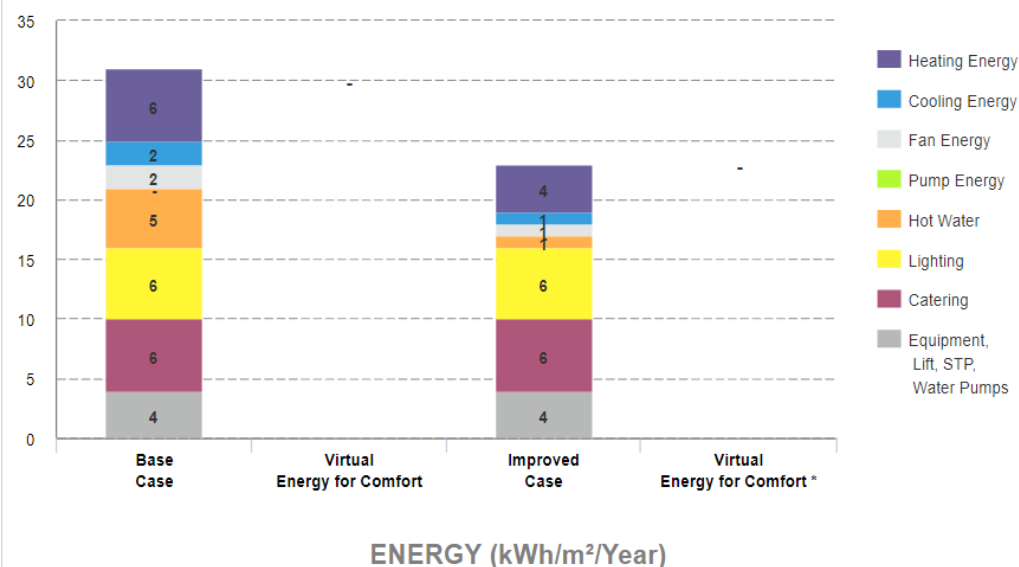
Payback in Years

8 Years

Operational CO2 Savings

25 tCO<sub>2</sub>/Year

22.4% Meets EDGE Energy Standard



Education is a new sector in the EDGE application.  
Relevant certified project to be included as soon as case study is published.

# HOSPITALS – COLOMBIA CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

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



### Energy Measures – 30% Savings through:

- Variable Refrigerant Flow Cooling Systems
- Air Conditioning with Air or Water Chiller
- Insulation of Roof and External Wall



### Water – 32% Savings through:

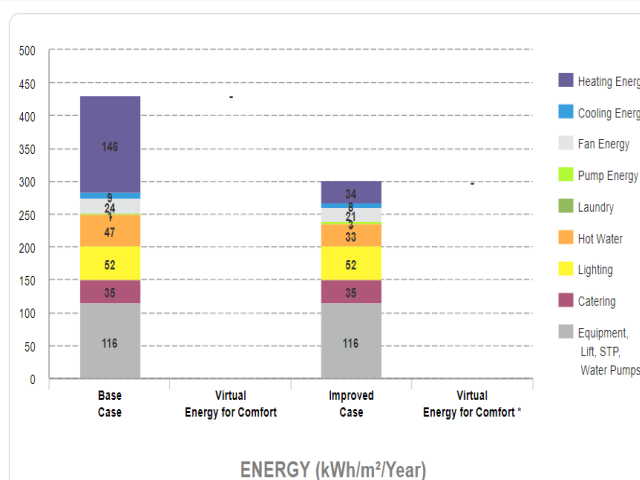
- Low Flow Showerhead and Faucet
- Water-Efficient Urinals and Kitchen Faucet



### Materials – 38% Savings through:

- Concrete Filler Floor Slabs

30.05% Meets EDGE Energy Standard



## PROJECT METRICS

Incremental Cost

\$256,700

Utility Cost Savings

\$8,420/month

Payback in Years

2.5

Operational CO<sub>2</sub> Savings

645 tCO<sub>2</sub>/Year

## RELEVANT CERTIFIED PROJECT – LEBANON



### Energy Measures – 21% Savings through:

- Reduced Window To Wall Ratio
- Insulation Of Roof And External Walls And Higher Thermal Performance Glass
- Air Economizers
- Energy-efficient Air Conditioning With Air-cooled Chiller, Variable Frequency Drives In AHUs, And Variable Speed Drive Pumps
- Sensible Heat Recovery From Exhaust Air
- Energy-saving Lighting



### Water – 25% Savings through:

- Low-flow Faucets In Bathrooms
- Dual Flush For Water Closets In Bathrooms
- Water-efficient Faucets For Kitchen Sinks



### Materials – 26% Savings through:

- Clay Roofing Tiles On Steel Rafters
- Medium Weight Hollow Concrete Blocks For External Walls
- Lightweight Concrete Blocks And Drywall System For Internal Walls
- Vinyl Flooring.



## KESERWAN MEDICAL CENTER (LEBANON)

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

# LIGHT INDUSTRY– COLOMBIA CASE STUDY

## BUILDING DETAILS

Floors Above Ground	Shifts (8 hour, 6 work day)	Gross Internal Area
1	1	15,000 m <sup>2</sup>



Energy Measures – 22% Savings through:

- Skylights
- Occupancy Sensors in Bathrooms
- Reflective Paint for Roof and External Walls
- High Efficiency Boiler for Water Heating



Water – 42% Savings through:

- Low Flow Faucet and Showerhead
- Dual Flush Water Closet
- Water-Efficient Urinal



Materials –24% Savings through:

- Composite Slim Roof Slab with Steel I-Beam

## PROJECTED PROJECT METRICS

Incremental Cost

\$78,340

Utility Cost Savings

\$2,320 /month

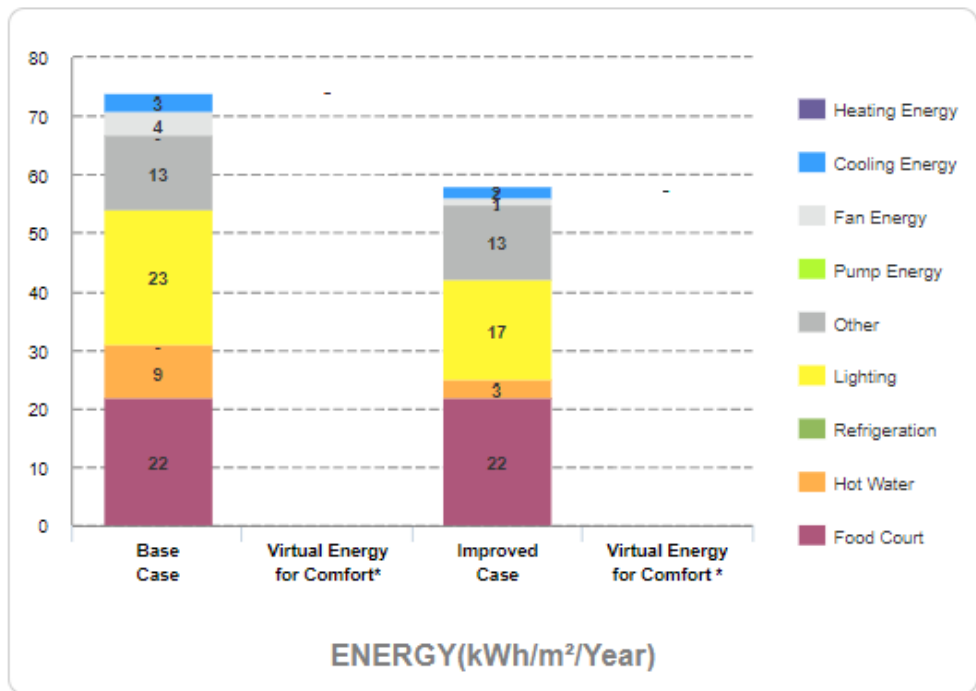
Payback in Years

02.8 Years

Operational CO<sub>2</sub> Savings

66 tCO<sub>2</sub>/Year

**22.44%** Meets EDGE energy standard







## COSTA RICA: GREEN BUILDINGS RETURN ON INVESTMENT



*Creating Markets, Creating Opportunities*



## COSTA RICA – ROI ON MEASURES NEEDED TO ACHIEVE THE EDGE STANDARD

	Incremental Cost	Utility Savings / month	Payback Period in Years
Homes	114,000 CRC/Unit	12,230 CRC/Unit	0.6
Hotels	73,050,000 CRC	5,728,000 CRC	1.1
Shopping Centers	117,564,000 CRC	7,555,700 CRC	1.3
Offices	15,500,000 CRC	1,125,000 CRC	1.2
Schools	16,882,000 CRC	412,700 CRC	3.4
Hospitals	196,186,000 CRC	6,744,000 CRC	2.4
Light Industry	254,433,000 CRC	7,000,000 CRC	3



# HOMES – COSTA RICA CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

Type of Unit	Average Unit Area	Bedrooms / Unit	Floors	Units
Mid Income	80m <sup>2</sup>	2	10	50



### Energy Measures – 25% Savings through:

- Energy Saving Light Bulbs
- External Shading Device
- Insulation of Roof



### Water – 22% Savings through:

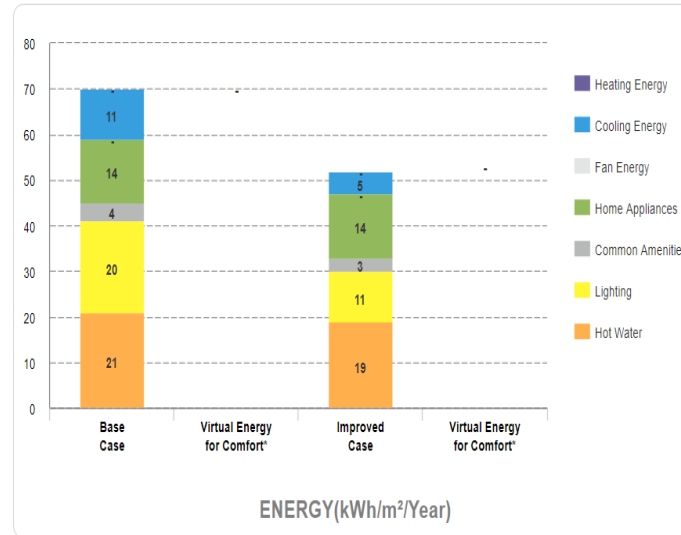
- Low-Flow Showerheads
- Low-Flow Faucets for Washbasins & Kitchen Sinks
- Dual Flush for Water Closets



### Materials – 30% Savings through:

- Hollow Concrete Precast Floor Slabs

24.54% Meets EDGE Energy Standard



## PROJECT METRICS

Incremental Cost  
114,000 CRC/unit

Utility Cost Savings  
12,230  
CRC/month/unit

Payback in Years  
0.6

Operational CO<sub>2</sub>  
Savings  
0.75 tCO<sub>2</sub>/Year/unit

## RELEVANT CERTIFIED PROJECT



### Energy Measures – 54% Savings through:

- Reduced Window to Wall Ratio
- natural ventilation
- energy-saving lighting



### Water – 27% Savings through:

- Low-Flow Faucet for kitchen sinks and washbasins
- Low-Flow Flush for Water Closet



### Materials – 55% Savings through:

- Concrete beam vault with insulation
- corrugated zinc sheets for roof
- medium weight hollow concrete blocks for internal and external walls
- finished concrete floor



## CONDOMINIO LINDA VISTA EL MIRADOR (COSTA RICA)



# HOTELS – COSTA RICA CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

Type of Hotel	Floors Above Ground	Total Guest Units	Internal Area
4 Star Hotel	8	200	15,599 m <sup>2</sup>



### Energy Measures – 20% Savings through:

- External Shading Device
- Energy Saving Lightbulb in Internal and External Area



### Water – 37% Savings through:

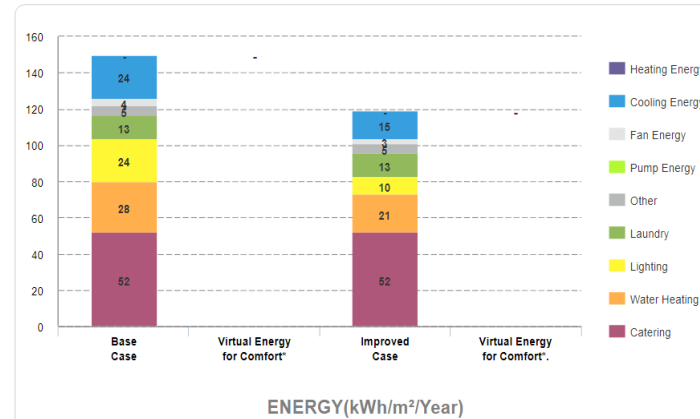
- Low-Flow Showerheads and Faucets Guestrooms
- Dual Flush Water Closet
- Water Efficient Washing Machine and Urinal



### Materials – 22% Savings through:

- Hollow Core Precast Slab Flooring
- Hollow Concrete Internal Wall Block

20.50% Meets EDGE Energy Standard



## PROJECT METRICS

Incremental Cost

73,050,000 CRC

Utility Cost Savings

5,728,000 CRC/month

Payback in Years

1.1

Operational CO<sub>2</sub> Savings

270 tCO<sub>2</sub>/Year

## RELEVANT CERTIFIED PROJECT



### Energy Measures – 60% Savings through:

- Reduced Window to Wall Ratio, external shading devices
- variable refrigerant volume cooling system
- heat pump for hot water
- energy-saving lighting in internal and external areas
- solar photovoltaics.



### Water – 26% Savings through:

- Low-flow showerheads
- low-flow faucets in guest rooms
- dual flush water closets in all bathrooms
- water-efficient kitchen faucets



### Materials – 34% Savings through:

- Cored bricks with internal and external plaster for internal and external walls
- parquet wood flooring.



**Eco Green Boutique Hotel (Vietnam)**

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

# SHOPPING CENTERS – COSTA RICA CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

Site Area	Car Parking	Floors Above Ground	Amenities
15,000 m <sup>2</sup>	Indoor Car Parking	1	Supermarket, Food Court



### Energy Measures – 23% Savings through:

- Insulation of Roof and External Wall
- Air Conditioning with Air Cooled Chiller
- Energy Saving Light Bulbs, Sales Area



### Water – 25% Savings through:

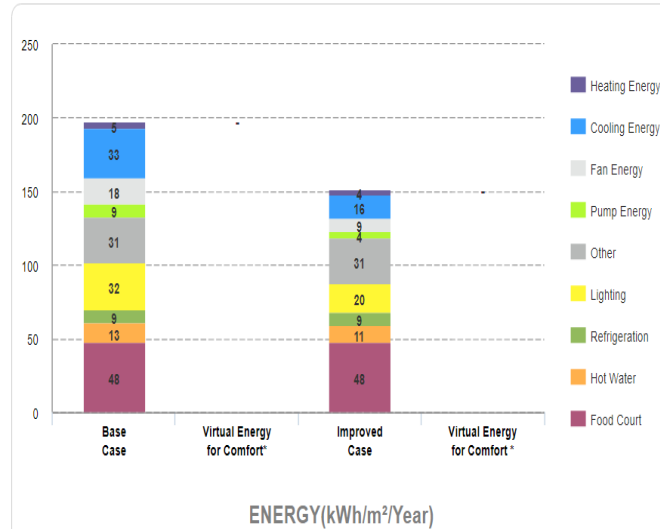
- Dual Flush for Water Closets
- Water Efficient Urinals
- Aerator and Auto Shut-off Faucet



### Materials – 25% Savings through:

- In-situ Trough Concrete Floor Slab

23.30% Meets EDGE energy standard



## PROJECT METRICS

Incremental Cost

117,564,000 CRC

Utility Cost Savings

7,555,700 CRC/month

Payback in Years

1.3

Operational CO<sub>2</sub> Savings

400 tCO<sub>2</sub>/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 Sheets on Steel Rafters Roof
- Steel Profile Cladding for External Walls; Autoclaved Aerated Concrete for Internal and External Walls



## RETAIL AT SANTA VERDE (COSTA RICA)



# OFFICES – COSTA RICA CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

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



### Energy Measures – 25% Savings through:

- Energy Saving Light Bulbs for Internal Space
- Natural Ventilation with Operable Window
- Air Conditioning: COP of 3.5\*



### Water – 47% Savings through:

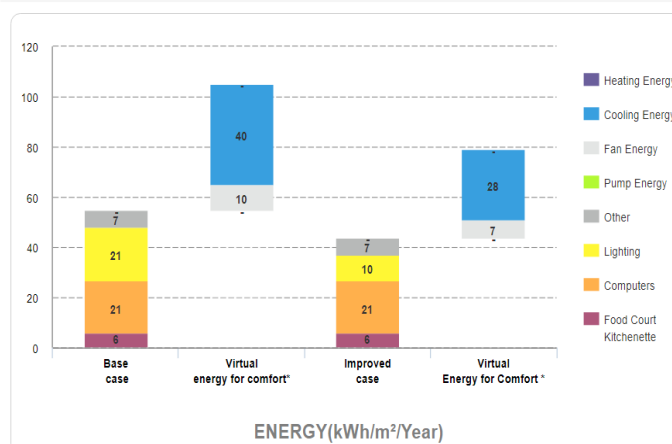
- Grey Water Treatment and Recycling System
- Rainwater Harvesting System 50% of Roof Area
- Water-efficient Urinals and Kitchen Faucet
- Dual flush for water closets in bathrooms
- Low Flow Faucet in Bathroom



### Materials – 20% Savings through:

- Hollow Core Precast Floor Slabs
- Finished Concrete Flooring

25.07% Meets EDGE Energy Standard



\*NOT PART OF ENERGY SAVING

Assumed Air Conditioning Installation in the Future

## PROJECT METRICS

Incremental Cost

15,500,000 CRC

Utility Cost Savings

1,125,000 CRC/month

Payback in Years

1.2

Operational CO<sub>2</sub> Savings

70 tCO<sub>2</sub>/Year

## RELEVANT CERTIFIED PROJECT



### Energy Measures – 22% Savings through:

- Reduced Window To Wall Ratio
- Energy-saving Lighting Systems In Internal And External Areas
- Occupancy Sensors In Bathrooms, Conference Rooms And Offices



### Water – 27% Savings through:

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



### Materials – 27% Savings through:

- Steel Sheets On Steel Rafters For Roof Construction
- Cement Fiber Boards On Metal Studs For External Walls
- Finished Concrete Flooring



Offices At Santa Verde (Costa Rica)



# SCHOOLS – COSTA RICA CASE STUDY

## BUILDING DETAILS

Occupancy Density	Operational Hours	Working Days	Holidays / Year
3	6	5	60



### Energy Measures – 25% Savings through:

- Variable Refrigerant Flow Cooling System
- Insulation of Roof and External Wall



### Water – 31% Savings through:

- Dual Flush
- Low Flow Faucet in
- Water-Efficient Urinals
- Water-Efficient Faucets for Kitchen Sinks



### Materials – 20% Savings through:

- Composite Slim Slabs with I-Beam Floor

## PROJECTED PROJECT METRICS

Incremental Cost

16,882,000 CRC

Utility Cost Savings

412,700 CRC/month

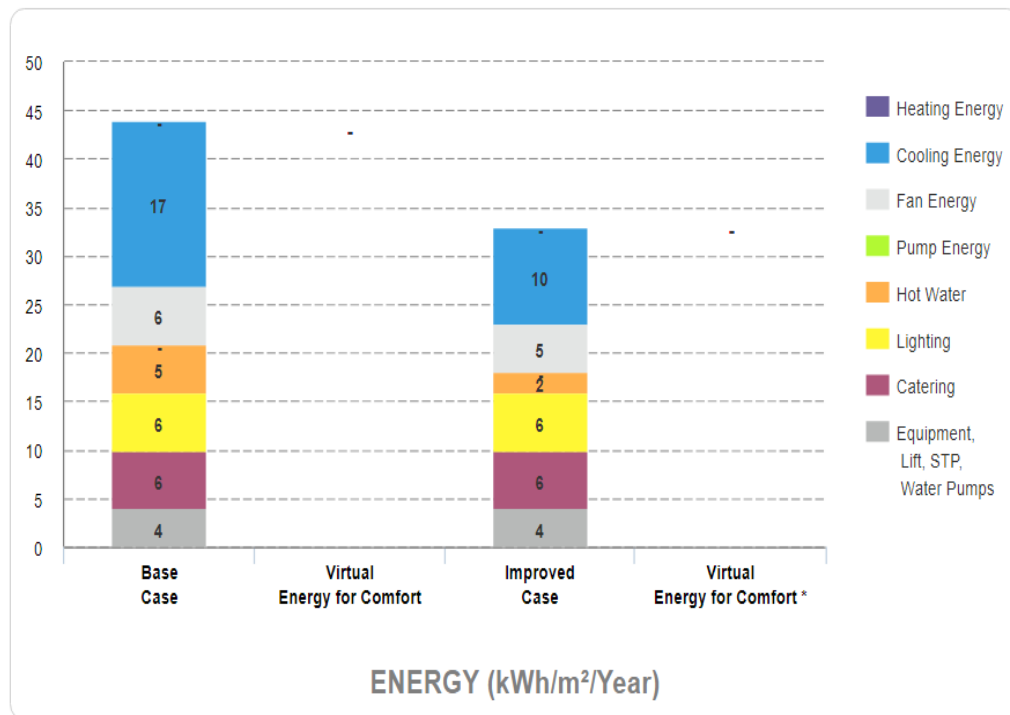
Payback in Years

3.4 Years

Operational CO2 Savings

30 tCO<sub>2</sub>/Year

**25.2%** Meets EDGE Energy Standard



Education is a new sector in the EDGE application.  
Relevant certified project to be included as soon as case study is published.

# HOSPITALS – COSTA RICA CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

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



### Energy Measures – 22% Savings through:

- Variable Refrigerant Flow Cooling System
- Insulation of Roof and External Wall
- Variable Frequency Driver on AHUs
- Variable Speed Drive Pump
- Energy Saving Light Bulb Internal Space (exclude OT)



### Water – 22% Savings through:

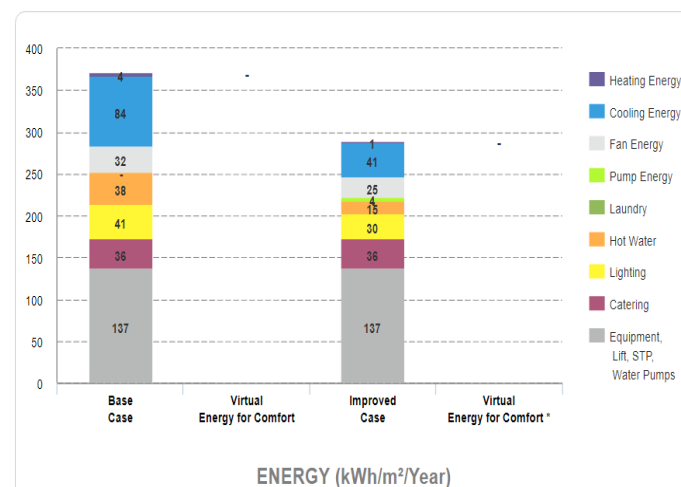
- Low Flow Showerheads and Faucets
- Dual Flush Water Closet
- Water-Efficient Urinals



### Materials – 25% Savings through:

- Concrete Filler Floor Slab

22.50% Meets EDGE Energy Standard



## PROJECT METRICS

Incremental Cost

196,186,000 CRC

Utility Cost Savings

6,744,000 CRC/month

Payback in Years

2.4

Operational CO<sub>2</sub> Savings

490 tCO<sub>2</sub>/Year

## RELEVANT CERTIFIED PROJECT – LEBANON



### 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
- 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 And Internal Walls
- Ceramic Tile Flooring



## KOMFO ANOKYE HOSPITAL (GHANA)

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

# LIGHT INDUSTRY– COSTA RICA CASE STUDY

## BUILDING DETAILS

Floors Above Ground	Shifts (8 hour, 6 work day)	Gross Internal Area
1	1	15,000 m <sup>2</sup>



Energy Measures – 29% Savings through:

- Variable Frequency Driver in Air Handling Units
- Air Conditioning with Air Cooled Screw Chiller
- Insulation of External Wall
- Solar Photovoltaics for 25% of Energy Consumption



Water – 34% Savings through:

- Dual Flush Water Closets
- Water-Efficient Urinals
- Aerators and Auto Shut-off Faucets



Materials – 24% Savings through:

- Concrete Filler Slabs for Flooring

## PROJECTED PROJECT METRICS

Incremental Cost

254,433,000 CRC

Utility Cost Savings

7,000,000 CRC/month

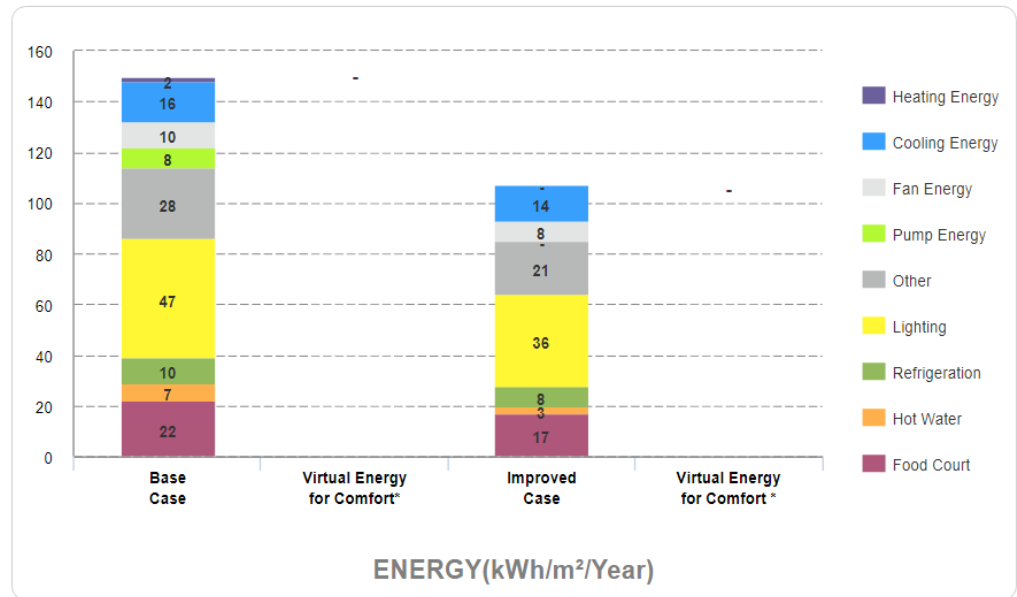
Payback in Years

3 Years

Operational CO<sub>2</sub> Savings

275 tCO<sub>2</sub>/Year

29.81% Meets EDGE energy standard







## MEXICO: GREEN BUILDINGS RETURN ON INVESTMENT



*Creating Markets, Creating Opportunities*





## MEXICO – ROI ON MEASURES NEEDED TO ACHIEVE THE EDGE STANDARD

	Incremental Cost	Utility Savings / month	Payback Period in Years
Homes	\$345/Unit	\$15/Unit	2
Hotels	\$227,700	\$7,430	3.1
Shopping Centers	\$132,700	\$8,230	1.4
Offices	\$52,420	\$1,250	3.5
Schools	\$25,200	\$290	7.2
Hospitals	\$300,970	\$5,430	4.6
Light Industry	\$117,490	\$6,170	1.6



# HOMES – MEXICO CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

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



### Energy Measures – 26% Savings through:

- Reduced Window to Wall Ratio
- Energy Saving Light Bulbs
- Natural Ventilation



### Water – 27% Savings through:

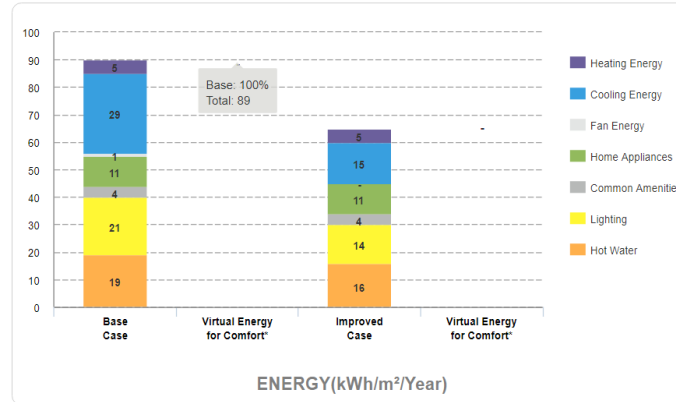
- Recycled Grey Water for Flushing
- Low-Flow Showerheads
- Low-Flow Faucets for Washbasins & Kitchen Sinks
- Dual Flush for Water Closets



### Materials – 21% Savings through:

- Concrete Filler Floor Slabs

26.51% Meets EDGE Energy Standard



## PROJECT METRICS

Incremental Cost

\$345/unit

Utility Cost Savings

\$14/month/unit

Payback in Years

2

Operational CO<sub>2</sub> Savings

2.6 tCO<sub>2</sub>/Year/unit

## RELEVANT CERTIFIED PROJECT



### Energy Measures – 35% Savings through:

- Reduced Window To Wall Ratio
- Energy-saving Lighting Systems For Internal Spaces, Common Areas And External Spaces



### Water – 22% Savings through:

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



### Materials – 30% Savings through:

- Concrete Filler Slab With Polystyrene Blocks For Floor Slabs And Roof Construction
- Honeycomb Clay Blocks With Plaster On Both Sides For Internal And External Walls



ACALL (MEXICO)



# HOTELS – MEXICO CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

Type of Hotel	Floors Above Ground	Total Guest Units	Internal Area
4 Star Hotel	8	200	15,599 m <sup>2</sup>



### Energy Measures – 21% Savings through:

- High Thermal Performance Glass
- Energy Saving Light Bulbs
- Preheat Water Using Waste Heat from the Generator



### Water – 21% Savings through:

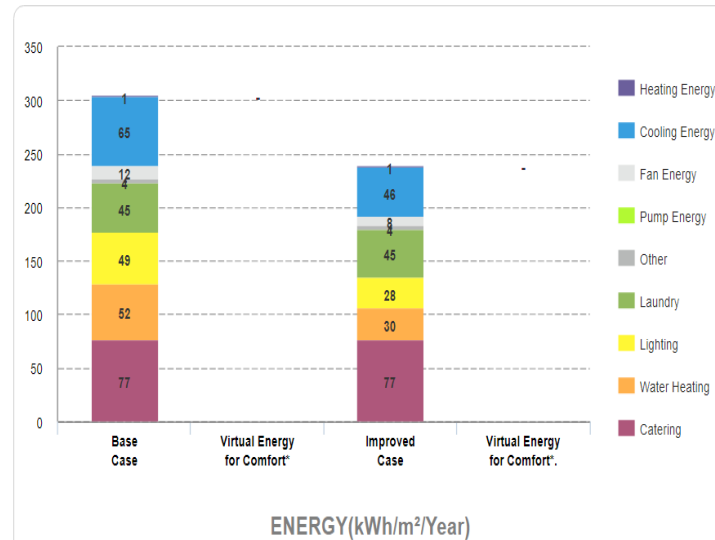
- Duel Flush for Water Closet
- Low Flow Faucet and Showerhead in Guest Rooms
- Aerator and Auto Shut-off Faucet in Other Restroom
- Water Efficient Dishwasher



### Materials – 28% Savings through:

- Concrete Filler Slab with Polystyrene Flooring

21.19% Meets EDGE Energy Standard



## PROJECT METRICS

Incremental Cost

\$227,700

Utility Cost Savings

\$7,430/month

Payback in Years

3.1

Operational CO<sub>2</sub> Savings

1645 tCO<sub>2</sub>/Year

## RELEVANT CERTIFIED PROJECT



### Energy Measures – 23% Savings through:

- Reduced Window to Wall Ratio, Low-E Coated Glass
- Air Conditioning with Air Cooled Screw Chiller
- Energy Saving Lighting for back-of-house, internal, external spaces



### 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 VERACRUZ (MEXICO)

# SHOPPING CENTERS – MEXICO CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

Site Area	Car Parking	Floors Above Ground	Amenities
15,000 m <sup>2</sup>	Indoor Car Parking	1	Supermarket, Food Court



### Energy Measures – 24% Savings through:

- Insulation of Roof and External Wall
- Air Conditioning with Air Cooled Screw Chiller
- Variable Refrigerant Flow Cooling System



### Water – 37% Savings through:

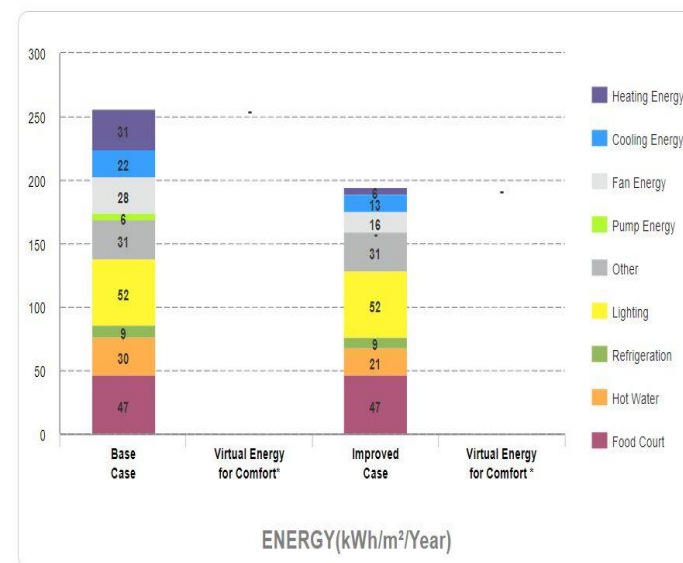
- Dual Flush for Water Closets
- Water Efficient Urinals
- Aerators and Auto Shut-off Faucet



### Materials – 24% Savings through:

- Concrete Filler Floor Slabs

24.18% Meets EDGE energy standard



## PROJECT METRICS

Incremental Cost

\$132,700

Utility Cost Savings

\$8,230/month

Payback in Years

1.4

Operational CO<sub>2</sub> Savings

1275 tCO<sub>2</sub>/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 Sheets on Steel Rafters Roof
- Steel Profile Cladding for External Walls; Autoclaved Aerated Concrete for Internal and External Walls



## RETAIL AT SANTA VERDE (COSTA RICA)

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

# OFFICES – MEXICO CASE STUDY & CERTIFIED PROJECT



## BUILDING DETAILS

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



### Energy Measures – 31% Savings through:

- Air Conditioning with Air Cooled Screw
- Energy Saving Light Bulbs
- Variable Refrigerant Flow Cooling System



### Water – 21% Savings through:

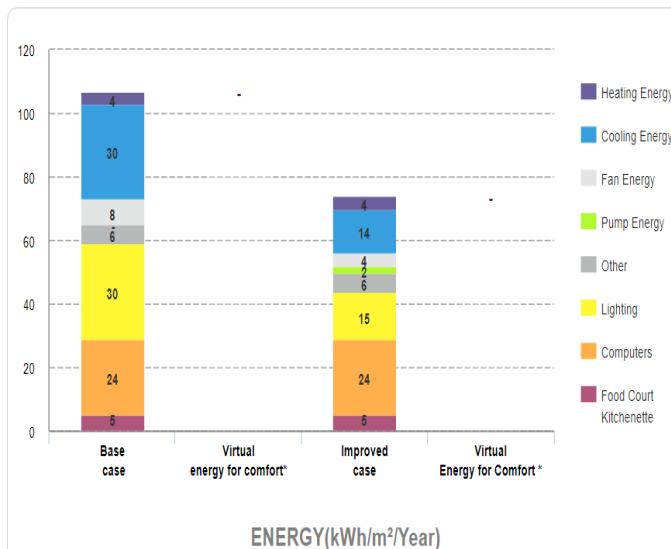
- Dual flush for water closets in bathrooms
- Low Flow Faucet
- Water-efficient urinals and faucets for kitchen sinks



### Materials – 22% Savings through:

- In-Situ Concrete with > 25% GGBS Floor Slabs

30.89% Meets EDGE Energy Standard



## PROJECT METRICS

Incremental Cost

\$52,420

Utility Cost Savings

\$1,250/month

Payback in Years

3.5

Operational CO<sub>2</sub> Savings

160 tCO<sub>2</sub>/Year

## RELEVANT CERTIFIED PROJECT



### Energy Measures – 33% Savings through:

- Reduced Window To Wall Ratio
- Reflective Paint For Roof And External Walls And Low-e Coated Glass
- Air Conditioning With Water-cooled Chiller
- Variable Frequency Drives In AHUs and Pumps With Variable Speed Drives
- Occupancy Sensors
- Energy-saving Light Bulbs For Internal And External Spaces



### Water – 38% Savings through:

- Low-flow Plumbing Fixtures For Washbasins And Kitchens
- Rainwater Harvesting System.



### Materials – 21% Savings through:

- Hollow-core Precast Floor Slabs, Steel Sheets For Roof
- Polymeric Render On Concrete Blocks For External Walls
- Plasterboards On Metal Studs With Insulation For Internal Walls And Flooring
- Nylon Carpets; And Finished Concrete Flooring



## CENTRO NACIONAL DE CONGRESOS Y CONVENCIONES (COSTA RACA)

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



# SCHOOLS – MEXICO CASE STUDY

## BUILDING DETAILS

Occupancy Density	Operational Hours	Working Days	Holidays / Year
3	6	5	60



### Energy Measures – 24% Savings through:

- Reduced Window to Wall Ratio
- Insulation of Roof and External Wall
- Natural Ventilation for Classroom



### Water – 31% Savings through:

- Dual Flush
- Water-Efficient Urinals
- Water-Efficient Faucets for Kitchen Sinks



### Materials – 29% Savings through:

- Concrete Filler Floor Slabs

## PROJECTED PROJECT METRICS

Incremental Cost

\$25,200

Utility Cost Savings

\$290/month

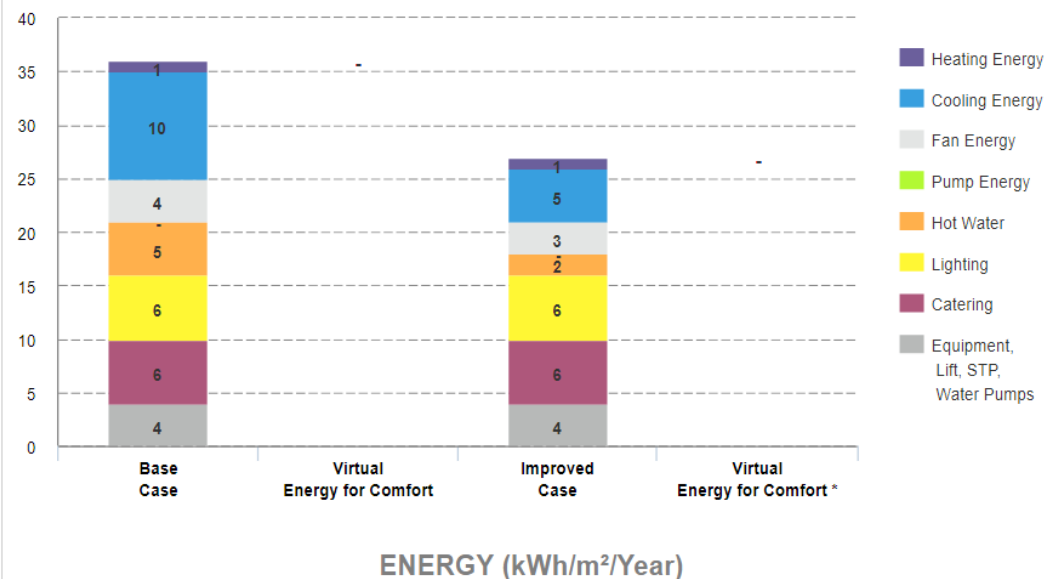
Payback in Years

7.2 Years

Operational CO<sub>2</sub> Savings

60 tCO<sub>2</sub>/Year

24.4% Meets EDGE Energy Standard



Education is a new sector in the EDGE application.  
Relevant certified project to be included as soon as case study is published.

# HOSPITALS – MEXICO CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

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



### Energy Measures – 22% Savings through:

- Variable Refrigerant Flow Cooling Systems
- Insulation of Roof and external Wall
- Air Conditioning with Aired Cooled Chiller



### Water – 35% Savings through:

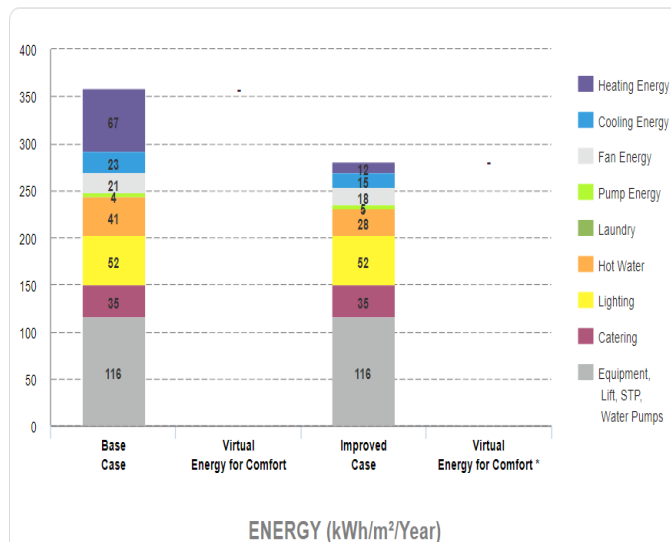
- Low Flow Faucet and Showerhead
- Dual Flush Water Closet
- Water-Efficient Urinals
- Water-Efficient Faucets for Kitchen Sinks



### Materials – 30% Savings through:

- In-Situ Concrete with > 25% GGBS Floor Slabs

21.64% Meets EDGE Energy Standard



## PROJECT METRICS

Incremental Cost

\$300,970

Utility Cost Savings

\$5,430/month

Payback in Years

4.6

Operational CO<sub>2</sub> Savings

1250 tCO<sub>2</sub>/Year

## RELEVANT CERTIFIED PROJECT



### Energy Measures – 32% Savings through:

- Reduced window to wall ratio, natural ventilation for corridors
- reflective paint for external walls, insulation of roof and external walls
- energy-saving lighting systems
- 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
- finished concrete flooring



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– MEXICO CASE STUDY



## BUILDING DETAILS

Floors Above Ground	Shifts (8 hour, 6 work day)	Gross Internal Area
1	1	15,000 m <sup>2</sup>



Energy Measures – 23% Savings through:

- Variable Frequency Driver Cooling System
- Air Conditioning with Air Cooled Screw Chiller
- Insulation of Roof and External Wall



Water – 45% Savings through:

- Dual Flush Water Closet, Water-Efficient Urinals
- Auto Shut-off Faucet in all Bathrooms
- Water Efficient Kitchen Faucets



Materials – 24% Savings through:

- Concrete Filler Roof Slabs

## PROJECTED PROJECT METRICS

Incremental Cost

\$117,490

Utility Cost Savings

\$6,170

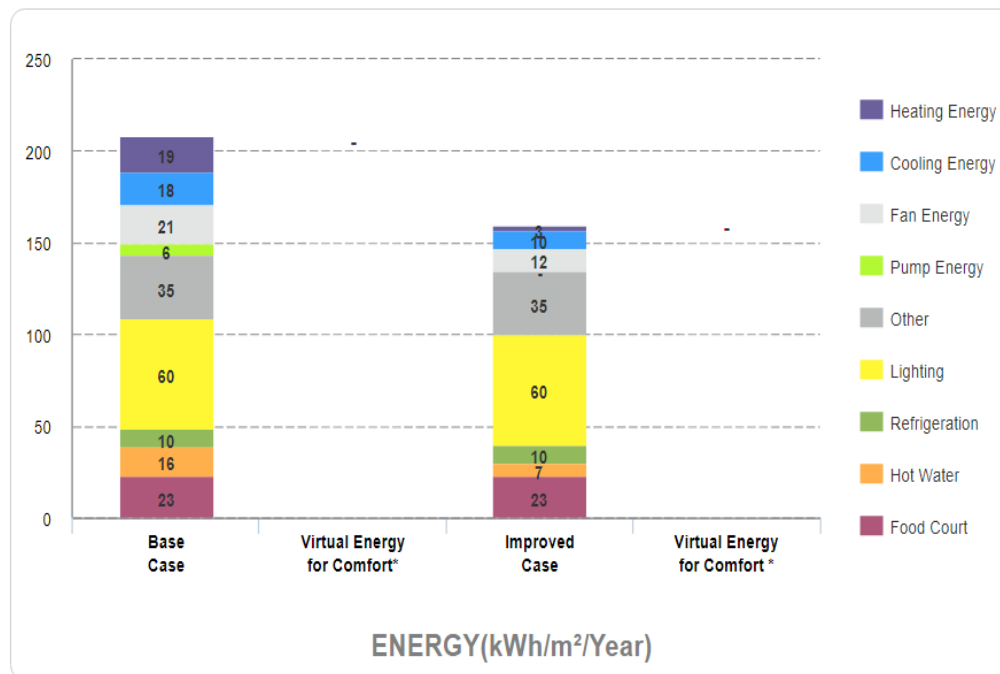
Payback in Years

1.6 Years

Operational CO<sub>2</sub> Savings

1050 tCO<sub>2</sub>/Year

22.76% Meets EDGE energy standard



Light Industry is a new sector in the EDGE application.  
Relevant certified project to be included as soon as case study is published.





## PERU: GREEN BUILDINGS RETURN ON INVESTMENT



*Creating Markets, Creating Opportunities*





## PERU – ROI ON MEASURES NEEDED TO ACHIEVE THE EDGE STANDARD

	Incremental Cost	Utility Savings / month	Payback Period in Years
Homes	865 S/Unit	55 S/Unit	1.3
Hotels	175,700 S	46,300 S	0.3
Shopping Centers	1,468,700 S	24,600 S	5
Offices	68,200 S	6,600 S	1
Schools	95,500 S	2,660 S	3
Hospitals	878,900 S	31,900 S	2.3
Light Industry	1,414,000 S	43,250 S	2.5



# HOMES – PERU CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

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



Energy Measures – 26% Savings through:

- Insulation of Roof
- Energy Saving Light Bulbs, Internal and Common Area
- Natural Ventilation



Water – 24% Savings through:

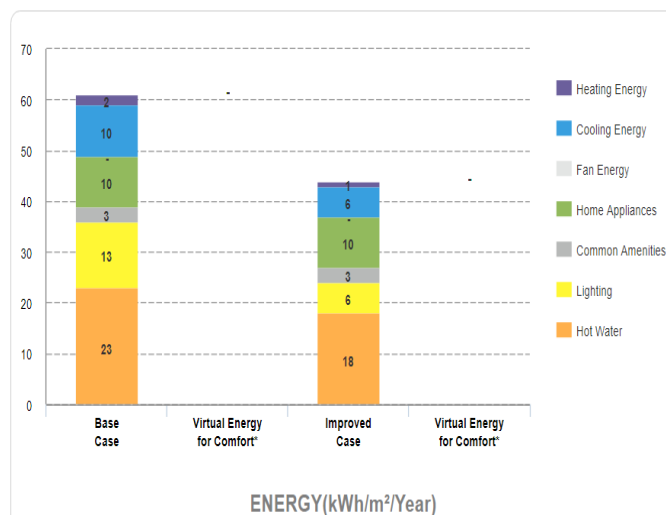
- Low-Flow Showerheads
- Low-Flow Faucets for Kitchen Sinks
- Dual Flush for Water Closets



Materials – 20% Savings through:

- Concrete Filler Floor Slabs

26.35% Meets EDGE Energy Standard



## PROJECT METRICS

Incremental Cost

865 S /unit

Utility Cost Savings

55 S/month/unit

Payback in Years

1.3

Operational CO<sub>2</sub> Savings

1.9 tCO<sub>2</sub>/Year/unit

## RELEVANT CERTIFIED PROJECT



Energy Measures – 32% Savings through:

- Reduced Window To Wall Ratio
- Insulation Of Roof And External Walls



Water – 36% Savings through:

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



Materials – 41% Savings through:

- Concrete Filler Slab For Floor Slabs And Roof Construction
- In-situ Reinforced Wall And Cored Bricks With Internal And External Plaster For External Walls
- Cored Bricks With Plaster On Both Sides For Internal Walls
- Laminated Wooden Flooring And Ceramic Tile



**EDIFICIO MULTIFAMILIAR MARISCAL CASTILLA (PERU)**



# HOTELS – PERU CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

Type of Hotel	Floors Above Ground	Total Guest Units	Internal Area
4 Star Hotel	8	200	15,599 m <sup>2</sup>



### Energy Measures – 22% Savings through:

- Variable Refrigerant Flow Cooling System
- Air Conditioning with Air Chilled Screwed
- Energy Saving Light Bulbs Internal Space



### Water – 21% Savings through:

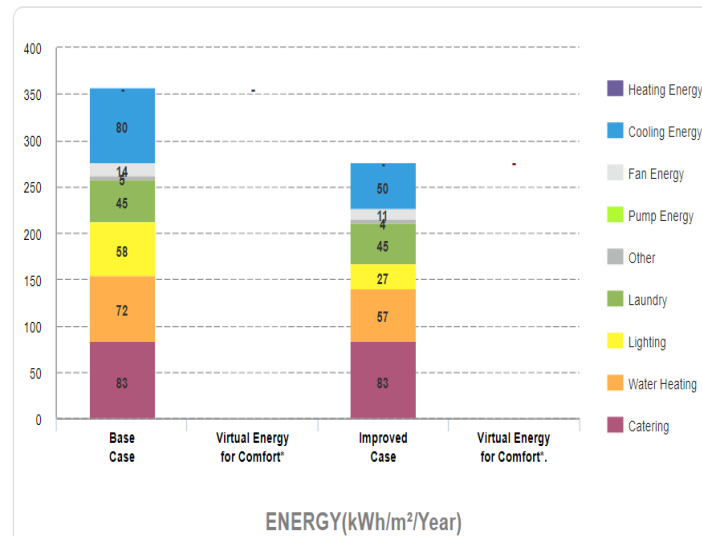
- Low-Flow Showerheads and Faucets Guestrooms
- Water Efficient Urinals and Kitchen Faucet
- Aerator and Auto Shut-off Faucet in public restroom



### Materials – 28% Savings through:

- In-Situ Concrete with > 25% GGBS Flooring

22.03% Meets EDGE Energy Standard



## PROJECT METRICS

Incremental Cost

175,700 S

Utility Cost Savings

46350 S/month

Payback in Years

0.3

Operational CO<sub>2</sub> Savings

2050 tCO<sub>2</sub>/Year

## RELEVANT CERTIFIED PROJECT



### Energy Measures – 51% Savings through:

- Reduced Window To Wall Ratio, Low-e Coated Glass
- Air Conditioning With Water Cooled Chiller
- External Shading Devices, Insulation Of Roof And External Walls
- Energy-efficient Lighting.



### Water – 32% Savings through:

- Low-flow Showerheads
- Dual Flush Water Closets
- Water-efficient Urinals



### Materials – 44% Savings through:

- Concrete Filler Slab For Floors And Roof
- Medium Weight Hollow Concrete Blocks For Internal Walls
- Finished Concrete Flooring And Upvc Window Frames.



## CITY EXPRESS HOTELS – SANTA FE (MEXICO)

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

# SHOPPING CENTERS – PERU CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

Site Area	Car Parking	Floors Above Ground	Amenities
15,000 m <sup>2</sup>	Indoor Car Parking	1	Supermarket, Food Court



### Energy Measures – 21% Savings through:

- Insulation of Roof and External Wall
- Variable Refrigerant Flow Cooling System
- Air Conditioning with Air Cooled Screw Chiller
- Energy Saving Light Bulbs, Sales Area



### Water – 24% Savings through:

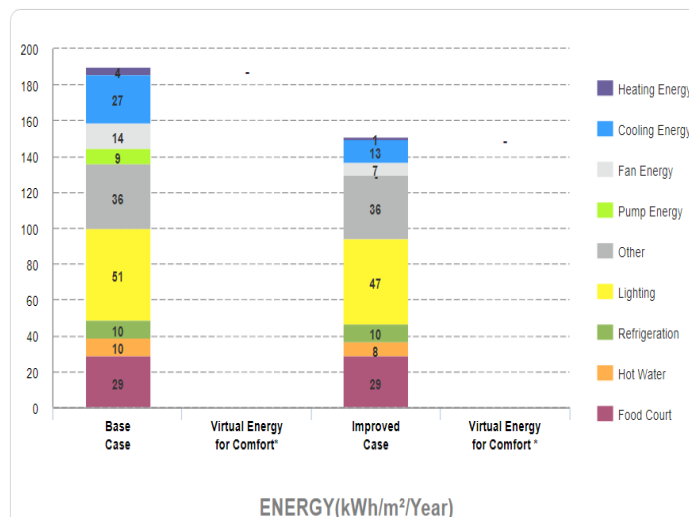
- Dual Flush for Water Closets
- Water Efficient Urinals
- Aerator and Auto Shut-off Faucet



### Materials – 23% Savings through:

- Concrete Filler Floor Slabs

20.75% Meets EDGE energy standard



## PROJECT METRICS

Incremental Cost

1,468,700 S

Utility Cost Savings

24,600 S/month

Payback in Years

5

Operational CO<sub>2</sub> Savings

1050 tCO<sub>2</sub>/Year

## RELEVANT CERTIFIED PROJECT



### Energy Measures – 37% Savings through:

- Reduced Window To Wall Ratio
- Reflective Paint And Insulation For Roof And Walls
- Recovery Of Waste Heat From The Generator For Space Heating
- Variable Frequency Drives In Ahus, Variable Speed Drives Pumps
- CO2 Sensor/Demand-controlled Ventilation For Fresh Air Intake
- High Efficiency Condensing Boiler For Space Heating
- High Efficiency Refrigerated Cases And Energy-efficient Lighting System



### Water – 53% Savings through:

- Dual Flush Water Closets, Water-efficient Urinals
- Aerators And Auto Shut-off Faucet In All Washrooms



### Materials – 30% Savings through:

- Corrugated Zinc Sheets For Roof Construction
- Steel Profile Cladding For External Walls And Solid Dense Concrete Blocks For Internal Walls



## KAUFLAND – HRISTO SMIMENSKI (BULGARIA)

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

# OFFICES – PERU CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

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



### Energy Measures – 22% Savings through:

- Variable refrigerant flow system
- Air Conditioning with Air Cooled Screw Chiller



### Water – 45% Savings through:

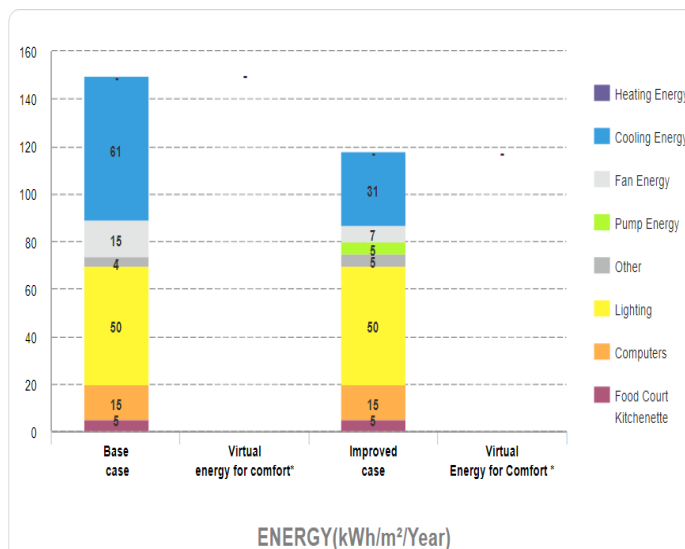
- Black Water Treatment and Recycling
- Water-efficient bathroom urinals and faucets for kitchen sinks
- Dual flush for water closets in bathrooms
- Low Flow Faucets in Bathroom



### Materials – 35% Savings through:

- In-Situ Concrete with > 25% GGBS Floor Slabs

21.91% Meets EDGE Energy Standard



## PROJECT METRICS

Incremental Cost

68,200 S

Utility Cost Savings

6,660 S/month

Payback in Years

1

Operational CO<sub>2</sub> Savings

280 tCO<sub>2</sub>/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
- dual flush 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 – PERU CASE STUDY

## BUILDING DETAILS

Occupancy Density	Operational Hours	Working Days	Holidays / Year
3	6	5	60



### Energy Measures – 39% Savings through:

- External Shading Device
- Insulation of Roof and External Wall



### Water – 23% Savings through:

- Dual Flush
- Water-Efficient Urinals
- Water-Efficient Faucets for Kitchen Sinks



### Materials – 23% Savings through:

- Concrete Filler Floor Slabs

## PROJECTED PROJECT METRICS

Incremental Cost

95,500 S

Utility Cost Savings

2,660 S/month

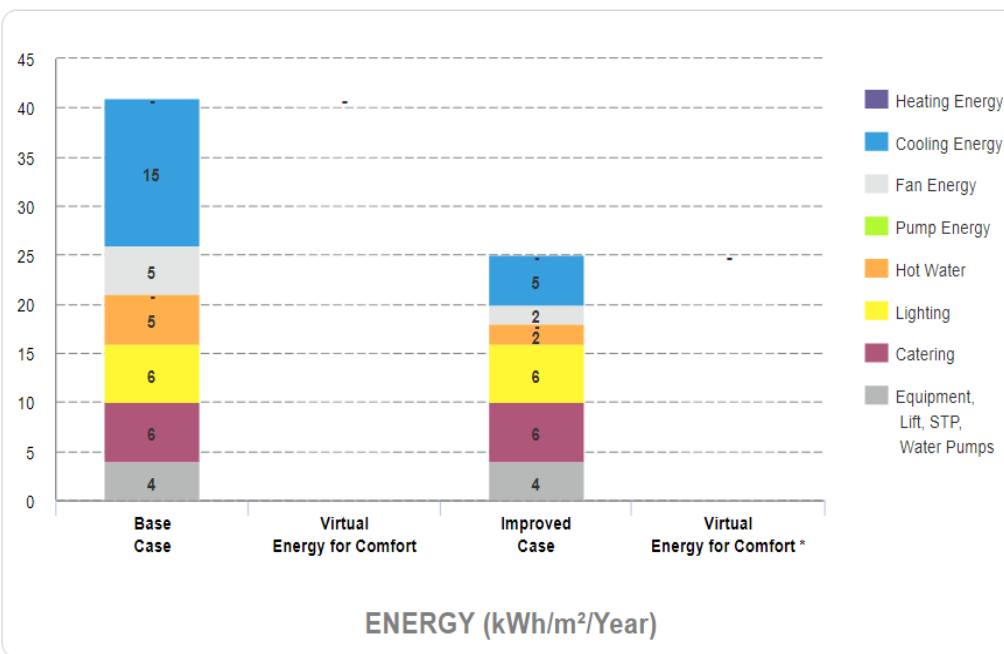
Payback in Years

3 Years

Operational CO2 Savings

60 tCO<sub>2</sub>/Year

**39.3% Meets EDGE Energy Standard**



Education is a new sector in the EDGE application.  
Relevant certified project to be included as soon as case study is published.

# HOSPITALS – PERU CASE STUDY & CERTIFIED PROJECT

## BUILDING DETAILS

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



### Energy Measures – 25% Savings through:

- Variable Refrigerant Flow Cooling Systems
- Insulation of Roof and External Wall
- Energy Saving Light Bulbs - Internal Spaces



### Water – 39% Savings through:

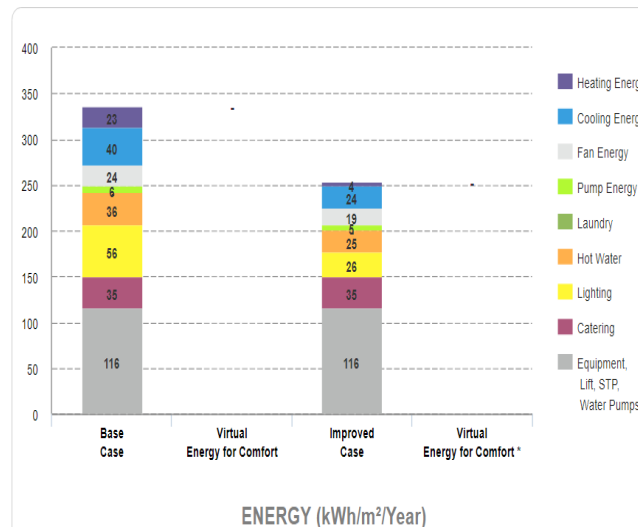
- Low Flow Showerhead and Faucet
- Dual Flush Water Closet
- Water Efficient Urinals



### Materials – 20% Savings through:

- In-Situ Concrete with > 25% GGBS Floor Slabs

24.55% Meets EDGE Energy Standard



## PROJECT METRICS

Incremental Cost

878,900 S

Utility Cost Savings

31,900 S/month

Payback in Years

2.3

Operational CO<sub>2</sub> Savings

1200 tCO<sub>2</sub>/Year

## RELEVANT CERTIFIED PROJECT



### Energy Measures – 32% Savings through:

- Reduced window to wall ratio, natural ventilation for corridors
- reflective paint for external walls, insulation of roof and external walls
- energy-saving lighting systems
- 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
- finished concrete flooring



**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– PERU CASE STUDY

## BUILDING DETAILS

Floors Above Ground	Shifts (8 hours, 6 work day)	Gross Internal Area
1	1	15,000 m <sup>2</sup>



Energy Measures – 39% Savings through:

- Solar Photovoltaics - 25% of Total Energy Demand
- Insulation of Roof and External Wall



Water – 36% Savings through:

- Dual Flush Water Closet
- Water-Efficient Urinals
- Auto Shut-off, Efficient Faucets



Materials – 22% Savings through:

- Concrete Filler Slab with Polystyrene Roof Block

## PROJECTED PROJECT METRICS

Incremental Cost

1,414,000 S

Utility Cost Savings

43,250 S/month

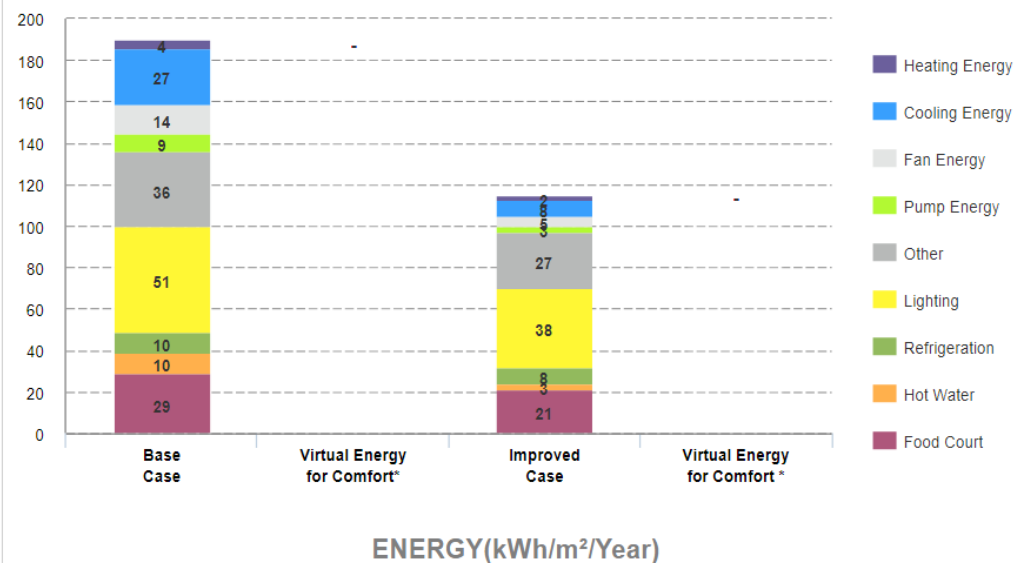
Payback in Years

2.5 Years

Operational CO<sub>2</sub> Savings

790 tCO<sub>2</sub>/Year

39.20% Meets EDGE energy standard



Light Industry is a new sector in the EDGE application.  
Relevant certified project to be included as soon as case study is published.





## METHODOLOGY, NOTES, ACKNOWLEDGMENTS



*Creating Markets, Creating Opportunities*

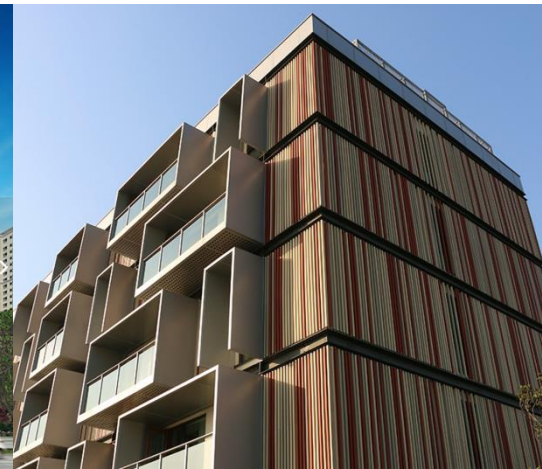
# RESEARCH OBJECTIVE: MOST EFFECTIVE INTERVENTIONS TO REACH THE EDGE STANDARD

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](http://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.

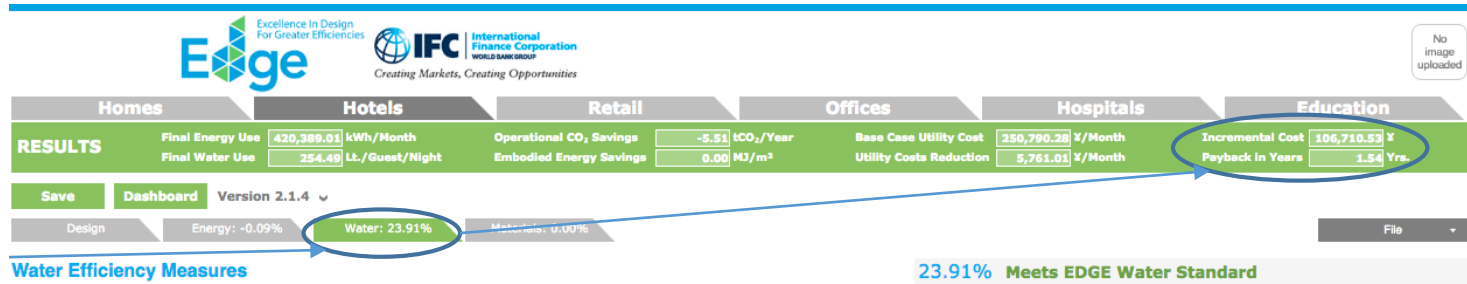


# RESEARCH METHODOLOGY

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

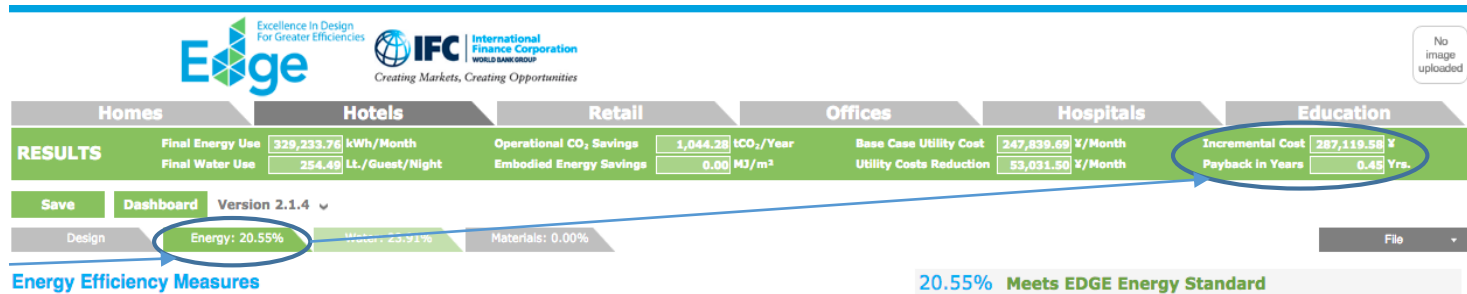
1

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.



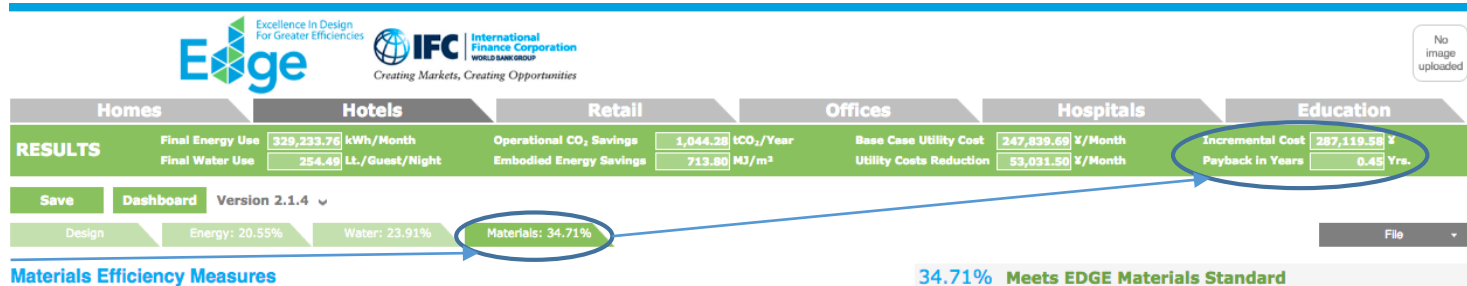
2

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.

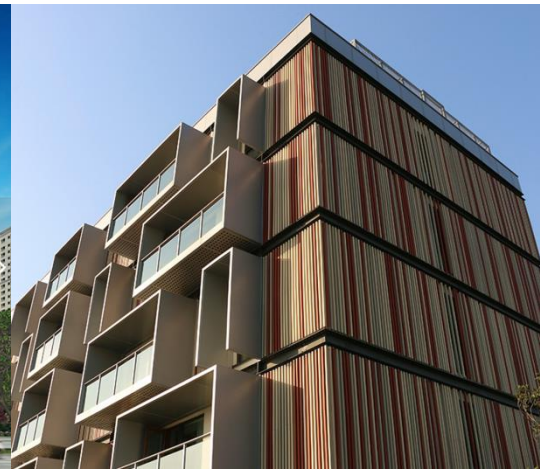


4

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/>



# ACKNOWLEDGEMENTS

## DONOR ACKNOWLEDGEMENT

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## COLLABORATION ACKNOWLEDGEMENT

IFC thanks the Georgetown University McDonough School of Business for collaborating on developing the market intelligence reports.

Visit [www.edgebuildings.com](http://www.edgebuildings.com) for more information