



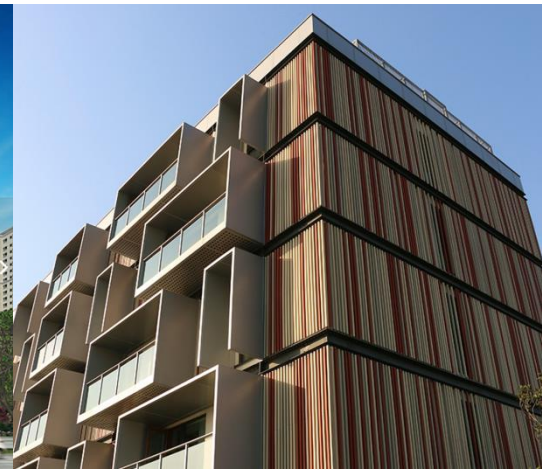
GREEN BUILDINGS RETURN ON INVESTMENT: SOUTH ASIA



Creating Markets, Creating Opportunities

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BANGLADESH : GREEN BUILDINGS RETURN ON INVESTMENT



Creating Markets, Creating Opportunities

BANGLADESH – ROI ON MEASURES NEEDED TO ACHIEVE THE EDGE STANDARD



	Incremental Cost	Utility Savings / month	Payback Period in Years
Homes	\$70/Unit	\$7/Unit	0.8
Hotels	\$83,655	\$7,450	0.9
Shopping Centers	\$26,5455	\$5,680	0.4
Offices	\$20,860	\$1,040	1.7
Schools	\$1,600	\$390	0.4
Hospitals	\$16,655	\$1,540	0.9
Light Industry	\$5,660	\$1,820	0.3





BUILDING DETAILS

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



Energy Measures – 24% Savings through:

- Energy saving light bulbs for Internal and external usage.



Water – 22% Savings through:

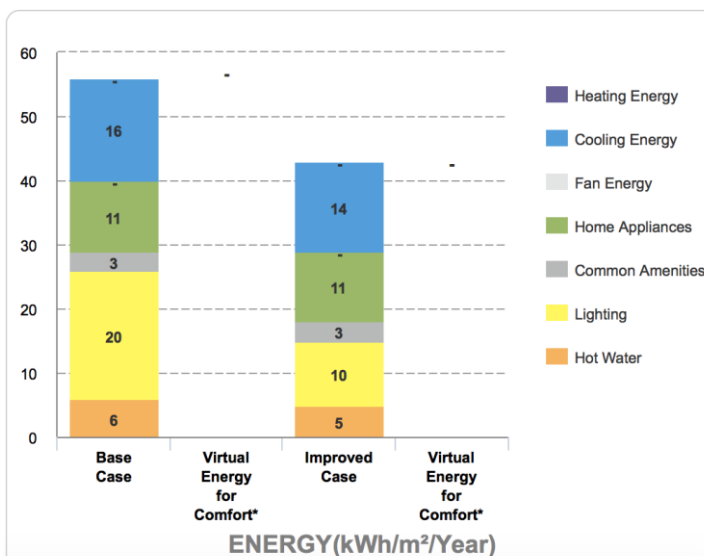
- Low-Flow Showerheads
- Low-Flow Faucets for Washbasins & Kitchen Sinks
- Dual Flush for Water Closets



Materials – 33% Savings through:

- In-Situ concrete for roof and slab
- Aerated Autoclaved Concrete bricks for internal and external walls.
- UPVC Window frames and ceramic tiles

23.65% Meets EDGE Energy Standard



PROJECT METRICS

Incremental Cost

\$70/unit

Utility Costs Savings

\$7 / unit / month

Payback in Years

0.8

Operational CO₂ Savings

0.70 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 27% Savings through:

- Low E-Coated Glass
- Reflective paint for roof & external walls
- External shading devices
- Energy saving lighting for indoor & outdoor areas
- Energy efficiency ceiling fans



Water – 35% Savings through:

- Low-Flow Showerheads and Faucets
- Dual flush water closets



Materials – 36% Savings through:

- In-Situ concrete reinforced for roof and slab
- Autoclaved Aerated Concrete Blocks for external and internal walls



KOLKATA WEST INTERNATIONAL CITY

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

HOTELS – BANGLADESH 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
- Insulation on roof and external wall
- Air conditioning with water cooled chiller
- Low E-Coated Glass



Water – 31% Savings through:

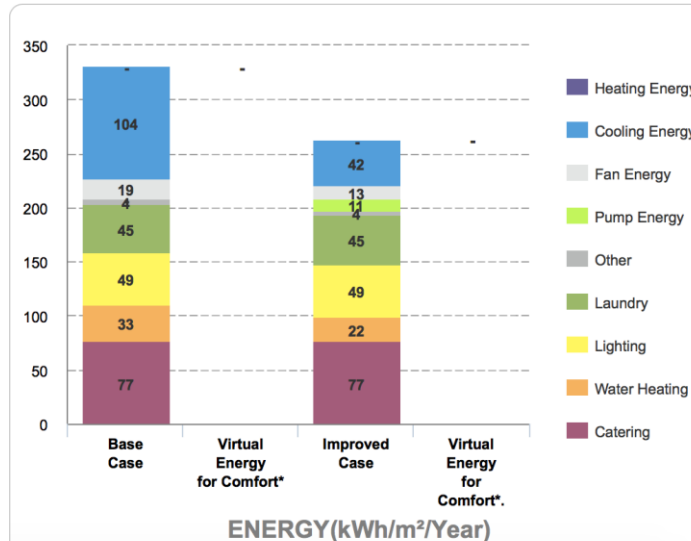
- Low flow shower heads and faucets in guest rooms
- Gray water treatment and recycling



Materials – 27% Savings through:

- In-Situ Trough >30% PFA, Concrete Slab Flooring
- Common brick wall for internal and external

20.44% Meets EDGE Energy Standard



PROJECT METRICS

Incremental Cost

\$83,655

Utility Costs Savings

\$7,450 / month

Payback in Years

0.9

Operational CO₂ Savings

652 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 60% Savings through:

- Reduced Window to Wall Ratio and external shading devices
- Low-E coated glass
- Natural corridor ventilation, variable refrigerant volume cooling system, heat pump for hot water
- Energy Saving Lighting, lighting controls for corridors



Water – 26% Savings through:

- Low flow shower heads and low flow faucets in guest room
- Dual flush water closets in all bathrooms
- Water-efficient kitchen faucets



Materials – 34% Savings through:

- Cored bricks for internal and external wall with plaster
- Parquet wood flooring



ECO GREEN BOUTIQUE HOTEL

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



BUILDING DETAILS

Site Area	Car Parking	Floors	Amenities
15,000 m ²	Indoor Car Parking	1	Shopping Mall



Energy Measures – 22% Savings through:

- Reflective paint for roof
- Variable Refrigerant Flow (VRF) for cooling system
- Energy Saving Light Bulbs in Sales area



Water – 24% Savings through:

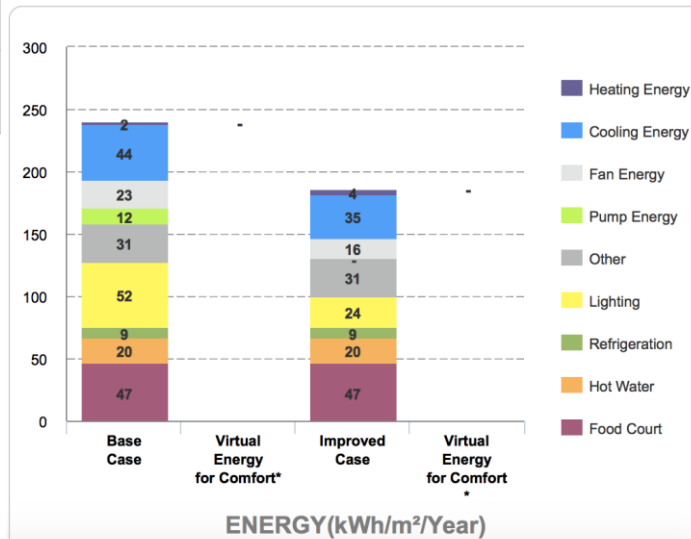
- Dual flush for water closet in all bathrooms



Materials – 25% Savings through:

- Roof Construction: In-Situ Concrete with >30%PFA
- Autoclaved Aerated Concrete blocks for internal and external walls.
- UPVC Window frames
- Ceramic tiles

22.23% Meets EDGE energy standard



PROJECT METRICS

Incremental Cost

\$26,455

Utility Costs Savings

\$5,860/ month

Payback in Years

0.4

Operational CO₂ Savings

497 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 29% Savings through:

- Reduced Window to Wall Ratio
- Insulation for Roof & walls
- Occupancy sensors in bathroom
- Energy Saving Lighting in sales area, corridor, common area and external spaces



Water – 24% Savings through:

- Single flush for water closets and water efficient urinals
- Aerators and Auto Shut-off Faucet in All Washrooms



Materials – 23% Savings through:

- Steel sheet on steel rafter roof construction
- Cement fiber board on metal studs for all external wall



RETAIL AT SANTA VERDE

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

OFFICES – BANGLADESH 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 – 21% Savings through:

- Reflective paint for roof and external wall.
- Low E-Coated Glass.
- Variant Refrigerant Flow (VRF) System..

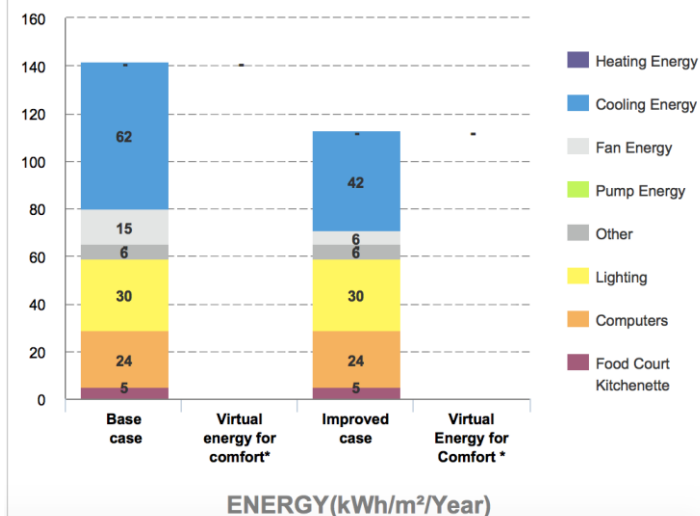
Water – 21% Savings through:

- Water efficient urinals in all bathroom
- Water efficient faucets for all kitchen sink
- Gray water treatment and recycling system

Materials – 22% Savings through:

- Ceramic tiles
- In-Situ Concrete >30% PFA for roof.
- Common brick wall for internal and external walls.
- Aluminum window frames.

20.50% Meets EDGE Energy Standard



PROJECT METRICS

Incremental Cost
\$20,860

Payback in Years
1.7

Utility cost saving
\$1,040/Month

Operational CO₂
Savings
91 tCO₂/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 30% Savings through:

- Occupancy sensors in bathrooms
- Low E-Coated glass
- Variable refrigerant volume (VRV) cooling system.
- Sensible heat recovery from exhaust air
- Energy saving lighting
- Daylight photoelectric sensors for internal space

Water – 70% Savings through:

- Low-flow faucets in kitchen and bathroom.
- Dual-flush water closets.
- Gray water treatment and recycling system.
- Water efficient urinals and rain water harvesting

Materials – 45% Savings through:

- Autoclaved Aerated Concrete blocks for internal walls
- Curtain walling for external walls



DAAN MOGOT BARU OFFICE PARK (INDONESIA)

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

SCHOOLS – BANGLADESH CASE STUDY



BUILDING DETAILS

Floors Above and below Ground	Classroom	Gross Internal Area
4/1	1000	5,000 m ²



Energy Measures – 31% Savings through:

- Insulation of roof
- External shading devices



Water – 23% Savings through:

- Water efficient faucets for kitchen sink
- Dual Flush Water Closet
- Water-Efficient urinals



Materials – 28% Savings through:

- In-Situ Concrete reinforced
- Aerated Autoclaved Concrete Blocks
- Ceramic tiles

PROJECTED PROJECT METRICS

Incremental Cost

\$1,600

Utility Costs Savings

\$390 / month

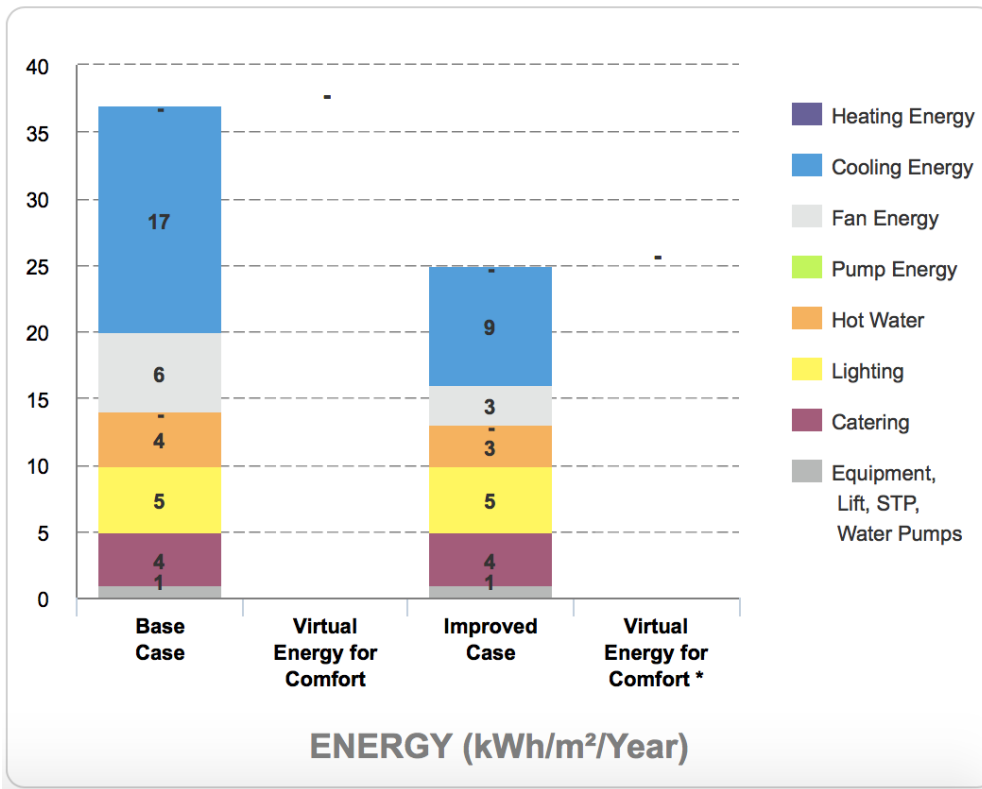
Payback in Years

0.4

Operational CO₂ Savings

38 tCO₂/Year

30.9% Meets EDGE Energy Standard



HOSPITALS – BANGLADESH 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 – 23% Savings through:

- External shading device
- Natural ventilation in patient room
- Insulation of roof and external wall



Water – 20% Savings through:

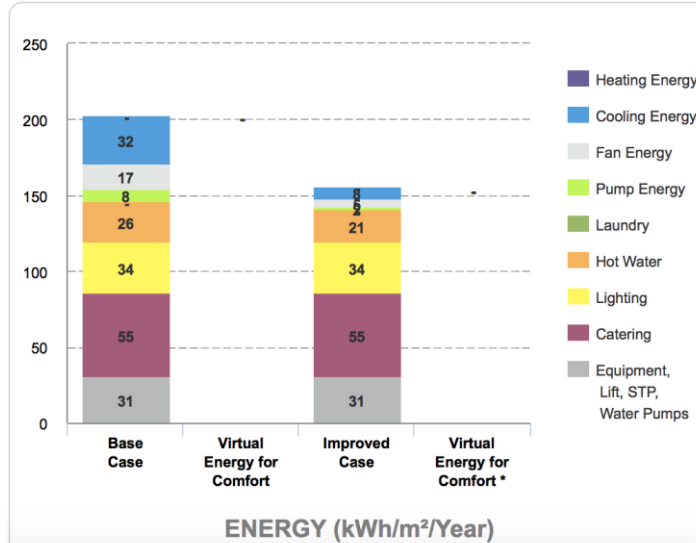
- Low-Flow Faucets in all Bathrooms
- Water efficient dishwasher and pre-rinse valve
- Water-Efficient Urinals in all bathrooms



Materials – 33% Savings through:

- In-Situ Concrete reinforced concrete
- Aerated Autoclaved Concrete Blocks

23.49% Meets EDGE Energy Standard



PROJECT METRICS

Incremental Cost

\$16,655

Utility Costs Savings

\$1,540 / month

Payback in Years

0.9

Operational CO₂ Savings

147.92 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 32% Savings through:

- Reduced Window To Wall Ratio
- Insulation of Roofs and External Walls
- Reflective paint for external wall
- Natural ventilation n for corridor
- Energy-Saving Lighting System for Internal and External Spaces
- Solar Photovoltaics



Water – 35% Savings through:

- Low-flow Faucets In Bathrooms and water efficient urinals
- Single flush and flush valve for water closet
- Rainwater harvesting



Materials – 43% Savings through:

- Steel Sheets on Steel Rafters for Roof Construction
- Medium weight hollow concrete blocks for External and Internal Walls
- Finished concrete flooring



SEDE de EBAIS de ESCOBAL de BELEN

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

BUILDING DETAILS

Floors Above Ground	Shifts in a Day	Gross Internal Area
1	1	15,000 m ²



Energy Measures – 21% Savings through:

- Reflective Paint/Tiles for Roof
- Skylight to provide daylight to 50% of top floor
- Variable frequency drive in AHU's



Water – 25% Savings through:

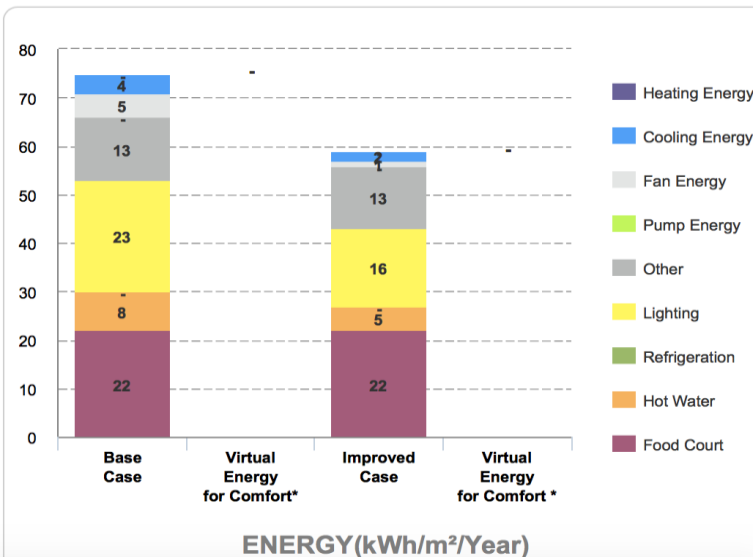
- Auto Shut-off faucets
- Rainwater Harvesting System



Materials – 27% Savings through

- In-Situ concrete > 30% PFA
- Autoclaved Aerated Concrete Blocks for external wall

21.46% Meets EDGE energy standard



PROJECT METRICS

Incremental Cost

\$5,660

Utility Costs Savings

\$1,820 / month

Payback in Years

0.3

Operational CO₂ Savings

152 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 23% Savings through:

- Reduced Window To Wall Ratio
- Reflective paint of Roofs and External Walls
- Variable Refrigerant Flow cooling system
- Energy-Saving Lighting System for Internal and External Spaces



Water – 22% Savings through:

- Low-flow Faucets In Bathrooms
- Black water treatment and recycling system



Materials – 28% Savings through:

- Thinner In-Site concrete slabs with less rebar for floor and slab
- Ceramic Tile Flooring



SONG HAU SURFACE WATER PLANT (VIETNAM)

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



INDIA: GREEN BUILDINGS RETURN ON INVESTMENT



Creating Markets, Creating Opportunities

INDIA: DELHI – ROI ON MEASURES NEEDED TO ACHIEVE THE EDGE STANDARD



	Incremental Cost	Utility Savings / month	Payback Period in Years
Homes	Rs 9,060/unit	Rs 455/unit	1.7
Hotels	Rs 12,282,680	Rs 915,230	1.2
Shopping Centers	Rs 198,460	Rs 900,670	0
Offices	Rs 1,659,550	Rs 195,830	0.7
Schools	Rs 850,650	Rs 56,560	1.2
Hospitals	Rs 2,717,540	Rs 185,530	1.2
Light Industry	Rs 9,058,460	Rs 513,650	1.5



BUILDING DETAILS

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



Energy Measures – 25% Savings through:

- Energy saving light bulbs for Internal space
- Reflective paint for roof and external wall.
- Solar water collector



Water – 24% Savings through:

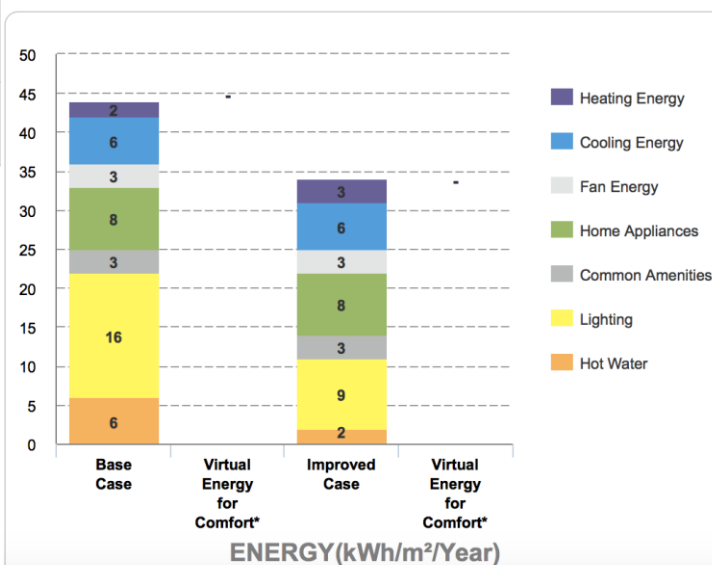
- Low-Flow Faucets for Washbasins & Kitchen Sinks
- Low flow shower head
- Dual flush for water closet



Materials – 21% Savings through:

- In-Situ concrete >30% PFA, for floor slab
- Common brick wall for internal and external walls.
- UPVC Window frames and ceramic tiles

25.05% Meets EDGE Energy Standard



PROJECT METRICS

Incremental Cost

Rs. 9,060/unit

Utility Costs Savings

Rs. 455 / unit / month

Payback in Years

1.7

Operational CO₂ Savings

0.68 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 23% Savings through:

- Reduced Window to Wall Ratio
- Reflective paint and tiles for roof
- External shading devices
- Energy saving lighting in outdoor areas



Water – 24% Savings through:

- Low-Flow faucets for kitchen sink
- Recycled Black water for flushing



Materials – 71% Savings through:

- In-Situ concrete > 30% PFA
- Internal and external walls made of FaIG blocks
- UPVC window frames
- Ceramic tile flooring



KESAR CITY

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

HOTELS – INDIA (DELHI) 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:

- Air conditioning with water cooled chiller
- Energy-Saving Light Bulbs for internal and external spaces & also in back-of-house
- Lightening controls for corridor



Water – 23% Savings through:

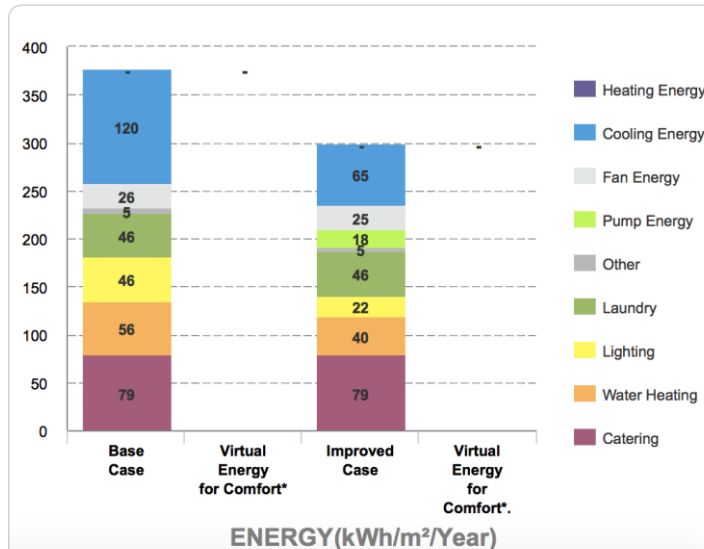
- Low flow shower head in guest rooms
- Water efficient dishwashers & pre-rinse valve
- Water efficient urinals



Materials – 27% Savings through:

- In-Situ Through Concrete >30% PFA Slab Flooring
- Common wall for external and internal use

20.63% Meets EDGE Energy Standard



PROJECT METRICS

Incremental Cost

Rs 12,282,680

Utility Costs Savings

Rs 915,230 / month

Payback in Years

1.2

Operational CO₂

Savings

913 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 21% Savings through:

- Reduced Window to Wall Ratio and external shading devices
- Low-E coated glass
- Variable speed drive on the fans of cooling tower
- Air conditioning with water cooled screw chillers
- Energy Saving Lighting, for outdoor space and heat pumps
- Variable speed drive pumps



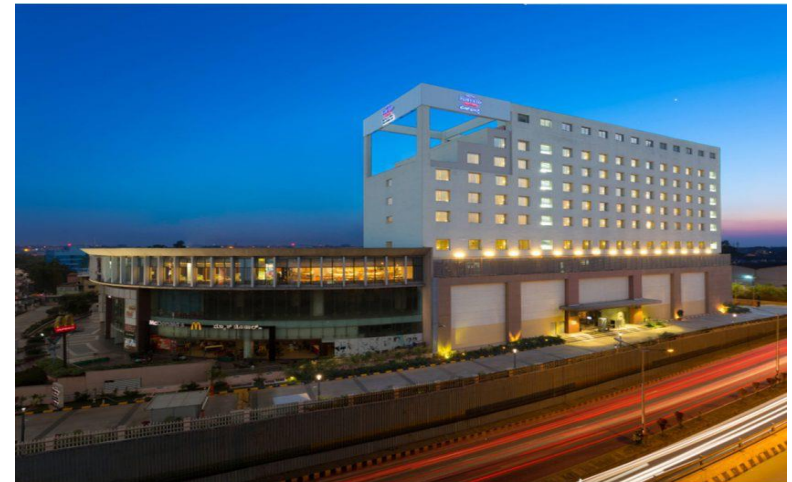
Water – 23% Savings through:

- Black water treatment and recycling system
- Dual flush for all bathrooms



Materials – 30% Savings through:

- In-Situ reinforced concrete
- Solid dense concrete blocks for internal and external walls
- Laminated wooden flooring



SAMHI – MARRIOTT (INDIA)

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

BUILDING DETAILS

Site Area	Car Parking	Floors	Amenities
15,000 m ²	Indoor Car Parking	1	Shopping Mall



Energy Measures – 21% Savings through:

- Reflective paint for roof
- Variable Refrigerant Flow (VRF) cooling system
- Energy Saving Light Bulbs in all spaces



Water – 21% Savings through:

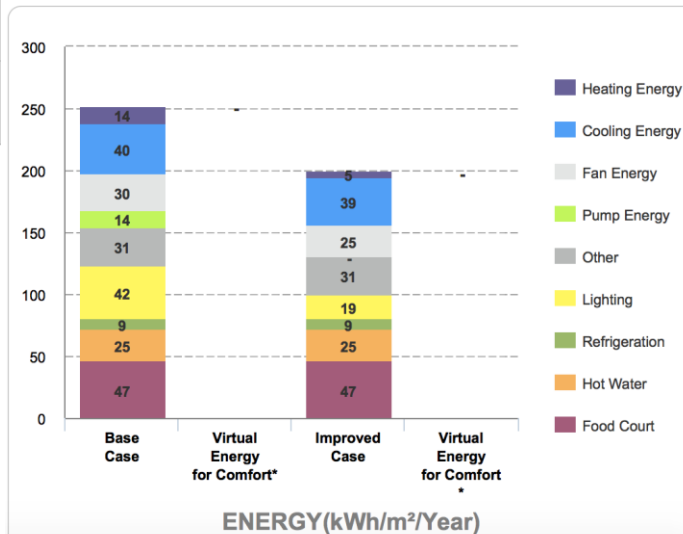
- Dual faucets in all bathrooms
- Water Efficient Urinals



Materials – 25% Savings through:

- Roof Construction: In-Situ concrete > 30% PFA
- Autoclaved Aerated Concrete Blocks for external wall
- UPVC window frames

20.89% Meets EDGE energy standard



PROJECT METRICS

Incremental Cost

Rs 198,460

Utility Costs Savings

Rs 900,670/ month

Payback in Years

0

Operational CO₂ Savings

569 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



Water – 27% Savings through:

- Low-Flow faucets for kitchen and bathroom
- Aerators and Auto Shut-off Faucet in All Washrooms
- Water efficient urinals and dual water closet



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



BMB 001 CAMBUCI - OBRAMAX

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

OFFICES – INDIA (DELHI) 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 – 20% Savings through:

- Insulation on roof.
- Low E-Coating glass.
- Energy efficient light bulbs for internal space.

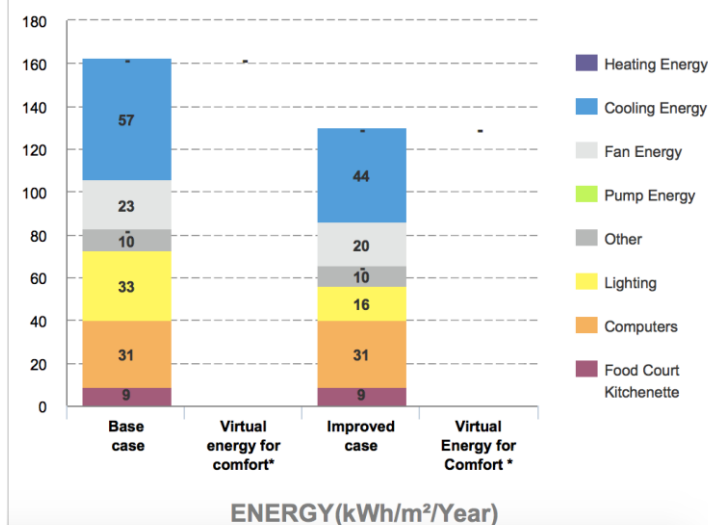
Water – 28% Savings through:

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

Materials – 26% Savings through:

- Ceramic tiles.
- In-Site Concrete<30% PFA for roof.
- Common brick wall
- Aluminum window frames.

20.17% Meets EDGE Energy Standard



PROJECT METRICS

Incremental Cost
Rs 1,659,550

Payback in Years
0.7

Utility cost saving
Rs 195,830/Month

Operational CO₂
Savings
119 tCO₂/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 68% Savings through:

- Reduced window to wall ratio.
- Higher thermal performance glass
- Reflective paint and insulation of the roof.
- Variable refrigerant volume (VRV) cooling system.
- Sensible heat recovery from exhaust air
- Energy saving lighting and solar photovoltaic

Water – 83% Savings through:

- Low-flow plumbing fixtures.
- Rain water harvesting.
- Black water treatment and recycling system.

Materials – 28% Savings through:

- Stone and ceramic tiles for floors
- UPVC window frames.
- Polystyrene roof insulation and AAC blocks for external walls



ABHIKALPAN OFFICE (INDIA)

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

SCHOOLS – INDIA (DELHI) CASE STUDY

BUILDING DETAILS

Floors Above and below Ground	Classroom	Gross Internal Area
4/1	1000	5,000 m ²



Energy Measures – 23% Savings through:

- Insulation of roof
- Occupancy sensors in classrooms and bathroom
- Photoelectric sensors to harvest daylight



Water – 20% Savings through:

- Low-Flow Faucets
- Dual Flush Water Closet
- Water-Efficient urinals



Materials – 22% Savings through:

- In-Situ Concrete: reinforced
- Aerated Autoclaved Concrete blocks
- Ceramic tiles

PROJECTED PROJECT METRICS

Incremental Cost

Rs 850,650

Utility Costs Savings

Rs 56,560 / month

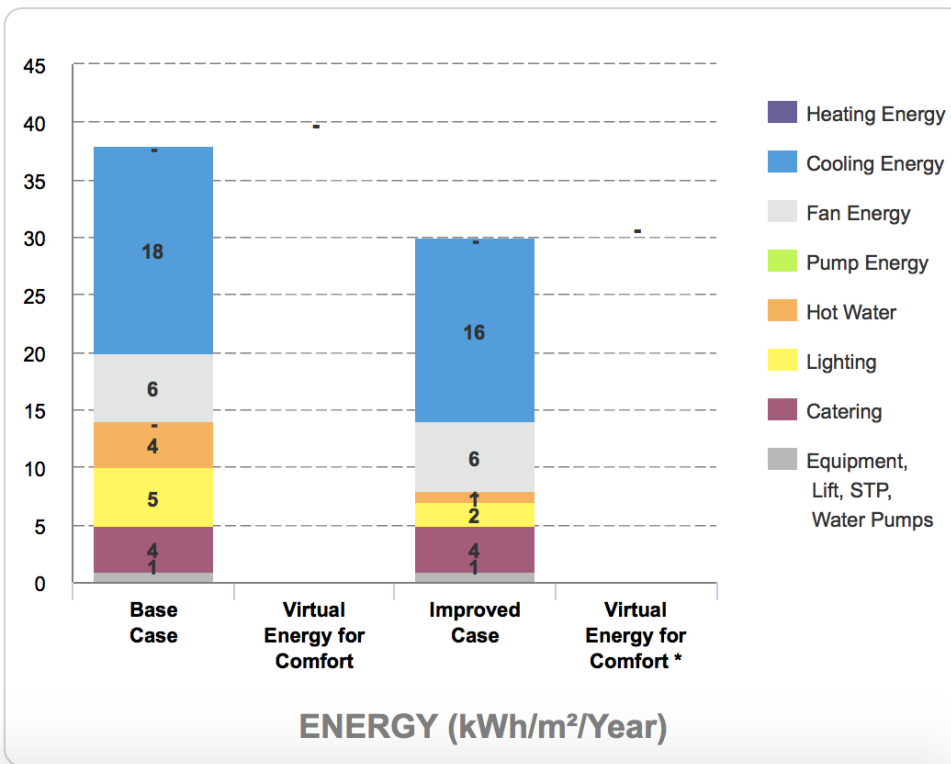
Payback in Years

1.2

Operational CO₂ Savings

34 tCO₂/Year

22.8% Meets EDGE Energy Standard



HOSPITALS – INDIA (DELHI) 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:

- External shading
- Insulation of roof and external wall
- Energy saving light bulbs for internal & external space
- Occupancy sensors in bathroom



Water – 21% Savings through:

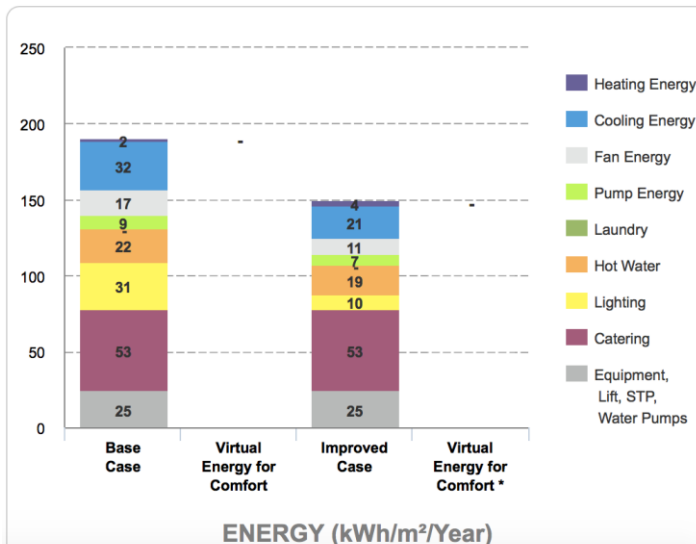
- Low-Flow Faucets and shower heads in all Bathrooms
- Dual-Flush for Water Closets in all Bathrooms
- Water-Efficient urinals in bathroom



Materials – 25% Savings through:

- In-Situ Concrete reinforced
- Aerated Autoclaved Concrete Blocks

22.15% Meets EDGE Energy Standard



PROJECT METRICS

Incremental Cost

Rs 2,717,540

Utility Costs Savings

Rs 185,530 / month

Payback in Years

1.2

Operational CO₂ Savings

160 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 21% Savings through:

- Reduced Window To Wall Ratio and insulation of external wall
- High performance glass and air economizer
- Air Conditioning with Air Cooled Chiller
- Energy-Saving Lighting System for Internal and External Spaces
- Solar Hot Water Collectors
- Variable frequency drive in AHU and variable speed drives
- Sensible heat recovery from exhaust air



Water – 25% Savings through:

- Low-flow Faucets In Bathrooms and Dual-flush Water Closets
- Water efficient faucets in kitchen sink



Materials – 26% Savings through:

- Clay roofing tiles on Steel Rafters for Roof Construction
- Medium weight hollow concrete blocks for External
- Vinyl flooring and lightweight concrete blocks for internal walls



KESERWAN MEDICAL CENTRE

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

LIGHT INDUSTRY – INDIA (DELHI) CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Floors Above Ground	Shifts in a Day	Gross Internal Area
1	1	15,000 m ²



Energy Measures – 36% Savings through:

- Reflective Paint/Tiles for Roof
- Skylight to provide daylight to 50% of top floor
- Solar Photovoltaic for power requirements



Water – 22% Savings through:

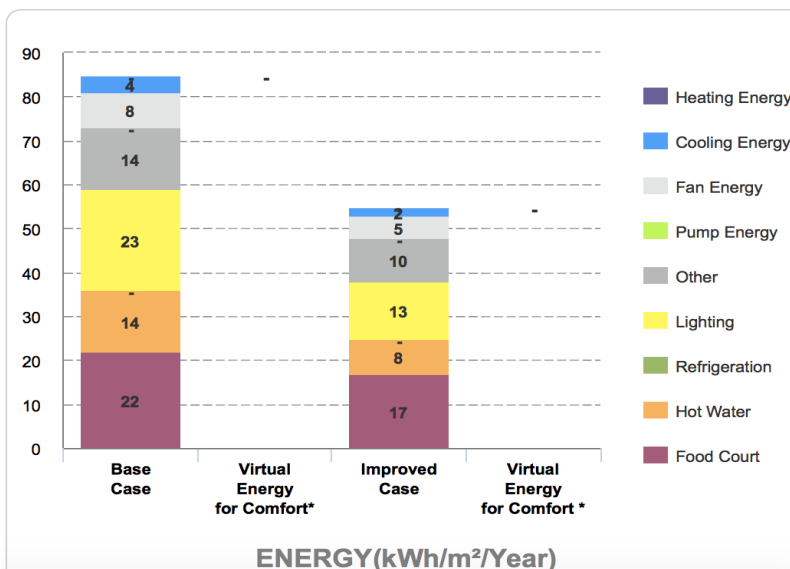
- Auto Shut-off faucets
- Rainwater Harvesting System
- Dual faucets for all bathrooms



Materials – 21% Savings through:

- In-Situ concrete > 30% PFA
- Autoclaved Aerated Concrete for external wall

35.53% Meets EDGE energy standard



PROJECTED PROJECT METRICS

Incremental Cost
Rs 9,058,460

Utility Costs Savings
Rs 513,650 / month

Payback in Years
1.5

Operational CO₂ Savings
328 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 38% Savings through:

- Reduced Window To Wall Ratio
- Reflective paint of Roofs and External Walls
- Variable Refrigerant Flow cooling system
- Energy-Saving Lighting System for Internal and External Spaces
- Skylight to provide daylight to 50% of top floor area



Water – 23% Savings through:

- Single flush and flush valve for water closet in all bathrooms
- Water efficient urinals in all bathrooms
- Aerated and auto shutoff faucets in all bathrooms



Materials – 63% Savings through:

- Steel sheet on steel rafter for roof construction
- Medium weight hollow concrete blocks for external walls
- Plastic board on metal studs for internal walls and finishing concrete



LATAM PARQUE LOGISTICO LIMA SUR

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



INDIA (MUMBAI) : GREEN BUILDINGS RETURN ON INVESTMENT



Creating Markets, Creating Opportunities

INDIA: DELHI – ROI ON MEASURES NEEDED TO ACHIEVE THE EDGE STANDARD



	Incremental Cost	Utility Savings / month	Payback Period in Years
Homes	Rs 9,700/unit	Rs 420/unit	1.9
Hotels	Rs 9,550,050	Rs 1,261,230	0.6
Shopping Centers	Rs 881,570	Rs 768,910	0.1
Offices	Rs 1,043,415	Rs 208,310	0.4
Schools	Rs 646,854	Rs 44,800	1.2
Hospitals	Rs 856,690	Rs 255,050	0.3
Light Industry	Rs 8,883,220	Rs 435,740	1.7



BUILDING DETAILS

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



Energy Measures – 22% Savings through:

- Energy saving light bulbs for Internal and external
- Insulation of roof & Low E-Coated glass
- Solar water collector



Water – 32% Savings through:

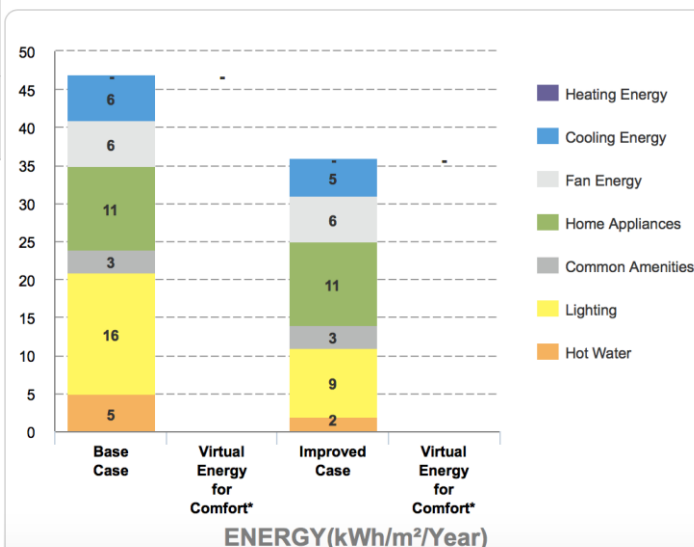
- Low-Flow Faucets for Washbasins & Kitchen Sinks
- Recycle Gray water flushing



Materials – 37% Savings through:

- In-Situ concrete for roof and slab >30% PFA
- Aerated Autoclaved Concrete bricks for internal and external walls.
- UPVC Window frames and ceramic tiles

22.34% Meets EDGE Energy Standard



PROJECT METRICS

Incremental Cost

Rs. 9,700/unit

Utility Costs Savings

Rs. 420 / unit / month

Payback in Years

1.9

Operational CO₂ Savings

0.63 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 33% Savings through:

- Reduced Window to Wall Ratio
- Reflective paint for roof & external walls
- External shading devices
- Energy saving lighting for indoor & outdoor areas
- Solar Hot water collector



Water – 39% Savings through:

- Low-Flow Showerheads and Faucets
- Dual flush water closets
- Recycled Black water for flushing
- Rain water harvesting



Materials – 23% Savings through:

- In-Situ concrete reinforced for roof and slab



VBHC – VAIBHAV BANGALORE

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

HOTELS – INDIA (MUMBAI) 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:

- Higher Thermal Performance Glass
- Energy-Saving Light Bulbs for internal space



Water – 26% Savings through:

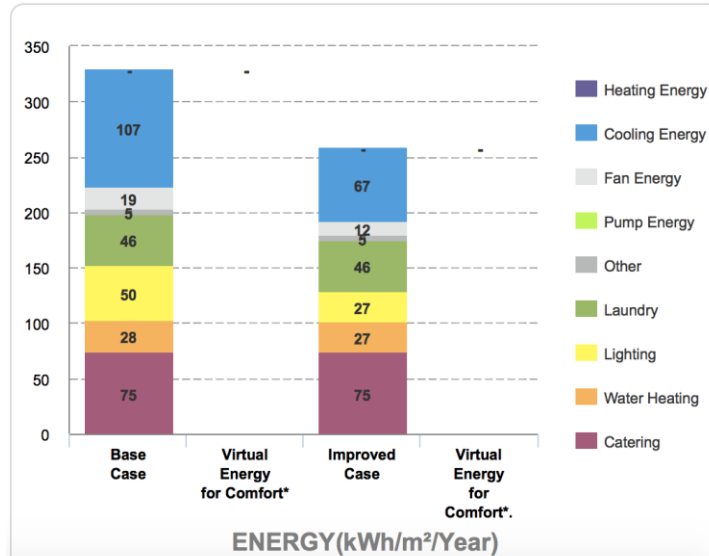
- Gray Water Treatment and Recycling System
- Water efficient dish washers



Materials – 42% Savings through:

- In-Situ Trough Concrete Slab Flooring
- Aerated Autoclaved Concrete Blocks
- UPVC window frames

21.35% Meets EDGE Energy Standard



PROJECT METRICS

Incremental Cost

Rs 9,550,050

Utility Costs Savings

Rs 1,261,230 / month

Payback in Years

0.6

Operational CO₂

Savings

795 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 21% Savings through:

- Reduced Window to Wall Ratio and external shading devices
- Solar Photovoltaic
- Natural corridor ventilation, variable refrigerant volume cooling system, heat pump for hot water
- Energy Saving Lighting, lighting controls for corridors
- Air cooling in air cooled screw chillers



Water – 21% Savings through:

- Low flow plumbing fixtures for showerheads and washbasin
- Dual flush water closets for all bathrooms
- Water-efficient urinals, kitchen faucets and landscaping



Materials – 37% Savings through:

- Micro concrete tiles on steel rafters for roof construction
- Timber window frames and wood block finishing for flooring
- Autoclaved Aerated Concrete Blocks for external and internal walls



SPRINGHILL CONDOTEL AT JIMBARAN HIJAU

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

SHOPPING CENTERS – INDIA (MUMBAI) CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Site Area	Car Parking	Floors	Amenities
15,000 m ²	Indoor Car Parking	1	Shopping Mall



Energy Measures – 22% Savings through:

- Reflective paint for roof
- Variable Refrigerant Flow (VRF) for cooling system
- Energy Saving Light Bulbs in Sales area



Water – 23% Savings through:

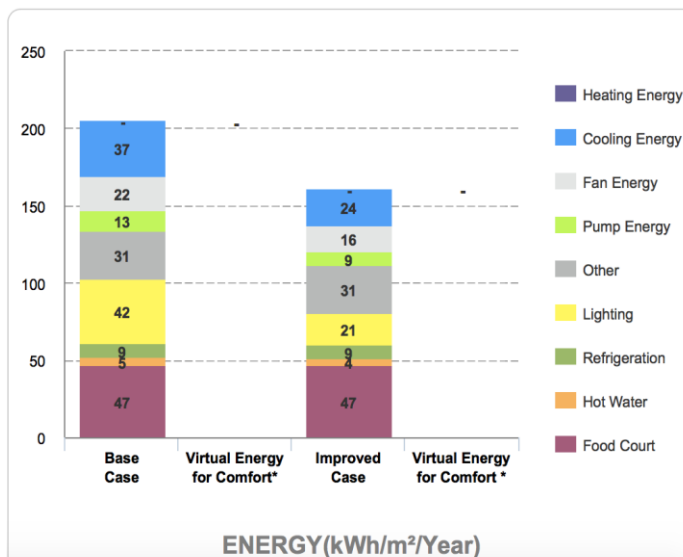
- Dual flush for water closet in all bathrooms
- Water efficient kitchen faucets



Materials – 21% Savings through:

- Roof Construction: In-Situ Concrete with >30%PFA
- UPVC Window frames
- Ceramic tiles
- Common brick wall for internal and external walls

21.73% Meets EDGE energy standard



PROJECT METRICS

Incremental Cost

Rs 881,570

Utility Costs Savings

Rs 768,910 / month

Payback in Years

0.1

Operational CO₂ Savings

482 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 37% Savings through:

- Reduced Window to Wall Ratio, recovery of waste heat from generator
- Reflective Paint & insulation for Roof & walls
- Variable Refrigerant Volume (VRV) Cooling System
- Energy Saving Lighting and CO2 sensors controlled ventilation for fresh air
- Variable frequency drives in AHU, Variable speed drive pumps
- High efficiency condensing boilers for space heating



Water – 53% Savings through:

- Water efficient urinals and duals flush water closet
- Aerators and Auto Shut-off Faucet in All Washrooms



Materials – 30% Savings through:

- Steel profile cladding for external wall
- Corrugated zinc sheet for roof construction
- Solid dense concrete blocks for external wall



KAUFLAND – HRISTO SMIMENSKI

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

OFFICES – INDIA (MUMBAI) 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 – 21% Savings through:

- Reflective paint for roof and external wall.
- Insulation of roof.
- Energy saving lights for internal and external spaces.

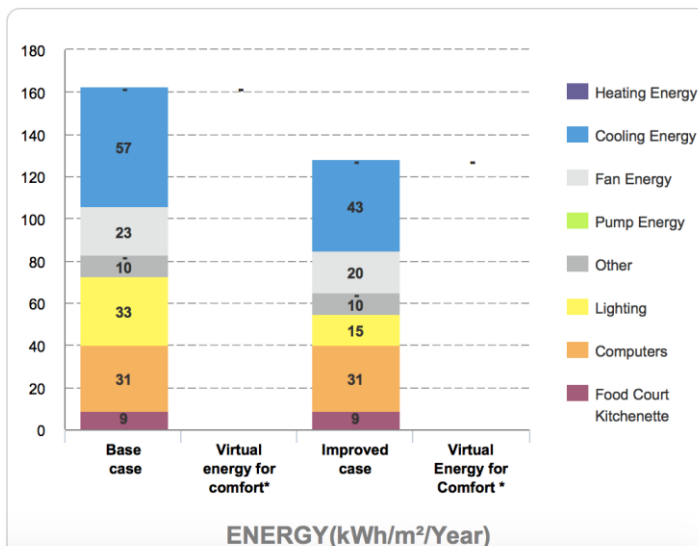
Water – 29% Savings through:

- Gray water treatment and recycling system
- Dual flush for water closets in bathrooms

Materials – 21% Savings through:

- Ceramic tiles.
- In-Site concrete<30% PFA, for roof.
- Aerated Autoclaved Concrete blocks
- Aluminum window frames

21.48% Meets EDGE Energy Standard



PROJECT METRICS

Incremental Cost
Rs 1,043,415

Payback in Years
0.4

Utility cost saving
Rs 208,310/Month

Operational CO₂
Savings
126 tCO₂/Year

RELEVANT CERTIFIED PROJECT

Energy Measures – 27% Savings through:

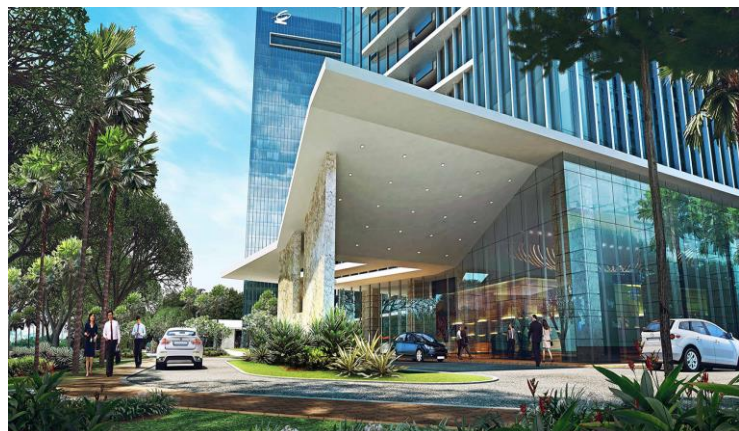
- Reduced window to wall ratio.
- Higher thermal performance glass..
- Energy saving lighting
- Efficient cooling system

Water – 65% Savings through:

- Low-flow faucet wash basin.
- Dual-flush water closets.
- Water efficient urinals.

Materials – 37% Savings through:

- Gypsum walls and stone tiled floor for retail space
- Steel profile cladding
- Finish concrete floor for office towers.



CITRA TOWERS KEMAYORAN

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

SCHOOLS – INDIA (MUMBAI) CASE STUDY

BUILDING DETAILS

Floors Above and below Ground	Classroom	Gross Internal Area
4/1	1000	5,000 m ²



Energy Measures – 21% Savings through:

- Natural Ventilation: Corridors
- External shading devise



Water – 25% Savings through:

- Low-Flow Faucets
- Dual Flush Water Closet
- Water-Efficient urinals



Materials – 28% Savings through:

- In-Situ Concrete: reinforced
- Aerated Autoclaved Concrete blocks
- Ceramic tiles

PROJECTED PROJECT METRICS

Incremental Cost

Rs 646,854

Utility Costs Savings

Rs 44,800 / month

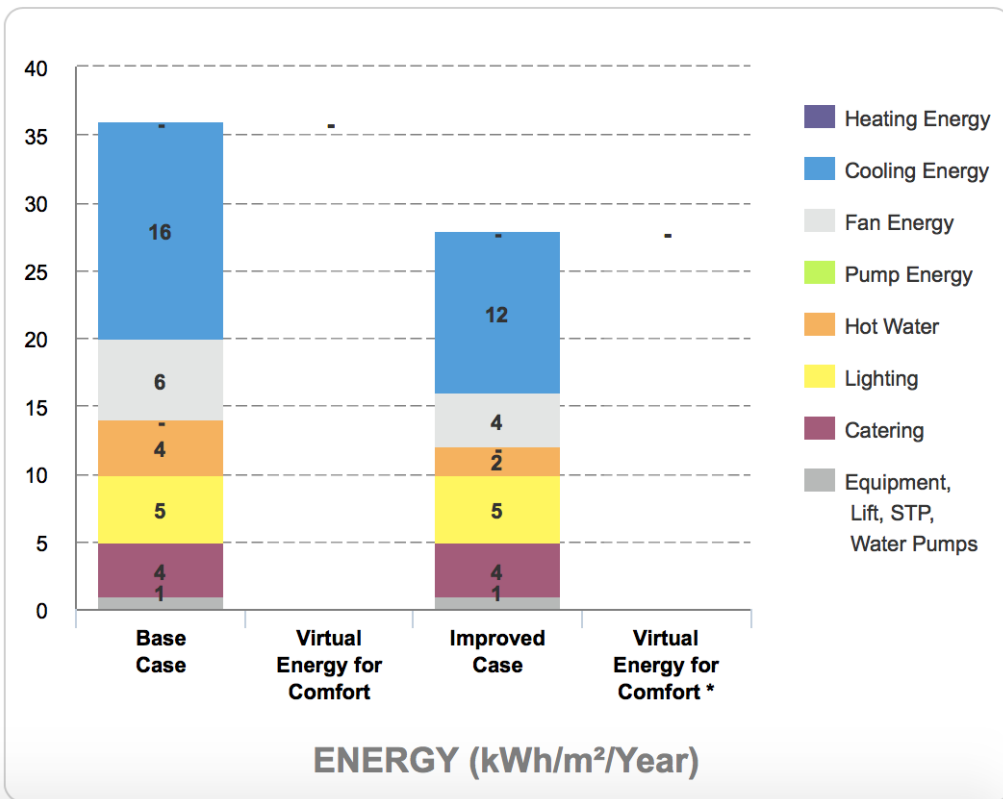
Payback in Years

1.2

Operational CO₂ Savings

29 tCO₂/Year

21.3% Meets EDGE Energy Standard



HOSPITALS – INDIA (MUMBAI) 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:

- Air economizer except for OT and ICU



Water – 20% Savings through:

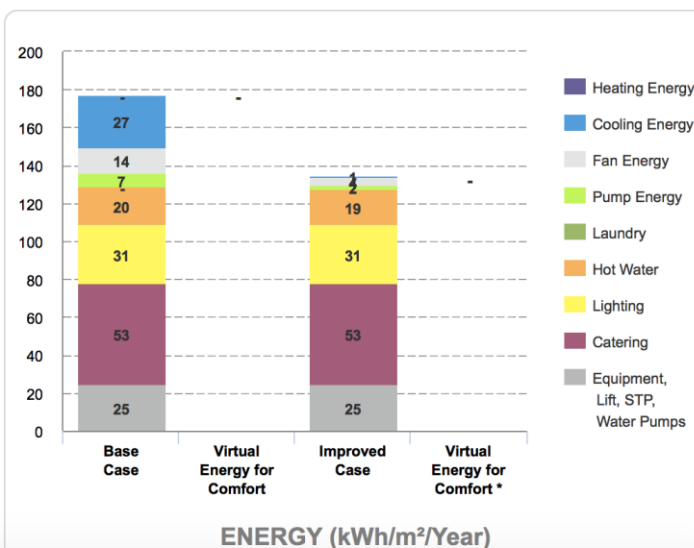
- Water efficient urinals in all Bathrooms
- Dual-Flush for Water Closets in all Bathrooms
- Water-Efficient Faucets for Kitchen Sinks



Materials – 33% Savings through:

- In-Situ Concrete reinforced
- Aerated Autoclaved Concrete Blocks

24.50% Meets EDGE Energy Standard



PROJECT METRICS

Incremental Cost

Rs. 856,690

Utility Costs Savings

Rs. 255,050 / month

Payback in Years

0.3

Operational CO₂ Savings

163 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 21% Savings through:

- Reduced Window To Wall Ratio and insulation of external wall
- High performance glass and air economizer
- Air Conditioning with Air Cooled Chiller
- Energy-Saving Lighting System for Internal and External Spaces
- Solar Hot Water Collectors
- Variable frequency drive in AHU and variable speed drives
- Sensible heat recovery from exhaust air



Water – 25% Savings through:

- Low-flow Faucets In Bathrooms and Dual-flush Water Closets
- Water efficient faucets in kitchen sink



Materials – 26% Savings through:

- Clay roofing tiles on Steel Rafters for Roof Construction
- Medium weight hollow concrete blocks for External
- Vinyl flooring and lightweight concrete blocks for internal walls



KESERWAN MEDICAL CENTRE

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

INDUSTRY – INDIA (MUMBAI) CASE STUDY & CERTIFIED PROJECT

BUILDING DETAILS

Floors Above Ground	Shifts in a Day	Gross Internal Area
1	1	15,000 m ²



Energy Measures – 34% Savings through:

- Reflective Paint/Tiles for Roof
- Skylight to provide daylight to 50% of top floor area
- Solar Photovoltaic for power requirement



Water – 28% Savings through:

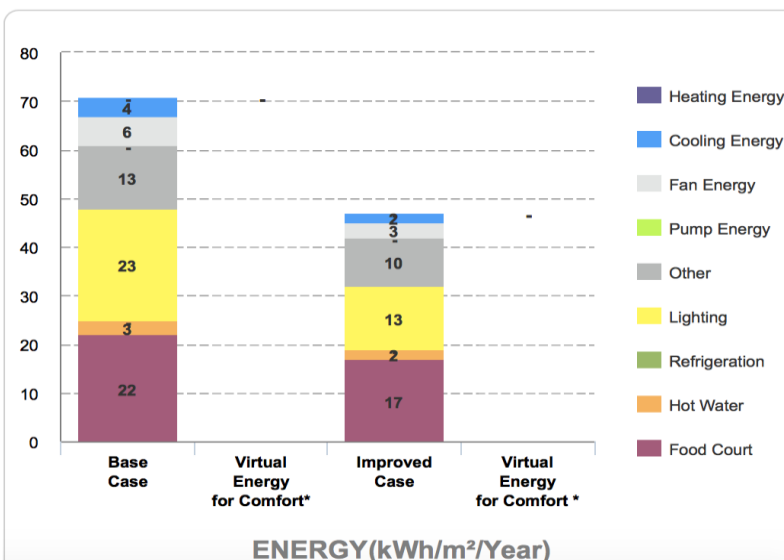
- Rainwater Harvesting System



Materials – 27% Savings through:

- In-Situ concrete > 30% PFA
- Autoclaved Aerated Concrete Blocks for external and internal walls
- Ceramic Tiles

34.48% Meets EDGE energy standard



PROJECTED PROJECT METRICS

Incremental Cost
Rs 8,883,220

Utility Costs Savings
Rs 435,740 / month

Payback in Years
1.7

Operational CO₂ Savings
265 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 27% Savings through:

- Reduced Window To Wall Ratio
- Reflective paint of Roofs and External Walls
- Energy-Saving Lighting System for Internal and External Spaces
- Skylight to provide daylight to 50% of top floor area



Water – 26% Savings through:

- Dual flush water closet in all bathrooms



Materials – 25% Savings through:

- Steel sheet on steel rafter for roof construction
- Finished concrete flooring



TPARK BANGPLEE 4

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



SRI LANKA: GREEN BUILDINGS RETURN ON INVESTMENT

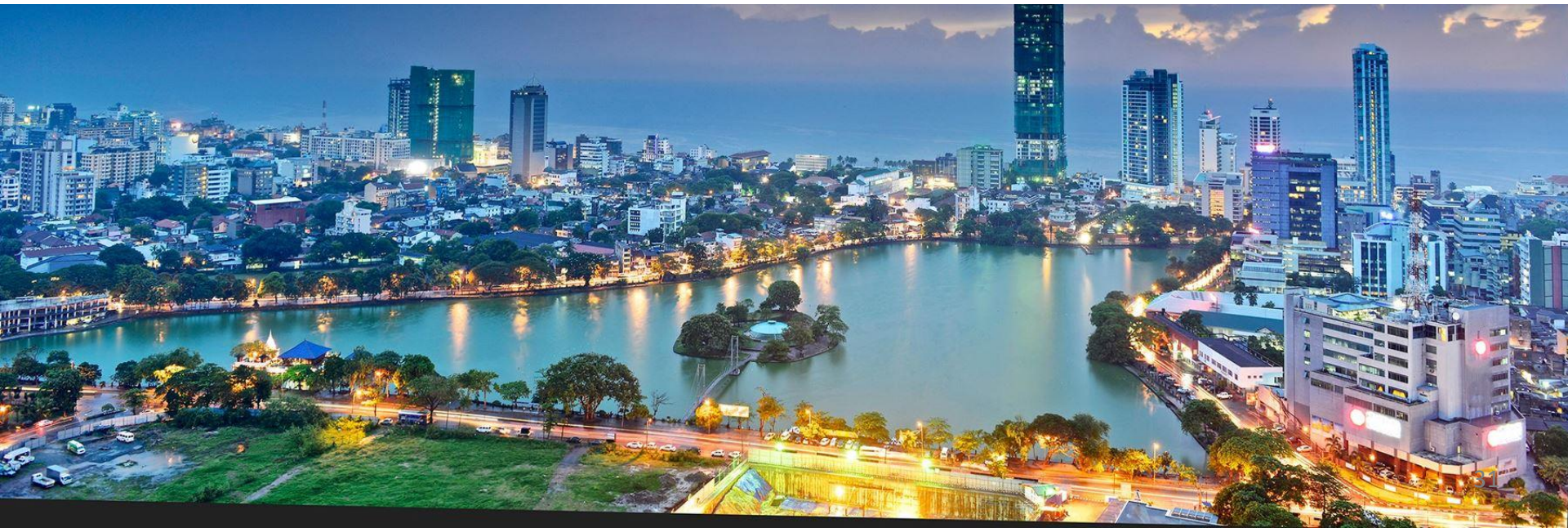


Creating Markets, Creating Opportunities

SRI LANKA – ROI NEEDED TO REACH EDGE STANDARD



	Incremental Cost	Utility Savings / month	Payback Period in Years
Homes	\$100 / unit	\$10 / unit	0.7
Hotels	\$152,810	\$13,235	1
Shopping Centers	\$117,575	\$13,100	0.75
Offices	\$25,260	\$2,630	0.8
Schools	\$7,645	\$950	1
Hospitals	\$108,00	\$9,200	1
Light Industry	\$22,470	\$2,185	1



BUILDING DETAILS

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



Energy Measures – 25% Savings through:

- Energy saving light bulbs for Internal and external usage.



Water – 22% Savings through:

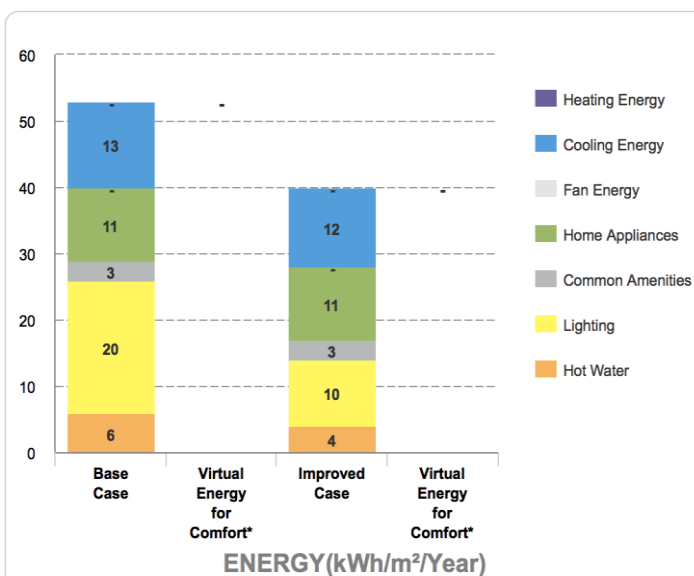
- Low-Flow Showerheads
- Low-Flow Faucets for Washbasins & Kitchen Sinks
- Dual Flush for Water Closets



Materials – 40% Savings through:

- In-Situ concrete for roof and slab
- Aerated Autoclaved Concrete bricks for internal and external walls.
- UPVC Window frames and ceramic tiles

24.63% Meets EDGE Energy Standard



PROJECT METRICS

Incremental Cost

\$98/unit

Utility Costs Savings

\$12 / unit / month

Payback in Years

0.7

Operational CO₂ Savings

0.80 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 22% Savings through:

- Reduced Window to Wall Ratio
- Reflective paint and tiles for roof
- External shading devices
- Energy saving lighting in outdoor areas



Water – 25% Savings through:

- Low-Flow Showerheads and Faucets
- Dual flush water closets
- Recycled gray water for flushing



Materials – 70% Savings through:

- In-Situ concrete for roof and slab
- Aerated Autoclaved Concrete bricks for internal and external walls
- UPVC window frames
- Ceramic tile flooring



TCP ALTURA (INDIA)

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

BUILDING DETAILS

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



Energy Measures – 22% Savings through:

- External Shading Devices
- Variable Refrigerant Flow (VRF) Cooling System
- Energy-Saving Light Bulbs



Water – 22% Savings through:

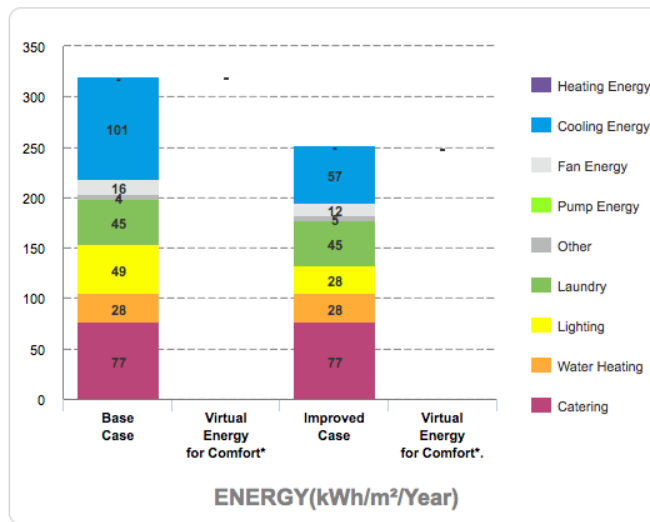
- Gray Water Treatment and Recycling System

Materials – 43% Savings through:



- In-Situ Trough Concrete Slab Flooring
- Facing Brick and Hollow Concrete Blocks

21.84% Meets EDGE Energy Standard



PROJECT METRICS

Incremental Cost

\$152,810

Utility Costs Savings

\$13,235 / month

Payback in Years

1

Operational CO₂ Savings

780 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 63% Savings through:

- Reduced Window to Wall Ratio and external shading devices
- Low-E coated glass
- Natural corridor ventilation, variable refrigerant volume cooling system, heat pump for hot water
- Energy Saving Lighting, lighting controls for corridors



Water – 22% Savings through:

- Water-Efficient fixtures in rooms and bathrooms
- Aerators and Auto Shut-off Faucet in Bathrooms
- Water-efficient landscaping



Materials – 44% Savings through:

- Autoclaved aerated concrete blocks
- UPVC window frames



THE 101 YOGYAKARTA TUGU (INDONESIA)

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

SHOPPING CENTERS – SRI LANKA CASE STUDY & CERTIFIED PROJECT



BUILDING DETAILS

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



Energy Measures – 31% Savings through:

- Insulation Roof
- Insulation of Existing Walls
- Energy Saving Light Bulbs in Sales Area



Water – 37% Savings through:

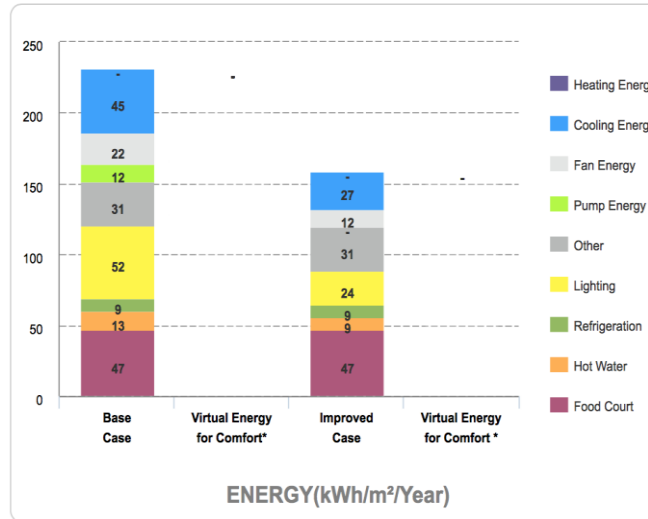
- Single Flush/Flush Valve for Water Closets
- Water Efficient Kitchen Faucets
- Water Efficient Urinals



Materials – 41% Savings through:

- Roof Construction: In-Situ Trough Concrete Slab

31.24% Meets EDGE energy standard



PROJECT METRICS

Incremental Cost
\$117,575

Utility Costs Savings
\$13,100 / month

Payback in Years
0.75

Operational CO₂ Savings
768 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 Sheets on Steel Rafters Roof
- Steel Profile Cladding for External Walls; Autoclaved Aerated Concrete for Internal and External Walls



SAVEMAX SUPER GROSIR CIBUBUR (INDONESIA)

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



OFFICES – SRI LANKA 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 – 29% Savings through:

- Occupancy Sensors in Bathrooms, Conference Rooms.
- Variable refrigerant flow system.
- Occupancy Sensors in Open Offices.
- Air Conditioning with Air Cooled Screw Chiller.

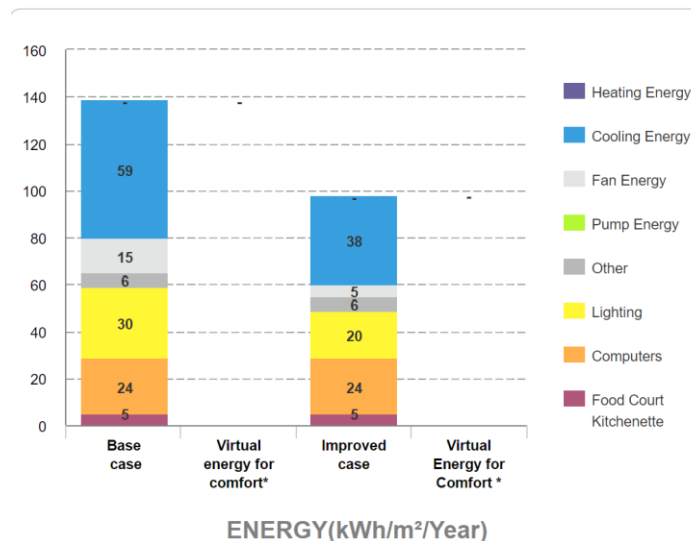
Water – 23% Savings through:

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

Materials – 75% Savings through:

- Timber Floor Construction.
- Concrete Filler Slab with Polystyrene Blocks.
- Stone Blocks – Hand Cut.
- Cork Tiles Flooring and Timber Window Frames.

28.80% Meets EDGE Energy Standard



PROJECT METRICS

Incremental Cost

\$25,260

Payback in Years

0.8

Operational CO₂ Savings

143 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 and energy saving light-bulbs.

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.

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

SCHOOLS – SRI LANKA CASE STUDY

BUILDING DETAILS

Floors Above and below Ground	Classroom	Gross Internal Area
4/1	1000	5,000 m ²



Energy Measures – 28% Savings through:

- Natural Ventilation: Corridors
- Energy Efficient Ceiling fans



Water – 25% Savings through:

- Low-Flow Faucets
- Dual Flush Water Closet
- Water-Efficient urinals



Materials – 25% Savings through:

- In-Situ Concrete: >25% GGBS
- Aluminum Sheet on timber roofing
- Plant Fiber Carpet

PROJECTED PROJECT METRICS

Incremental Cost

\$7,645

Utility Costs Savings

\$950 / month

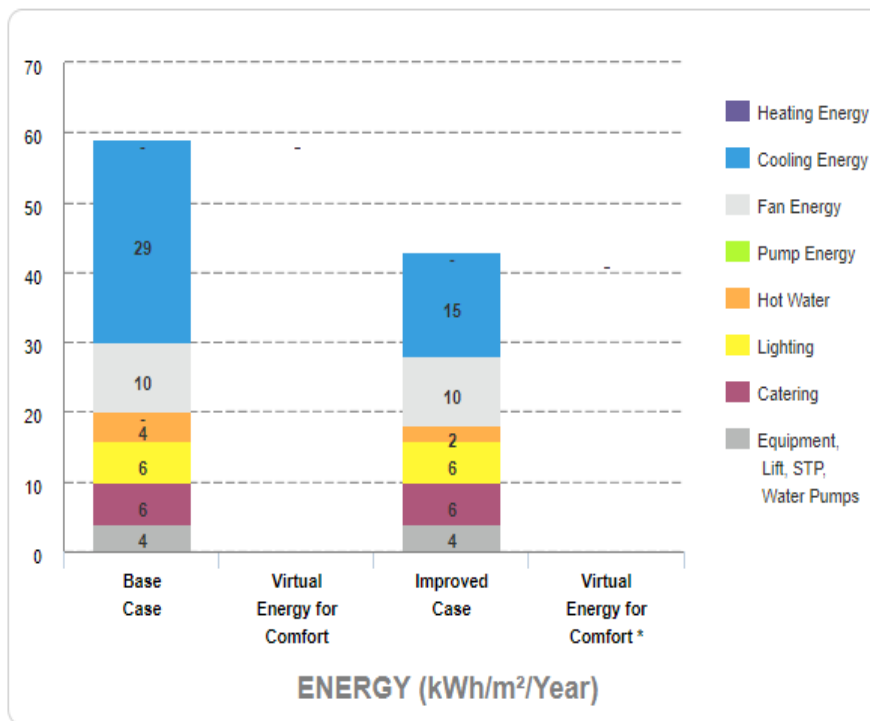
Payback in Years

1

Operational CO₂ Savings

160 tCO₂/Year

27.8% Meets EDGE Energy Standard



HOSPITALS – SRI LANKA 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:

- Higher Thermal Performance Glass
- Energy Saving Light Bulbs - Internal & External Spaces
- Reduced Window to Wall Ratio



Water – 28% Savings through:

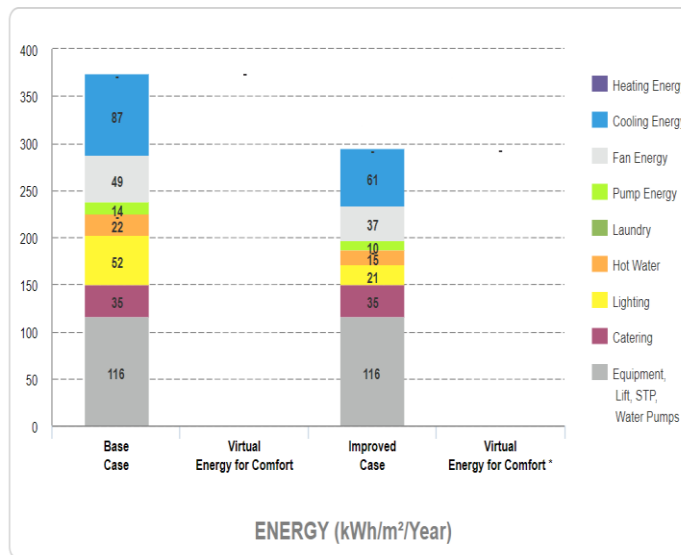
- Low-Flow Faucets in all Bathrooms
- Dual-Flush for Water Closets in all Bathrooms
- Water-Efficient Faucets for Kitchen Sinks



Materials – 22% Savings through:

- In-Situ Concrete with greater than 30% PFA

21.54% Meets EDGE Energy Standard



PROJECT METRICS

Incremental Cost

\$108,000

Utility Costs Savings

\$9,200 / month

Payback in Years

1

Operational CO₂ Savings

827 tCO₂/Year

RELEVANT CERTIFIED PROJECT



Energy Measures – 56% Savings through:

- Reduced Window To Wall Ratio
- Insulation of Roofs and External Walls
- Low E-Coated Glass
- Air Conditioning with Air Cooled Chiller
- Energy-Saving Lighting System 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 “Short-Crete” on both sides for External and Internal Walls
- Ceramic Tile Flooring



KOFO ANOKYE HOSPITAL (GHANA)

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

BUILDING DETAILS

Floors Above Ground	Shifts in a Day	Gross Internal Area
1	1	15,000 m ²



Energy Measures – 22% Savings through:

- Reflective Paint/Tiles for Roof
- Skylight to provide daylight to 50% of top floor area



Water – 29% Savings through:

- Auto Shut-off faucets
- Rainwater Harvesting System



Materials – 25% Savings through:

- Concrete Filler Slab

PROJECTED PROJECT METRICS

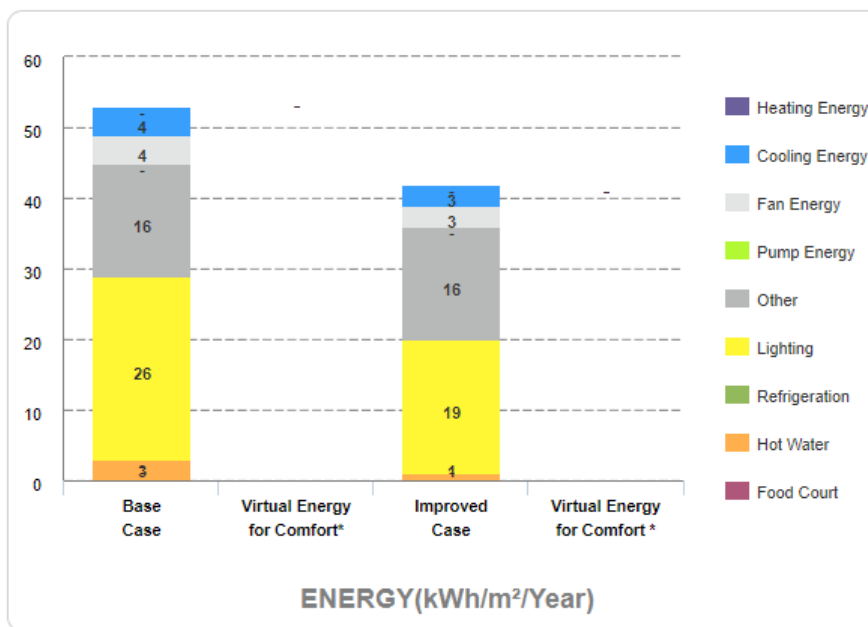
Incremental Cost
\$22,470

Utility Costs Savings
\$2,185 / month

Payback in Years
1

Operational CO₂ Savings
445 tCO₂/Year

22.21% 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



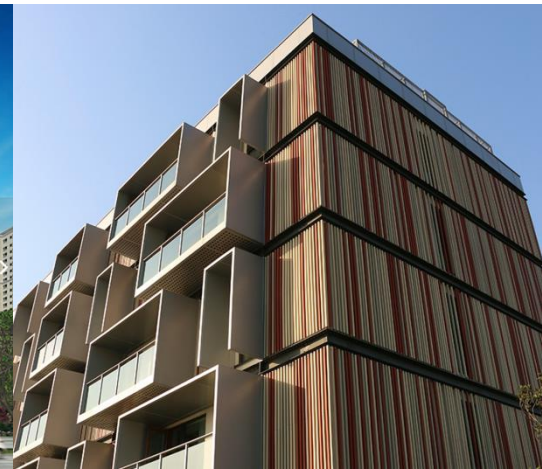
RESEARCH OBJECTIVE: MOST EFFECTIVE INTERVENTIONS TO REACH THE EDGE STANDARD

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.

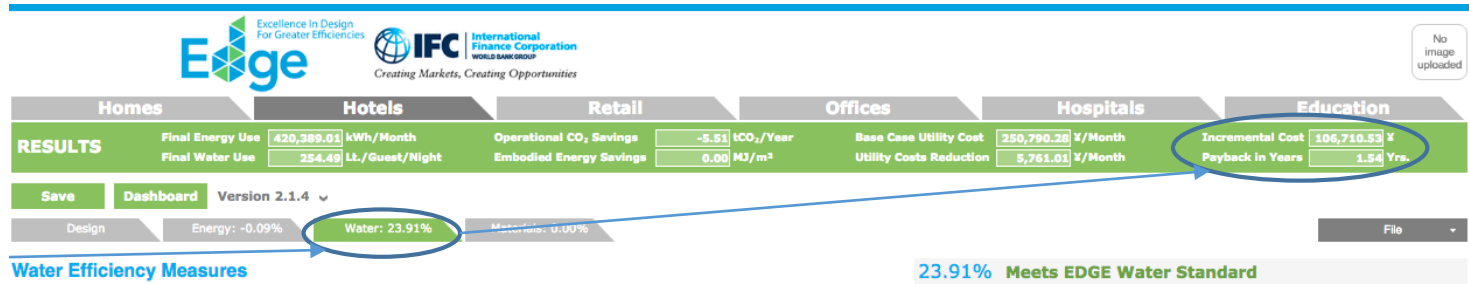
Third party certification verifies the resource efficiency savings so they can be credibly communicated between investors, developers, and buyers.

RESEARCH METHODOLOGY

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

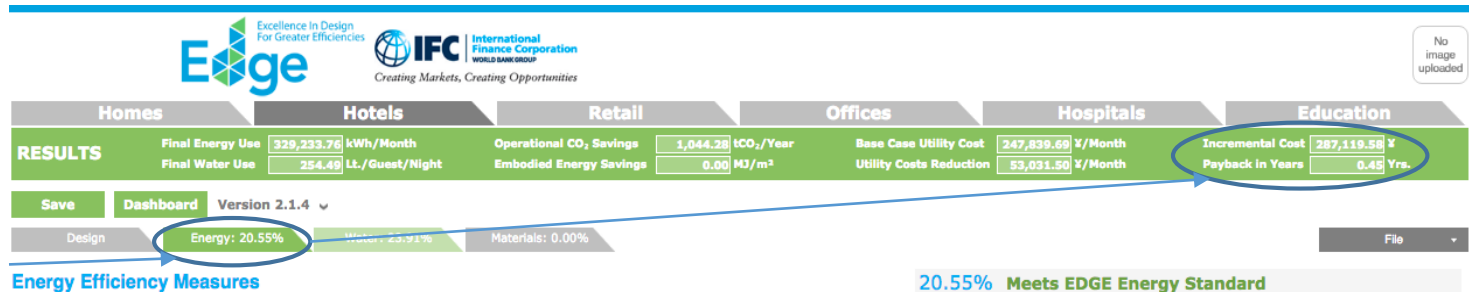
1

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.



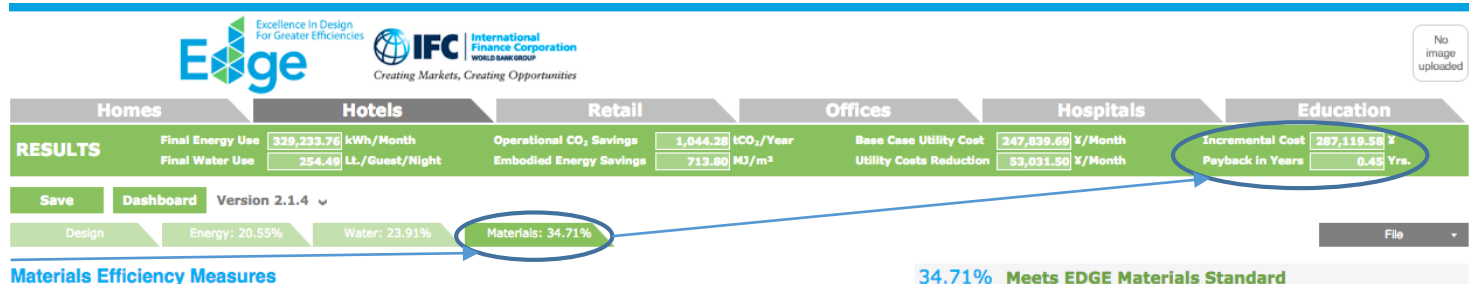
2

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.

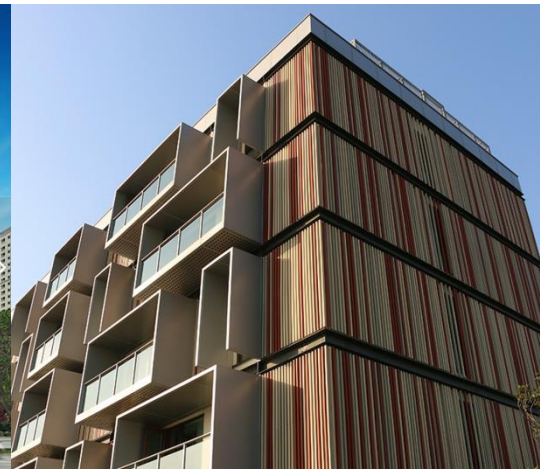


4

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/>



ACKNOWLEDGEMENTS

DONOR ACKNOWLEDGEMENT

IFC thanks the following national donors for their generous support of the EDGE program: the State Secretariat for Economic Affairs of Switzerland (SECO); the European Union; the Ministry of Finance of Japan; the Hungarian Export Import Bank; the Canada Climate Change Program and the Department of Foreign Affairs, Trade and Development Canada; the Royal Ministry of Foreign Affairs of Denmark and the Danish Green Growth Fund; the Federal Ministry of Finance of Austria; and the Ministry of Foreign Affairs of Finland.

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