GREEN BUILDINGS RETURN ON INVESTMENT: SCHOOLS IN EAST ASIA
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 seven East Asian countries – Cambodia, China, Fiji, Indonesia, Philippines, Thailand, and Vietnam – 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.
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.
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 **illustative 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, and do not as of yet have 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/green-building-market-intelligence-east-asia/](https://www.edgebuildings.com/green-building-market-intelligence-east-asia/)
SCHOOLS – KEY TAKEAWAYS

The most cost effective interventions in the Education sector are in the spheres of cooling and heating energy with pay back in just a few months.

ENERGY

- Natural Ventilation for Corridors and Classrooms
- Low-E Coated Glass
- Insulation of Roof and Walls
- Reduced Window To Wall Ratio
- Energy-Efficient ceiling fans
  - Effects of this intervention range from 15% - 20% in energy savings singlehandedly

INTERVENTIONS FOR COOLER CLIMATES

- Sensible Heat Recovery from Exhaust Air

MATERIALS

- Floor slabs are biggest cost drivers averaging 30% of material costs out of 7 total interventions
- Using other materials in these elements of a house usually saves over 20%

WATER

- Low-Flow Faucets for Washbasins
- Dual Flush Water Closets
- Water-Efficient Urinals
- Water-Efficient Faucets for Kitchen Sinks

PAYBACK PERIOD NEEDED TO REACH EDGE STANDARD

<table>
<thead>
<tr>
<th></th>
<th>Incremental Cost</th>
<th>Payback Period in Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia</td>
<td>$3,740</td>
<td>0.3</td>
</tr>
<tr>
<td>China</td>
<td>2,720 ¥</td>
<td>0.1</td>
</tr>
<tr>
<td>Fiji</td>
<td>$8,500</td>
<td>0.3</td>
</tr>
<tr>
<td>Indonesia</td>
<td>21,860 Thousand Rp</td>
<td>0.2</td>
</tr>
<tr>
<td>Philippines</td>
<td>475,230 PhP</td>
<td>0.5</td>
</tr>
<tr>
<td>Thailand</td>
<td>$460</td>
<td>0.2</td>
</tr>
<tr>
<td>Vietnam</td>
<td>14 MVnd</td>
<td>0.1</td>
</tr>
</tbody>
</table>
SCHOOLS – CAMBODIA CASE STUDY

BUILDING DETAILS

<table>
<thead>
<tr>
<th>Occupancy Density</th>
<th>Operational Hours</th>
<th>Working Days</th>
<th>Holidays / Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>6</td>
<td>5</td>
<td>60</td>
</tr>
</tbody>
</table>

Energy Measures – 28% Savings through:
- Natural Ventilation for Corridors & Classrooms
- Low-E Coated Glass
- Insulation of Roof

Water – 23% Savings through:
- Dual Flush
- Water-Efficient Urinals
- Water-Efficient Faucets for Kitchen Sinks

Materials – 29% Savings through:
- Timber Floor Construction Floor Slabs

PROJECTED PROJECT METRICS

Incremental Cost
$3,741

Payback in Years
0.30 Years

Operational CO2 Savings
61 tCO₂/Year

28.2% Meets EDGE Energy Standard

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

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/
SCHOOLS– CHINA CASE STUDY

BUILDING DETAILS

Energy Measures – 22% Savings through:
- Sensible Heat Recovery from Exhaust Air

Water – 23% Savings through:
- Dual Flush
- Water-Efficient Urinals
- Water-Efficient Faucets for Kitchen Sinks

Materials – 29% Savings through:
- Timber Floor Construction Floor Slabs

PROJECTED PROJECT METRICS

Incremental Cost
2,719 ¥

Payback in Years
0.09 Years

Operational CO2 Savings
80 tCO₂/Year

22.1% Meets EDGE Energy Standard

ENERGY (kWh/m²/Year)

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

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/
SCHOOLS – FIJI CASE STUDY

BUILDING DETAILS

<table>
<thead>
<tr>
<th>Occupancy Density</th>
<th>Operational Hours</th>
<th>Working Days</th>
<th>Holidays / Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>6</td>
<td>5</td>
<td>60</td>
</tr>
</tbody>
</table>

Energy Measures – 32% Savings through:
- Natural Ventilation for Corridors & Classrooms
- Insulation of Roof & External Walls
- Low-E Coated Glass
- Energy Efficient Ceiling Fans

Water – 23% Savings through:
- Dual Flush
- Water-Efficient Urinals
- Water-Efficient Faucets for Kitchen Sinks

Materials – 29% Savings through:
- Timber Floor Construction Floor Slabs

PROJECTED PROJECT METRICS

Incremental Cost
$8,513

Payback in Years
0.28 Years

Operational CO2 Savings
51 tC0₂/Year

32.0% Meets EDGE Energy Standard

Energy Measures – 32% Savings through:

- Energy Efficient Ceiling Fans

Water – 23% Savings through:

- Water-Efficient Urinals

Materials – 29% Savings through:

- Timber Floor Construction Floor Slabs

PROJECTED PROJECT METRICS

Incremental Cost
$8,513

Payback in Years
0.28 Years

Operational CO2 Savings
51 tC0₂/Year

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

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/
SCHOOLS – INDONESIA CASE STUDY

BUILDING DETAILS

<table>
<thead>
<tr>
<th>Occupancy Density</th>
<th>Operational Hours</th>
<th>Working Days</th>
<th>Holidays / Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>6</td>
<td>5</td>
<td>60</td>
</tr>
</tbody>
</table>

Energy Measures – 30% Savings through:
- Natural Ventilation for Corridors & Classrooms
- Low-E Coated Glass
- Insulation of Roof

Water – 23% Savings through:
- Dual Flush
- Water-Efficient Urinals
- Water-Efficient Faucets for Kitchen Sinks

Materials – 27% Savings through:
- Timber Floor Construction Floor Slabs

PROJECTED PROJECT METRICS

Incremental Cost
21,859 Thousand Rp

Payback in Years
0.16 Years

Operational CO2 Savings
70 tCO₂/Year

30.2% Meets EDGE Energy Standard

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

Case study for illustration purposes only, access more projects at [https://www.edgebuildings.com/projects/](https://www.edgebuildings.com/projects/)
SCHOOLS – PHILIPPINES CASE STUDY

BUILDING DETAILS

<table>
<thead>
<tr>
<th>Occupancy Density</th>
<th>Operational Hours</th>
<th>Working Days</th>
<th>Holidays / Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>6</td>
<td>5</td>
<td>60</td>
</tr>
</tbody>
</table>

Energy Measures – 23% Savings through:
- Natural Ventilation for Corridors & Classrooms
- Reflective Paint/Tiles for Roof & Walls
- Insulation of Roof

Water – 23% Savings through:
- Dual Flush
- Water-Efficient Urinals
- Water-Efficient Faucets for Kitchen Sinks

Materials – 29% Savings through:
- Timber Floor Construction Floor Slabs

PROJECTED PROJECT METRICS

Incremental Cost
476,230 PhP

Payback in Years
0.54 Years

Operational CO2 Savings
39 tCO₂/Year

23.2% Meets EDGE Energy Standard

ENERGY (kWh/m²/Year)

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

Case study for illustration purposes only, access more projects at https://www.edgebuildings.com/projects/
SCHOOLS – THAILAND CASE STUDY

BUILDING DETAILS

<table>
<thead>
<tr>
<th>Occupancy Density</th>
<th>Operational Hours</th>
<th>Working Days</th>
<th>Holidays / Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>6</td>
<td>5</td>
<td>60</td>
</tr>
</tbody>
</table>

Energy Measures – 24% Savings through:
- Natural Ventilation for Corridors & Classrooms
- Reflective Paint/Tiles for Roof & Walls
- Low-E Coated Glass
- Energy Efficient Ceiling Fans

Water – 23% Savings through:
- Dual Flush
- Water-Efficient Urinals
- Water-Efficient Faucets for Kitchen Sinks

Materials – 29% Savings through:
- Timber Floor Construction Floor Slabs

PROJECTED PROJECT METRICS

Incremental Cost
$459

Payback in Years
0.16 Years

Operational CO2 Savings
37 tCO₂/Year

24.0% Meets EDGE Energy Standard

Projected Project Metrics
- Incremental Cost: $459
- Payback in Years: 0.16 Years
- Operational CO2 Savings: 37 tCO₂/Year

Energy is a new sector in the EDGE application. Relevant certified project to be included as soon as case study is published.
SCHOOLS – VIETNAM CASE STUDY

BUILDING DETAILS

<table>
<thead>
<tr>
<th>Occupancy Density</th>
<th>Operational Hours</th>
<th>Working Days</th>
<th>Holidays / Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>6</td>
<td>5</td>
<td>60</td>
</tr>
</tbody>
</table>

Energy Measures – 28% Savings through:
- Natural Ventilation for Corridors & Classrooms
- Reflective Paint/Tiles for Roof & Walls
- Low-E Coated Glass
- Energy Efficient Ceiling Fans
- Solar Hot Water Collectors

Water – 23% Savings through:
- Dual Flush
- Water-Efficient Urinals & Kitchen Sinks

Materials – 29% Savings through:
- Timber Floor Construction Floor Slabs

PROJECTED PROJECT METRICS

Incremental Cost
14 mVND

Payback in Years
0.14 Years

Operational CO2 Savings
31 tCO₂/Year

24.0% Meets EDGE Energy Standard

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

Case study for illustration purposes only, access more projects at [https://www.edgebuildings.com/projects/](https://www.edgebuildings.com/projects/)
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.

In addition, IFC thanks contributors to the GEF-IFC Earth Fund Platform, and the Energy Sector Management Assistance Program (ESMAP) of the World Bank whose support helped seed EDGE.

COLLABORATION ACKNOWLEDGEMENT

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

Visit www.edgebuildings.com for more information