Excellence In Design For Greater Efficiencies

Edge

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IFC International Finance Corporation
World Bank Group

A Resource Efficiency Classification System for Developing Countries

Autif Sayyed

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History and Purpose

What is the need for another system?

Structure

EDGE Tool and Certification

Case Studies

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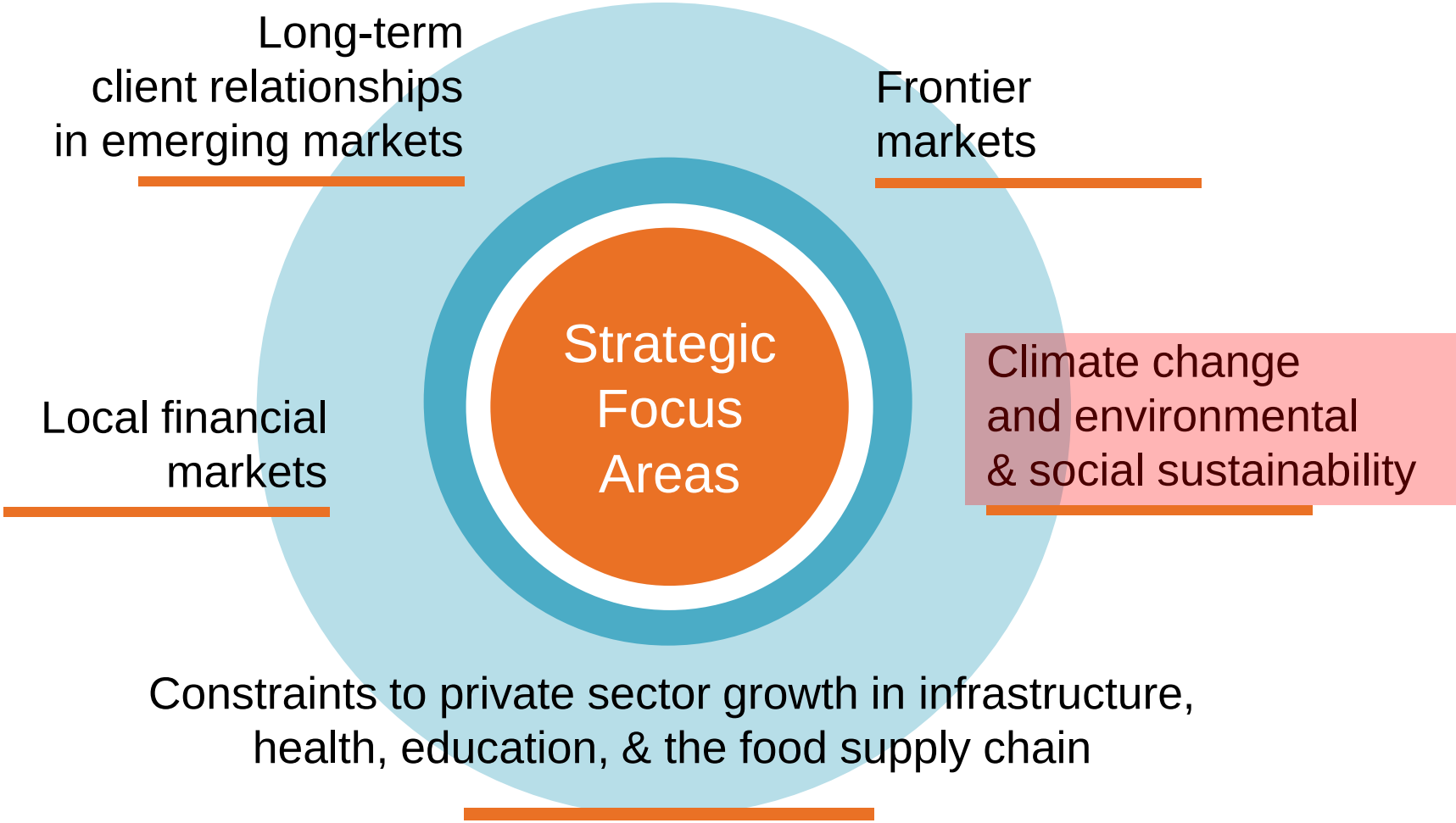
History and Purpose

What is the need for another system?

IFC's Priorities



Why are Green Buildings Important?

Buildings cause 40% of global GHG emissions

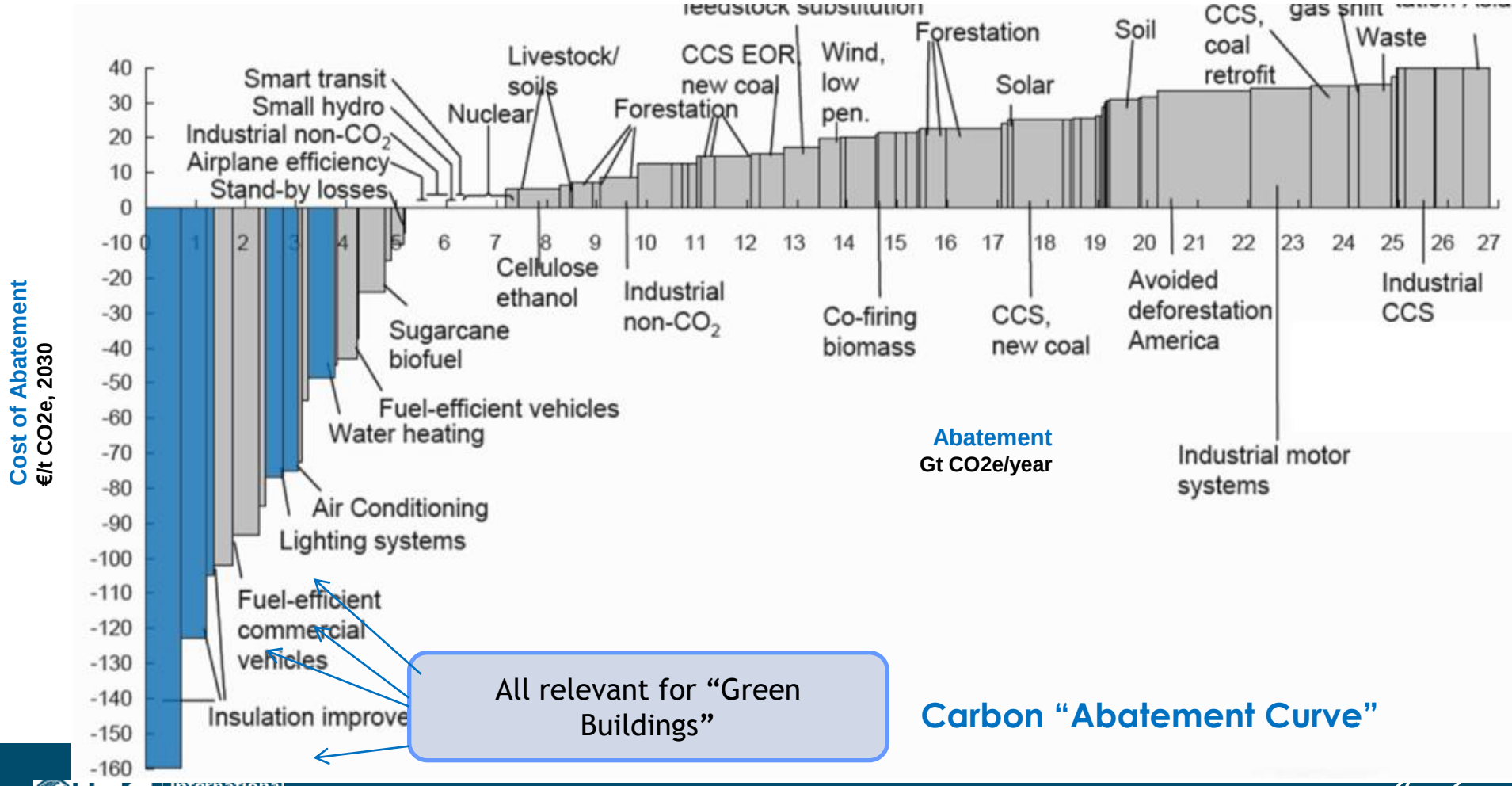
70% of the world will live in cities by 2050 causing increased demand for buildings

Climate change

Extreme weather events- droughts, floods

Threats to food security and livelihoods- harmful effects on agriculture, fishery and forestry

Buildings provide the low hanging fruits for abatement



Carbon "Abatement Curve"

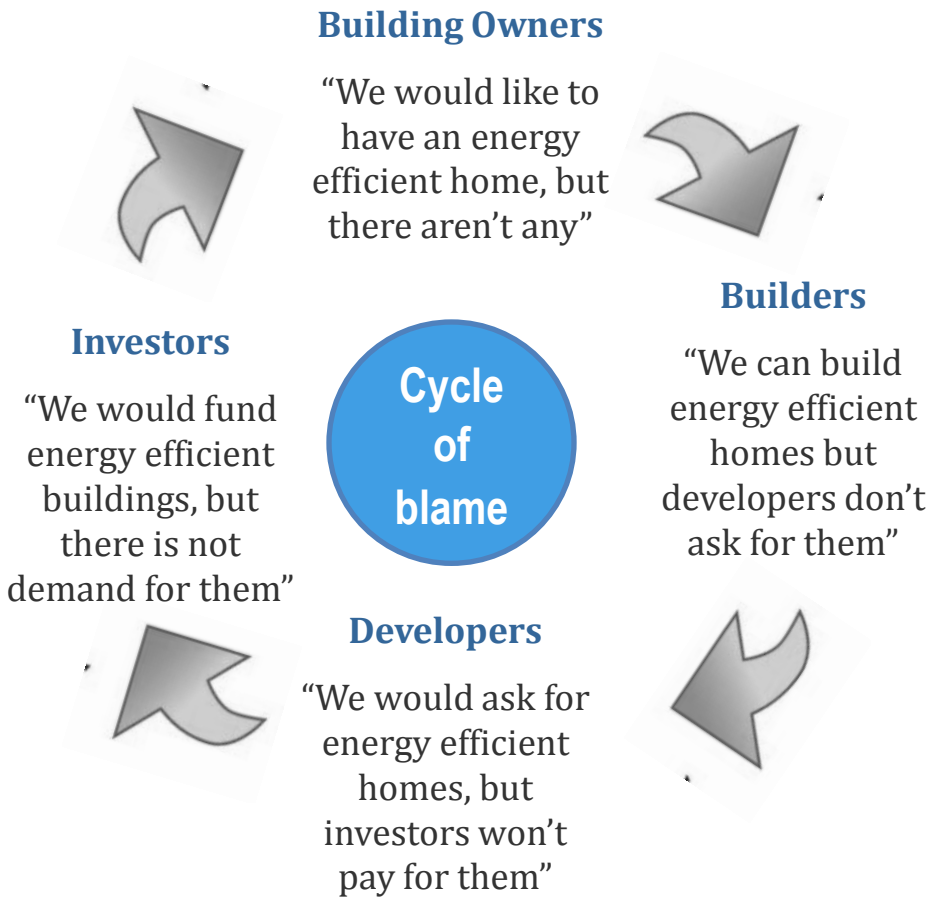
Source: McKinsey Analysis

Buildings are part of a big problem,

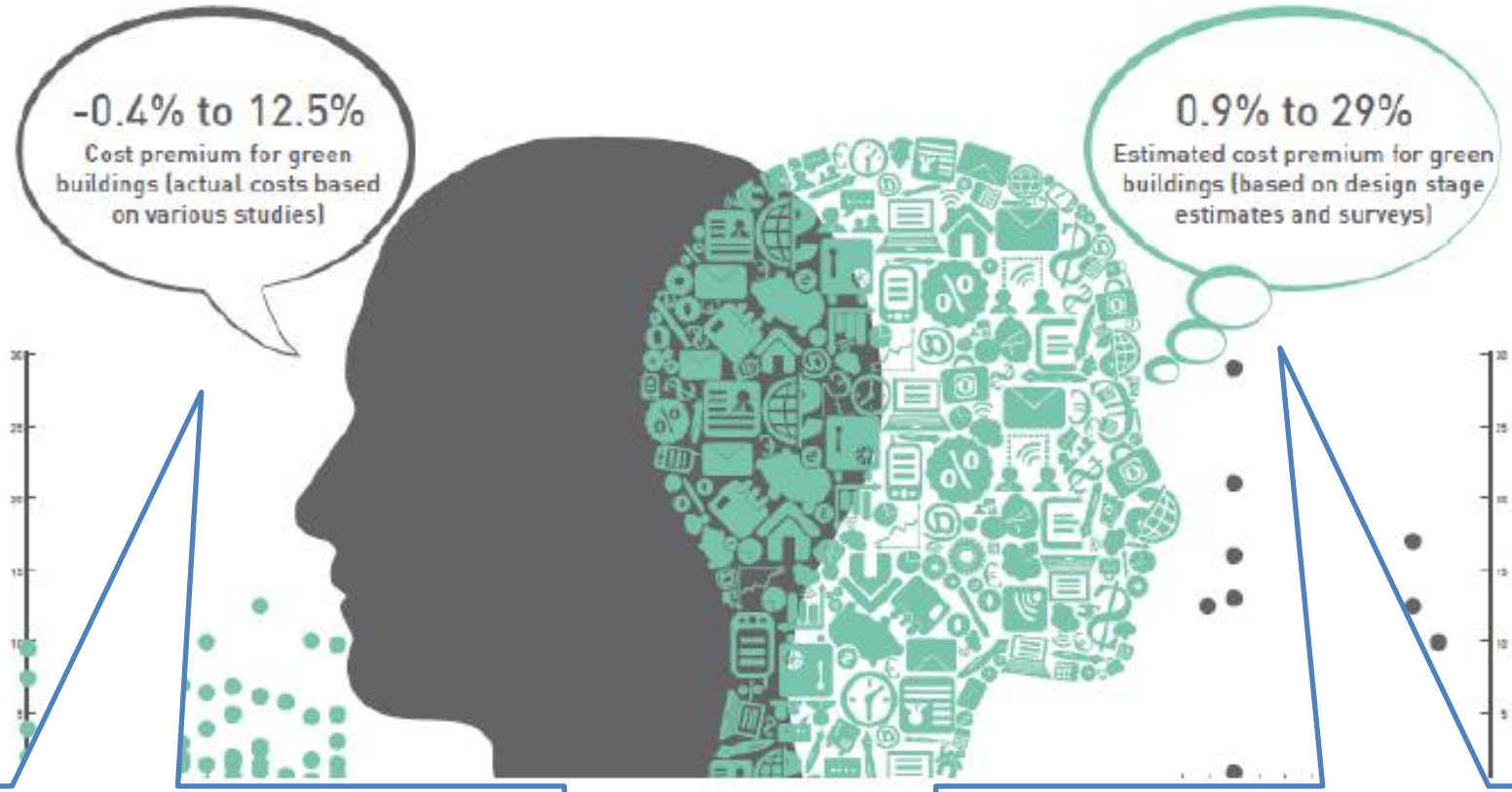
…but they can be a big part of the solution!

Why isn't everyone building green buildings?

1. **Absence of market demand for efficient Buildings**
2. **Building energy regulations are not set up yet**
3. **The voluntary standards is not widely adopted by the mass market**
4. **Lack of technical capacity**
5. **Ineffective incentives**



Decision making

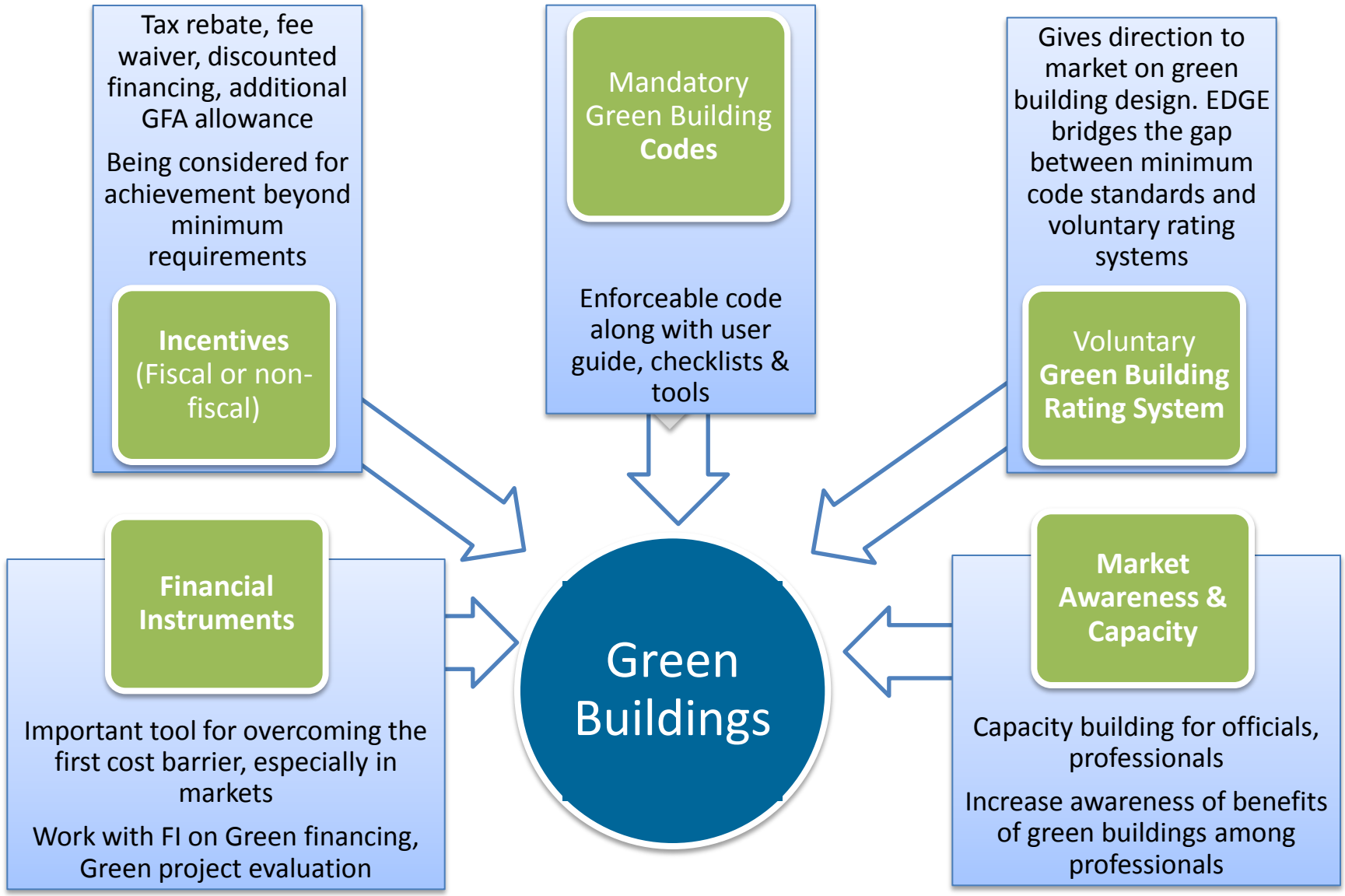


This is the actual incremental cost of green buildings

This is what most people think is additional cost of building green

Source: Business Case for Green Buildings, WorldGBC 2013

Combined Approach



IFC Support for Green Building Sector

- Green Building Regulations
- Financial products for
  - Green building developers and owner operators (green construction loans)
  - Green building material manufacturers
  - Green building buyers (green mortgage)
- Supporting the creation or growth of Energy Service Companies [ESCOs]
- Working with associations to increase demand and knowledge of the benefits of green building

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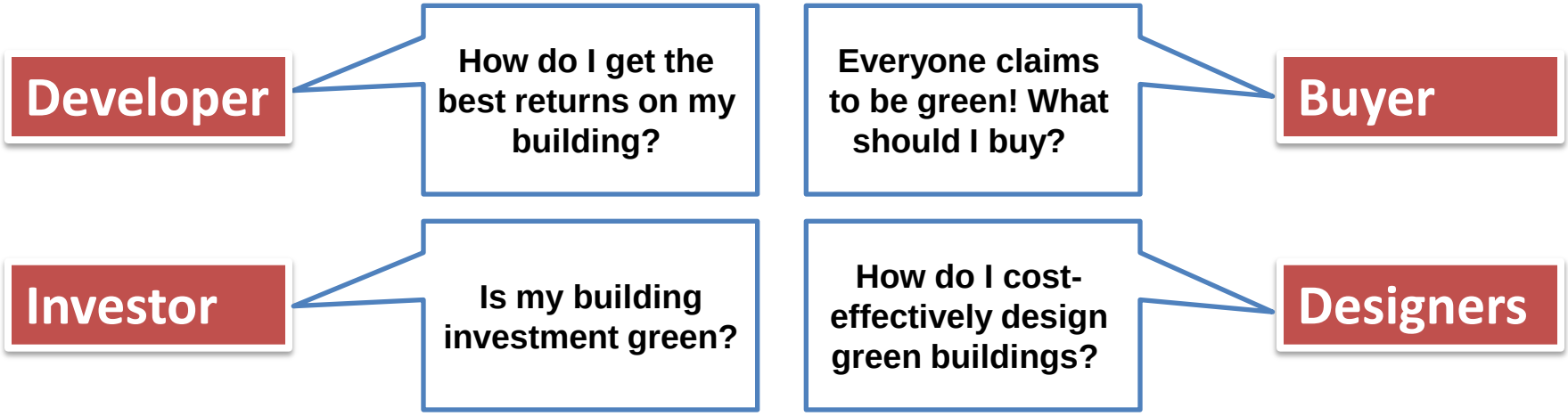
What is EDGE?

- EDGE stands for “Excellence in Design for Greater Efficiencies.”
- EDGE is a resource efficiency classification system designed for emerging markets.
- EDGE reveals technical solutions for going green and captures capital costs and projected operational savings.
- EDGE can be used by building professionals without the need for expensive green building specialists.

Decision making



The mass market needs a
simple
quick
& affordable
resource efficiency rating system for market transformation

Available Systems

General Guidelines

- Provide general guidance
- Not very useful for evaluating specific building designs

Detailed Building Analysis

- Very useful for guiding design decisions
- Too expensive to be used on most projects

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EDGE is designed to help good decision making on Energy, Water and Material use in buildings

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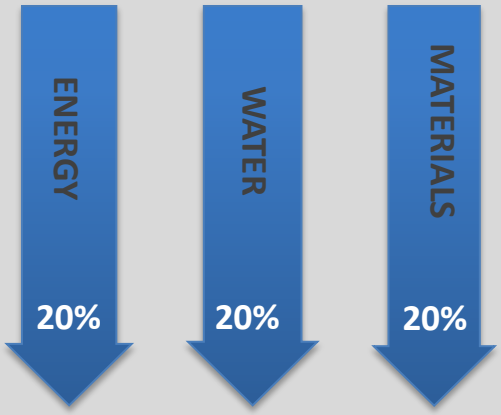
What is “Excellence in Design for Greater Efficiencies?”

An Assessment Tool + Rating System

+



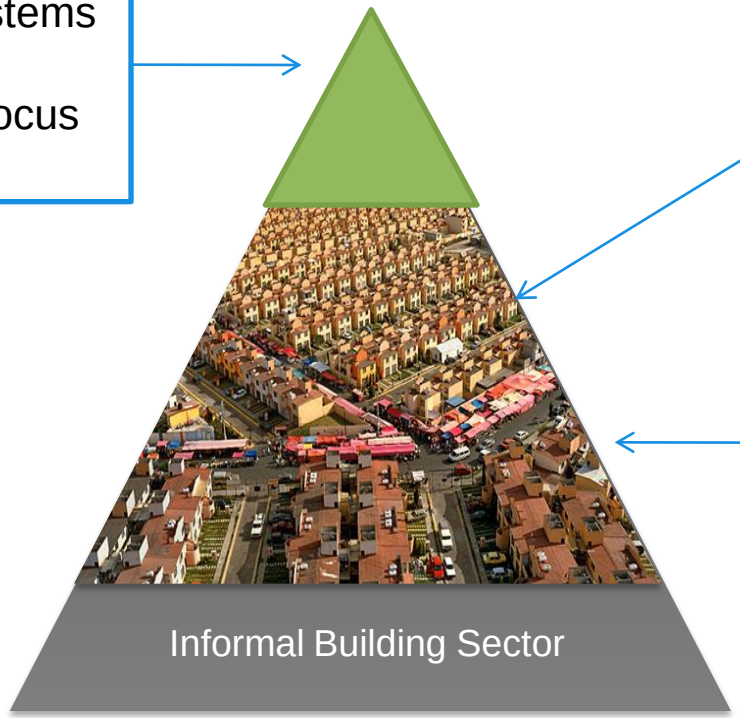
A Universal Standard

+

A Certification System

How can EDGE Make an Impact in Emerging Markets?

Current ratings systems have provided leadership with a focus on top-tier clients



EDGE can democratize the green buildings market

- Limited capacity to implement regulations
- Need for 'voluntary' quasi-regulations system
- Need for simple, quick, and affordable system

How can EDGE Make an Impact in Emerging Markets?

Creates green stock

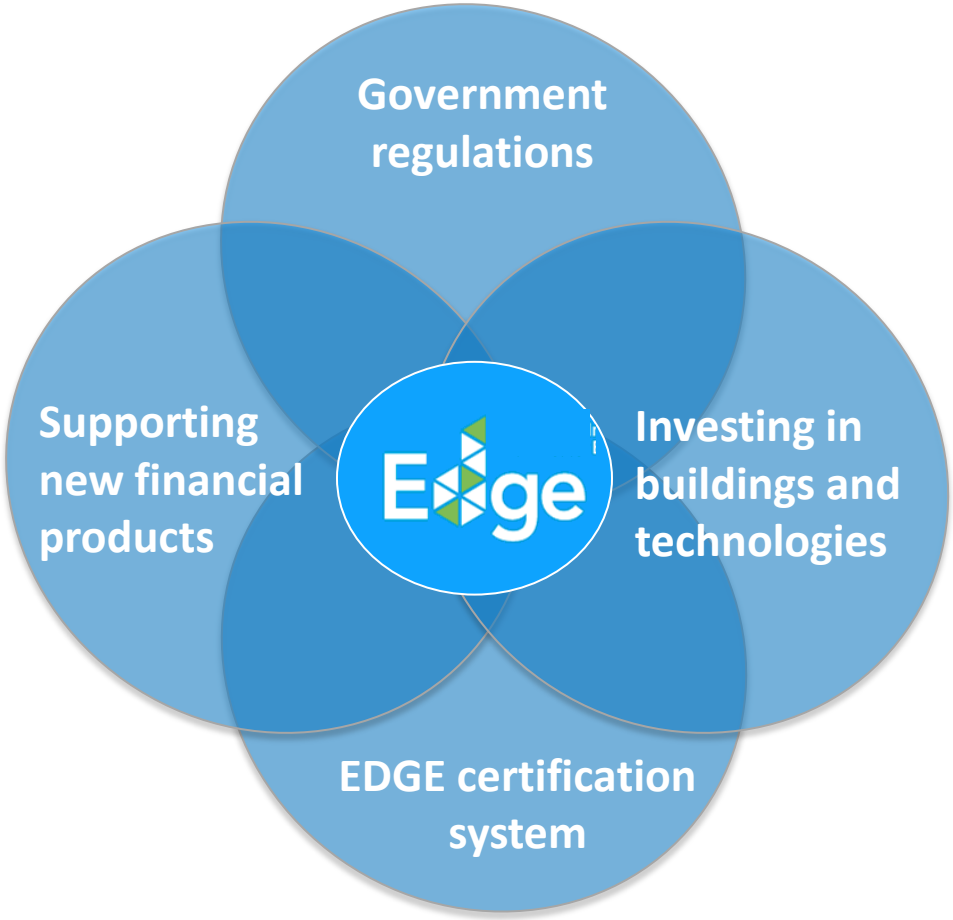
- Government regulations – new green building codes
- Investing in construction of new homes

Certifies green stock

- EDGE certification system
- Partnerships with local Green Building Council

Business opportunity

- Training and capacity building with banks
- Investment in credit lines



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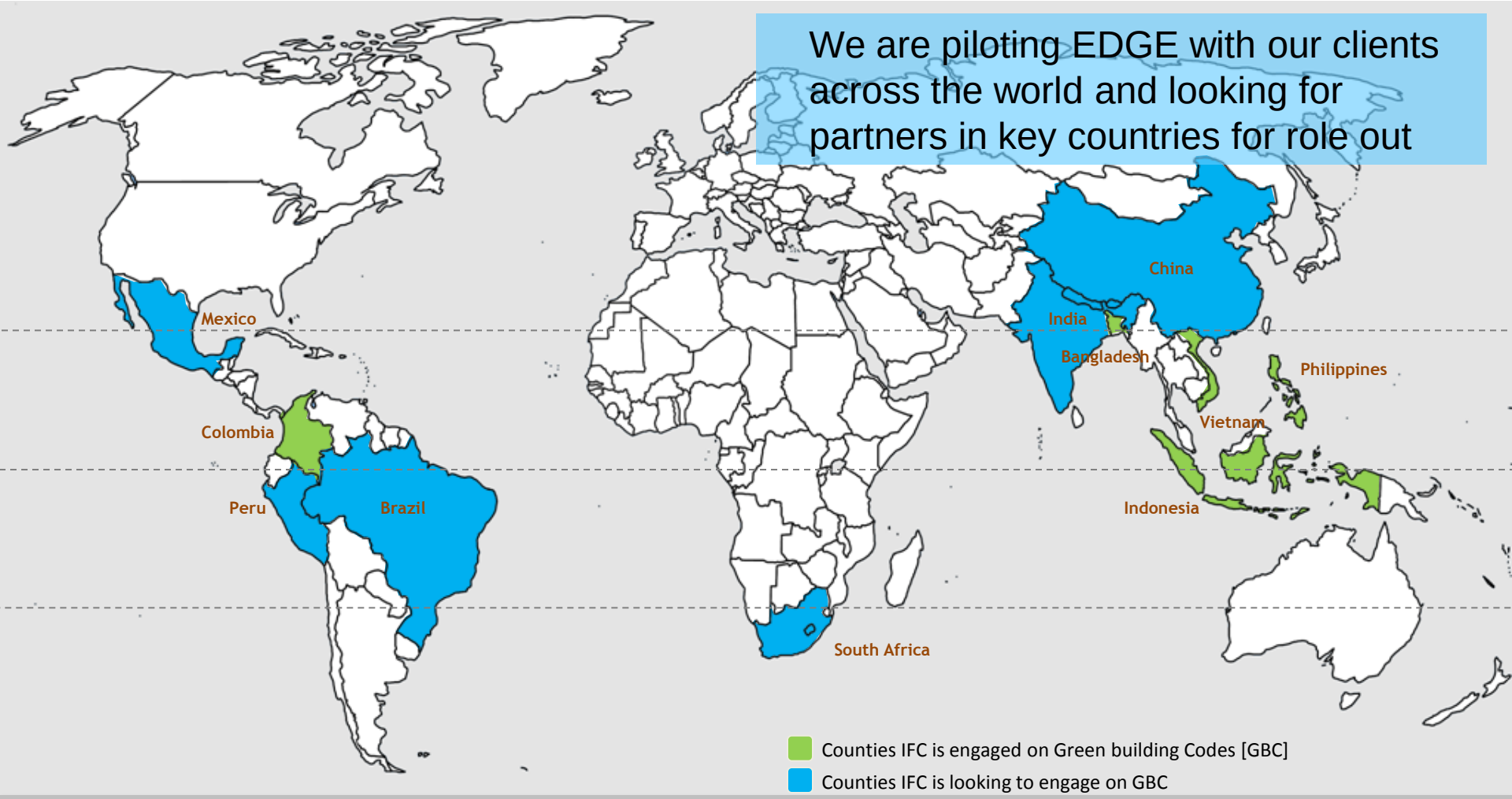
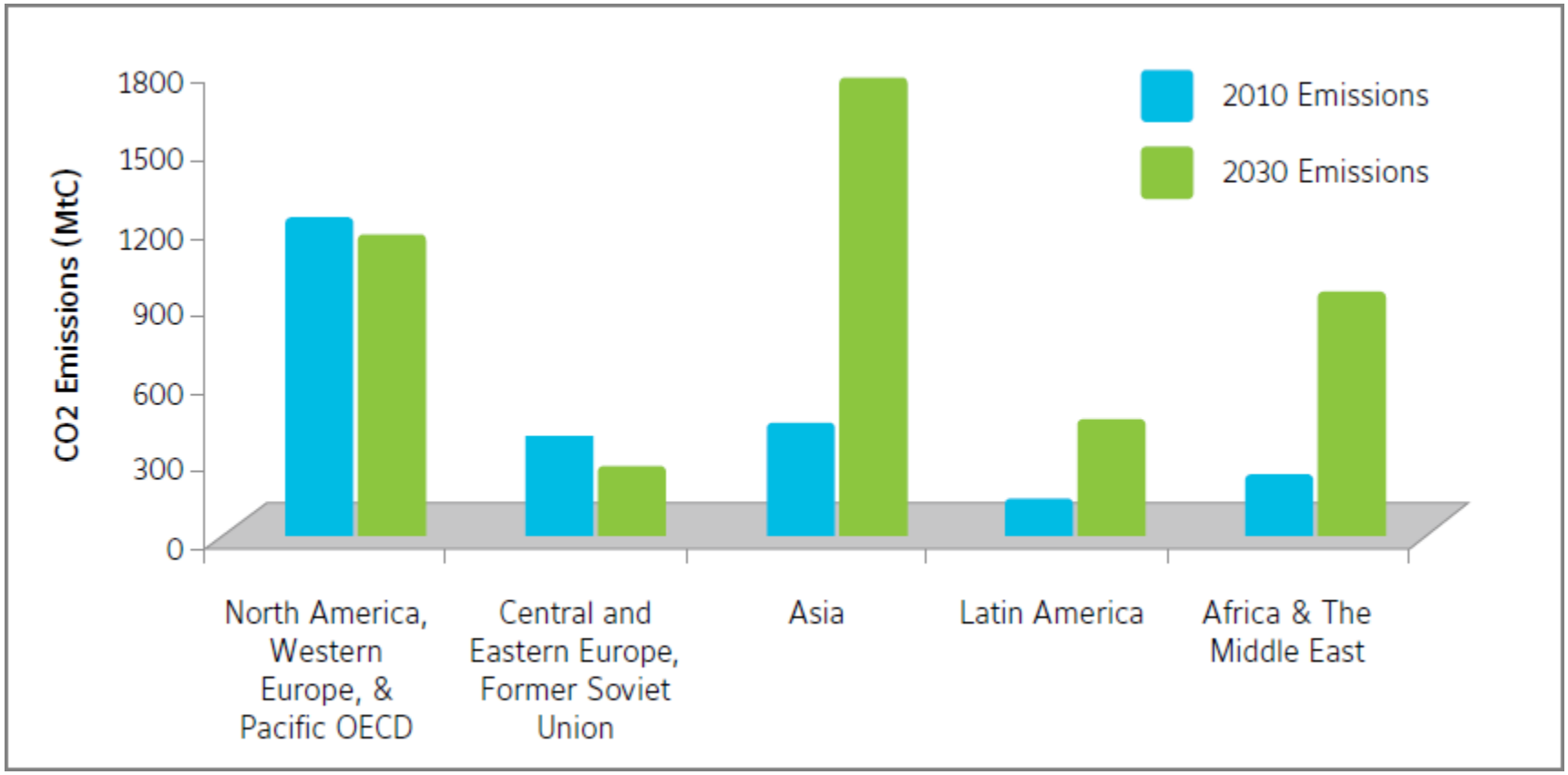
Where are we looking to introduce EDGE?

We are piloting EDGE with our clients across the world and looking for partners in key countries for role out

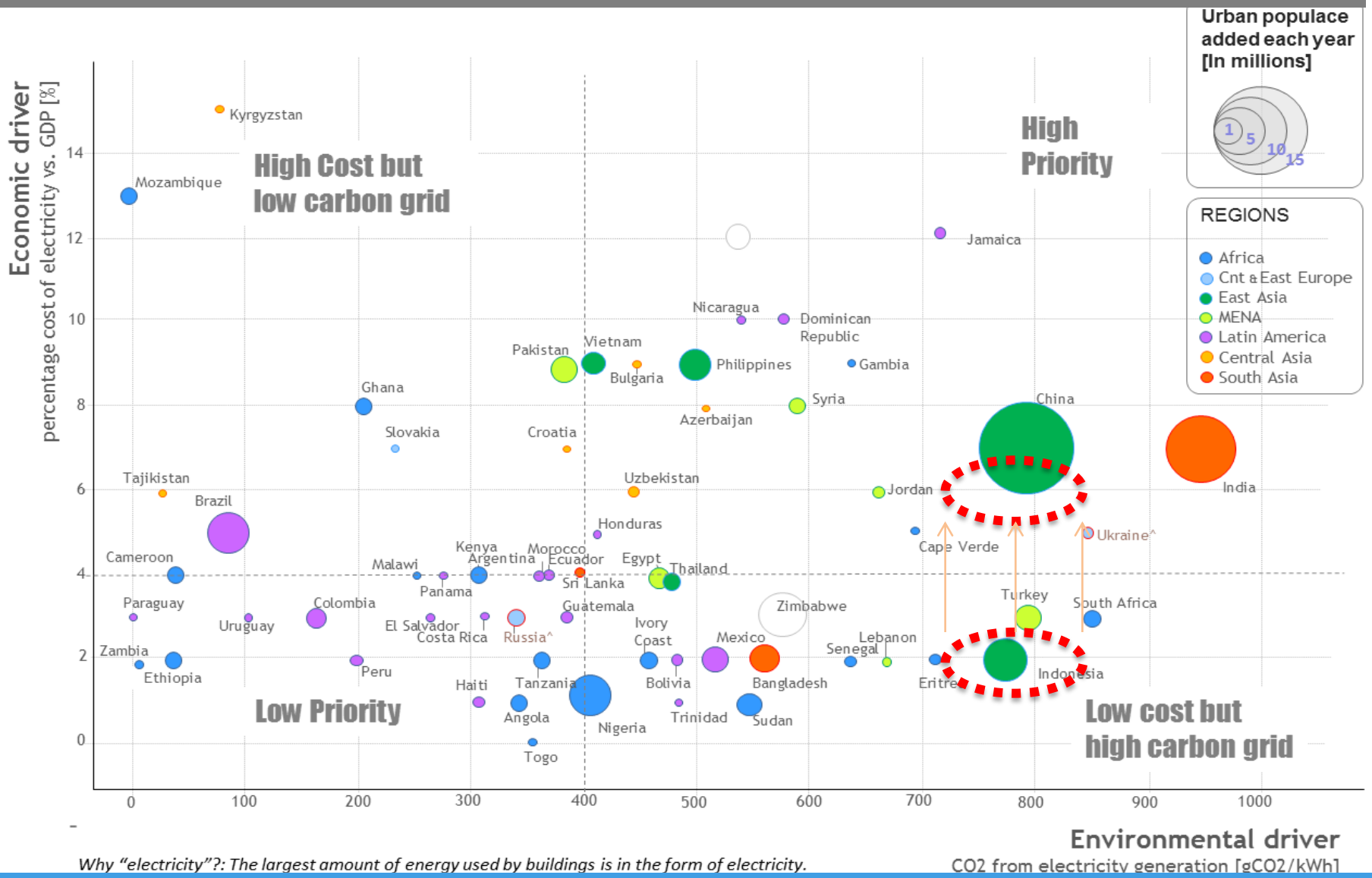


Regions of focus



Source: IPCC A1 scenario, www.ipcc.ch

Designing *new* buildings for greater efficiency is one of the biggest and most cost effective ways to reduce GHGs.



Why "electricity"?: The largest amount of energy used by buildings is in the form of electricity.

Green building options are commercially viable. By greening the building stock now one has the opportunity to make long term investments in low carbon.

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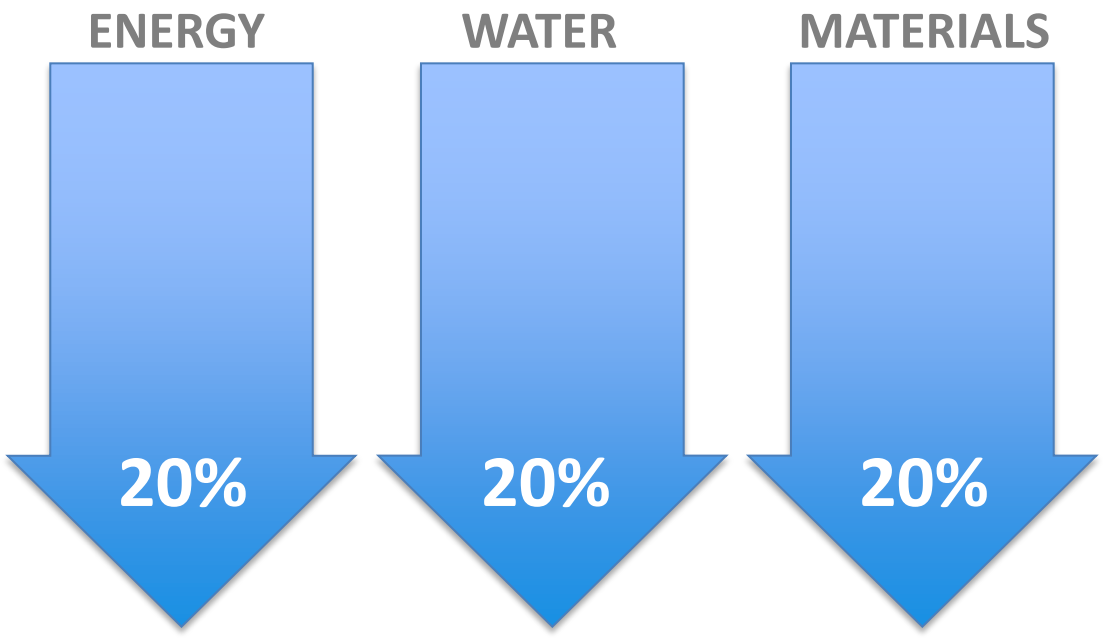
Structure
EDGE Tool and Certification

What is the EDGE Standard?

‘A greenfield building that has 20% less energy, water and material consumption compared to an equivalent local benchmark.’

The standard provides a performance assurance to buyers and investors.



EDGE Certificate

- Projects that meet the EDGE standard will receive a certificate confirming the project's predicted performance
- This can be used for corporate branding, marketing, and accessing better finance

The EDGE Tools

- EDGE has contextual data of utility costs and climate for different cities
- EDGE uses building physic calculations to give design-specific results
- EDGE spells out the most effective technical measures
- EDGE provides an investment planning tool for building owners and developers

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Edge Homes

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RESULTS								
Final Energy Use	257	kWh/Month	Operational CO2 Savings	0.2	tCO2/year	Base case utility costs	55.6	$/month
Final Water Use	21	m3/Month	Embodied CO2 Savings	-	tCO2	Utility costs reduction	13.1	$/month

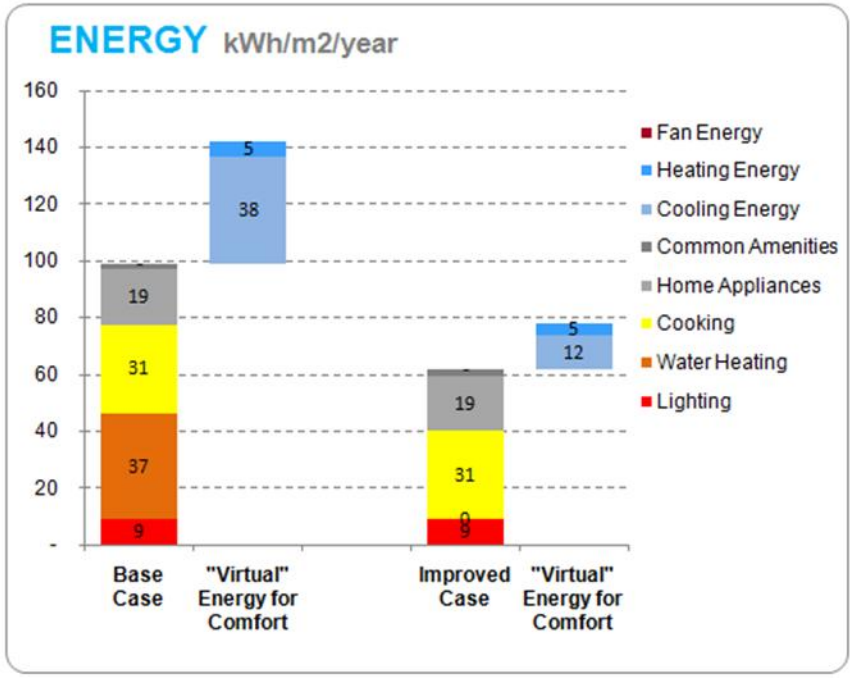
Energy Efficiency Measures

Select option from the list below

- [ ] Reflective Paint/Tiles for Roof
- [ ] Reflective Paint for External Wall
- [x] External Shading devices with HSA or VSA of 70 degrees.
- [ ] Insulation for Roof - Exposed to sun
- [ ] Insulation for External Wall - Exposed to sun
- [x] Single Low-E, Solar Control glass
- [ ] Double Low-E, Solar Control glass
- [x] Design Cross ventilation
- [ ] Install Ceiling Fans in all habitable rooms
- [ ] Install VRV/VRF for Space Heating & Cooling
- [x] Solar collectors for domestic hot water heating
- [ ] High efficiect Gas Condensing boiler for Space Heating
- [ ] Energy Efficient Gas Heaters for Hot water required for domestic use
- [ ] Low energy [CFL/LED/T5] Light Fixtures for all living spaces
- [ ] Low energy [CFL/LED/T5] Light Fixtures for Corridors & Outdoor Common area
- [ ] Automatic Controls for all Corridor & Outdoor lighting
- [ ] Photovoltaics to meet X% [choose from list below] of annual electricity use

10% of annual electricity 0.00 kWp

44.9% ENERGY SAVING **Meets EDGE energy standard**



EDGE has contextual data of utility costs and climate for different cities. It spells out the most effective technical options.

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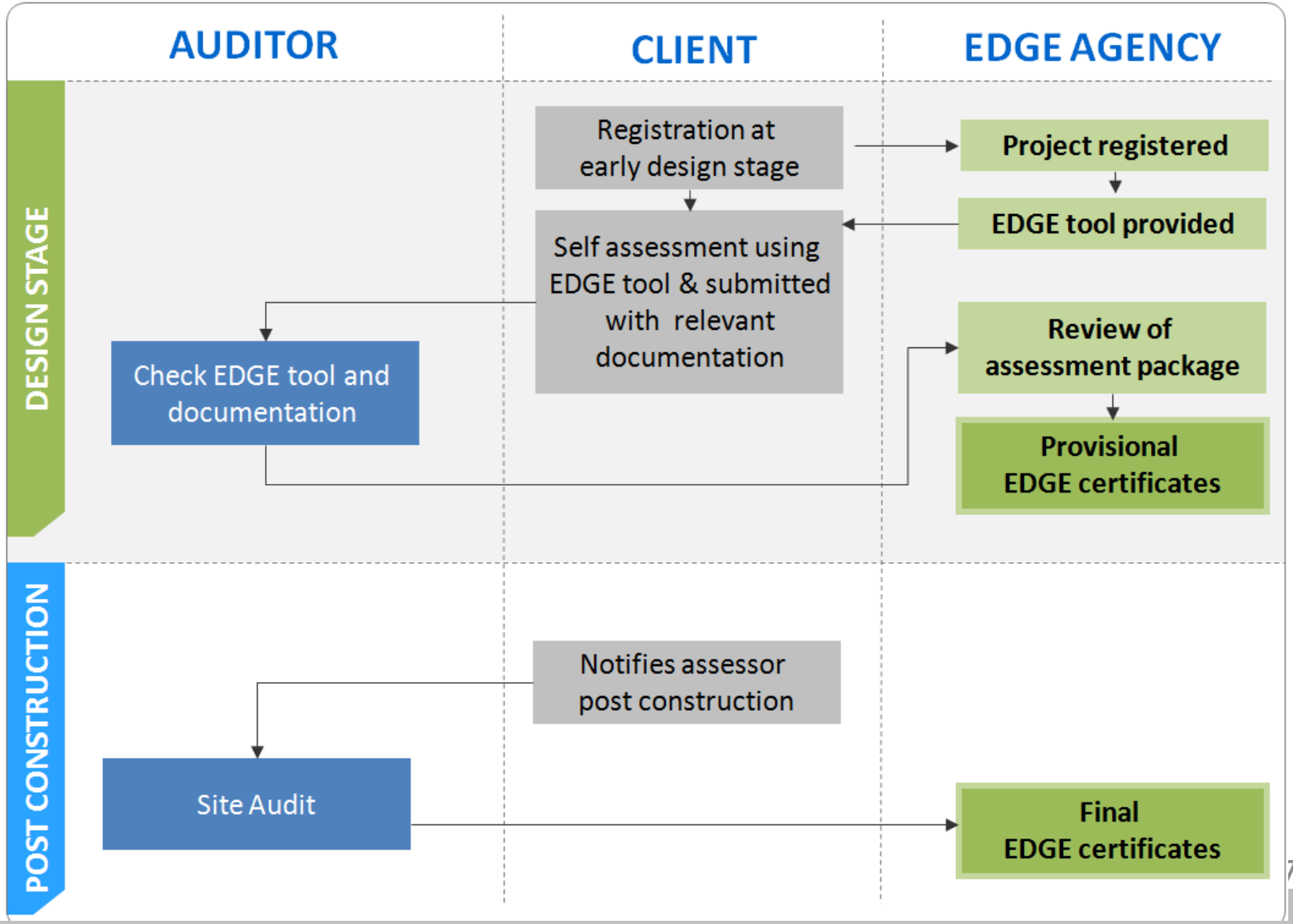
Who uses EDGE?

- **Investors** – to test the financial viability of a resource efficient building project.
- **Banks** – to offer green mortgages and green construction credit facility.
- **Building Owners** – to save on operational costs.
- **Developers** – to brand their projects ‘resource efficient’ and attract investors and buyers.

EDGE certification process



EDGE targets a gap in existing certification systems

EDGE

- **3 criteria:** focused on resource efficiency: energy, water, and materials
- Efficiency label similar to US's 'Energy Star' and EU's Energy Performance Certification
- **Clear substantive goal:** >20% reduction in the 3 criteria areas
- **Purely analytical approach:** EDGE tool calculates energy savings based on quantitative data

OTHERS (LEED, BREEAM)

- **6 or more criteria:** broader green buildings criteria such as health, transport, ecology, etc vs. specific to green buildings alone
- **Lenient requirements** on mandatory efficency performance
- **Different weighting of criteria and categories:** non analytical, subjective scoring of measures

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EDGE

- **Pass/Fail** certification outcome
- Calculation tool is provided at **low/no cost**
- **Certifications issued more quickly**
- **Estimates cost savings from various technology solutions** which can be used by banks and FIs to assess financial viability

OTHERS (LEED, BREEAM)

- **Levels of certification** e.g "certified", "Silver, "Gold", "Platinum"
- Energy calculations require **complex simulation software**
- Assessment process is **lengthy and expensive**
- **No cost savings component or technology recommendations** in certification

SIMPLE, QUICK, AFFORDABLE
Appropriate for mass market and developing countries

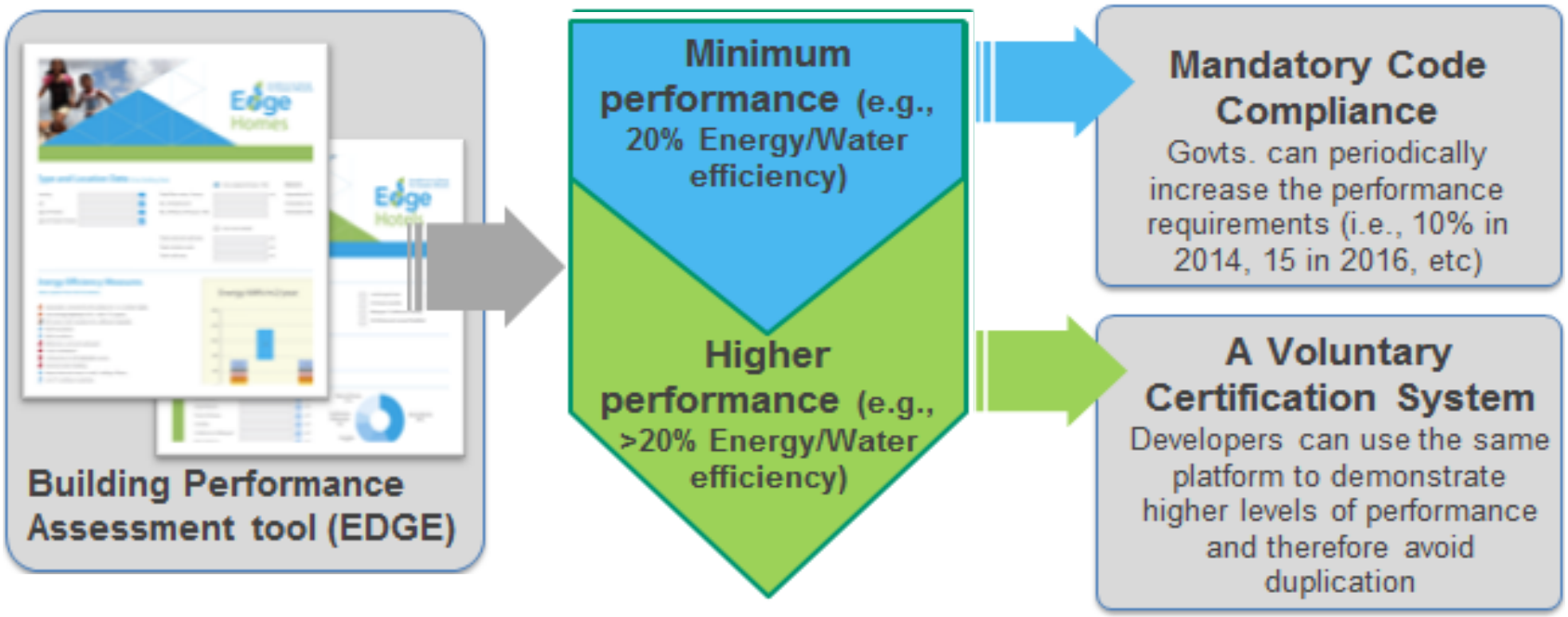
EXTENSIVE, *HIGHER* COST
Designed for high-end projects (limited # of builders / owners)

Green Building Code Development Approach

Selected and Targeted

Building Sector	Resource Type	Building Type
New buildings	Energy Water Materials (listed according to typical priority)	Apartments Hotels Offices Retail Hospitals
Older Buildings typically waste less resources. Rapid construction growth in region.	Alignment with national priorities	Building types with high volume and/or high savings potential.

Implementing a "hybrid approach": The case of Colombia



EDGE can be part of a regulated solution

Baseline

- Starting point for all resource reduction aspirations within EDGE
- Unique for every building, developed using the basic user inputs and detailed assumptions
- EDGE relies on information gleaned from typical building practices as well as national building performance codes, where they are in existence

The following location-specific information exists within EDGE:

Temperature, Wind velocity, Humidity, Solar radiation, Annual average rainfall (mm), Carbon dioxide intensity of the electricity grid (gCO2/kWh), Average cost of energy

EDGE Methodology

HVAC Demand	Hot Water Demand	Lighting Demand
Monthly quasi-steady-state calculation method based on the European CEN and ISO 13790 standards	EDGE broadly uses European standard EN 15316-3	the “quick method” under EN 15193’s energy requirements

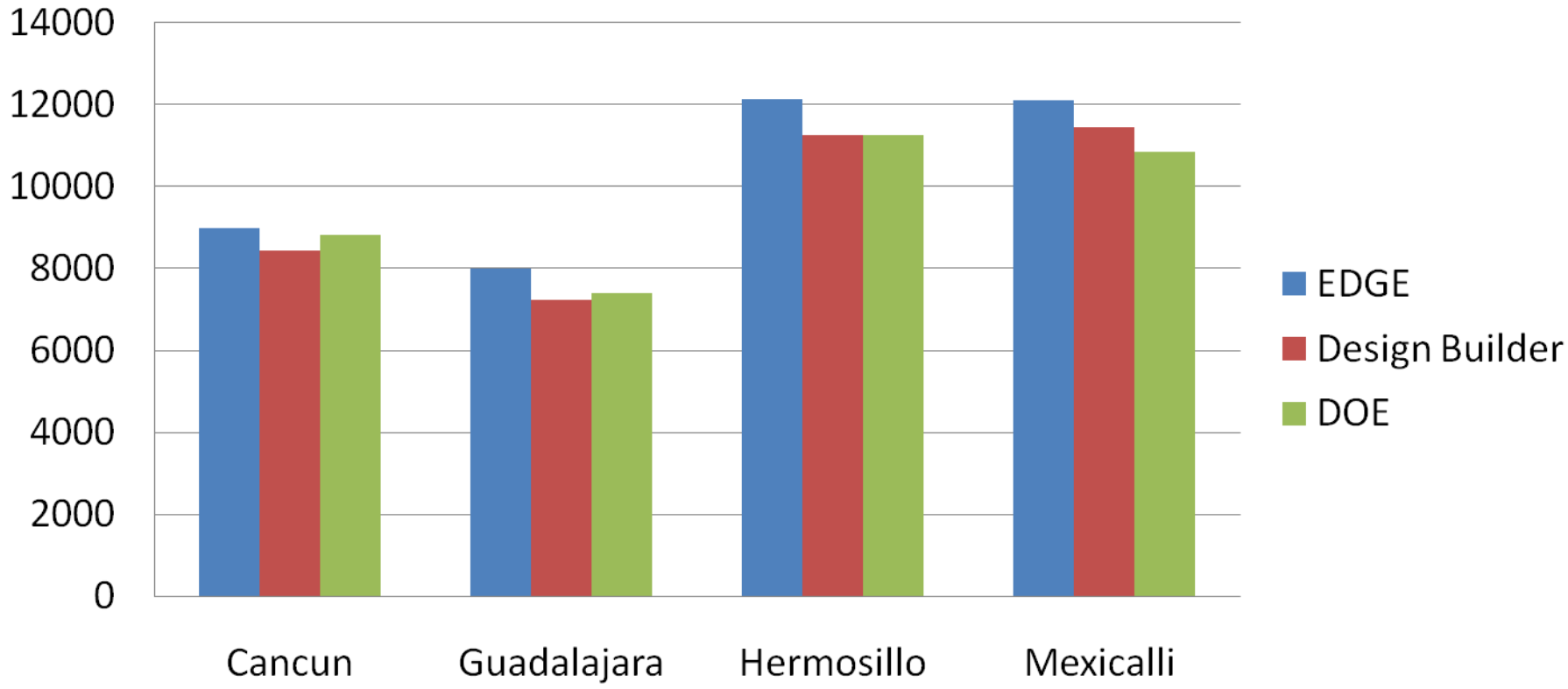
Water Demand	Rainwater harvesting	Embodied Energy
Using number of water fixtures, occupancy, usage rates, and the rate of water flow through the fixtures	using rainfall data from the project location and the size of the roof area from the design sheet.	Available global data incl. Inventory of Carbon and Energy (ICE) developed by the University of Bath .

Localizing EDGE

- Although a globally applicable tool, it will be localized to update assumptions and resource efficiency measure selection with the help of a local market study and data collection
- The final outputs of EDGE will also be validated and calibrated for each market
- EDGE will be customized and administered with a local partner

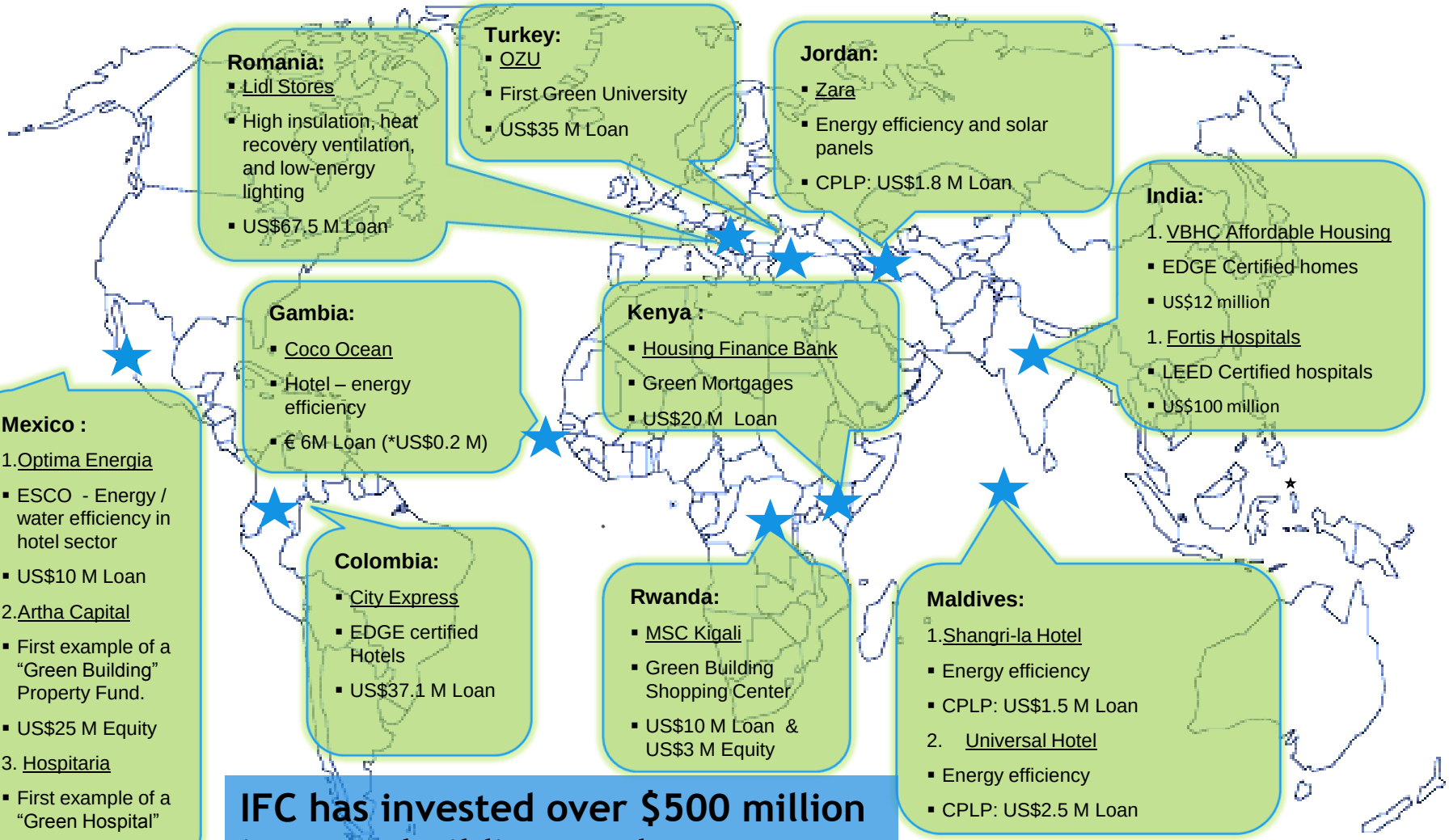
EDGE Validation- Example

Annual Energy consumption estimates kWh/year



Case Studies

EDGE Global Green Building Track Record



Romania:
- Lidl Stores
- High insulation, heat recovery ventilation, and low-energy lighting
- US$67.5 M Loan

Turkey:
- OZU
- First Green University
- US$35 M Loan

Jordan:
- Zara
- Energy efficiency and solar panels
- CPLP: US$1.8 M Loan

India:
1. VBHC Affordable Housing
- EDGE Certified homes
- US$12 million

1. Fortis Hospitals
- LEED Certified hospitals
- US$100 million

Gambia:
- Coco Ocean
- Hotel – energy efficiency
- € 6M Loan (*US$0.2 M)

Kenya :
- Housing Finance Bank
- Green Mortgages
- US$20 M Loan

Mexico :
1. Optima Energia
- ESCO - Energy / water efficiency in hotel sector
- US$10 M Loan

2. Artha Capital
- First example of a "Green Building" Property Fund.
- US$25 M Equity

3. Hospitaria
- First example of a "Green Hospital"
- US$9.5 M Equity

Colombia:
- City Express
- EDGE certified Hotels
- US$37.1 M Loan

Rwanda:
- MSC Kigali
- Green Building Shopping Center
- US$10 M Loan & US$3 M Equity

Maldives:
1. Shangri-la Hotel
- Energy efficiency
- CPLP: US$1.5 M Loan

2. Universal Hotel
- Energy efficiency
- CPLP: US$2.5 M Loan

IFC has invested over $500 million in green buildings to date

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RESIDENTIAL CASE STUDY

Apartment in Latin America

Energy, Water, and Materials	Cost Savings
Low-energy lights Limiting power density	$110 / yr
Solar collectors For hot water	
Low-flow taps For kitchen sinks	$20 / yr
Dual flush For toilets	
Hollow concrete blocks For external walls	$100
Incremental Capital Costs	$500
Energy Cost Savings	37%
Water Cost Savings	40%
Payback Time	3 years

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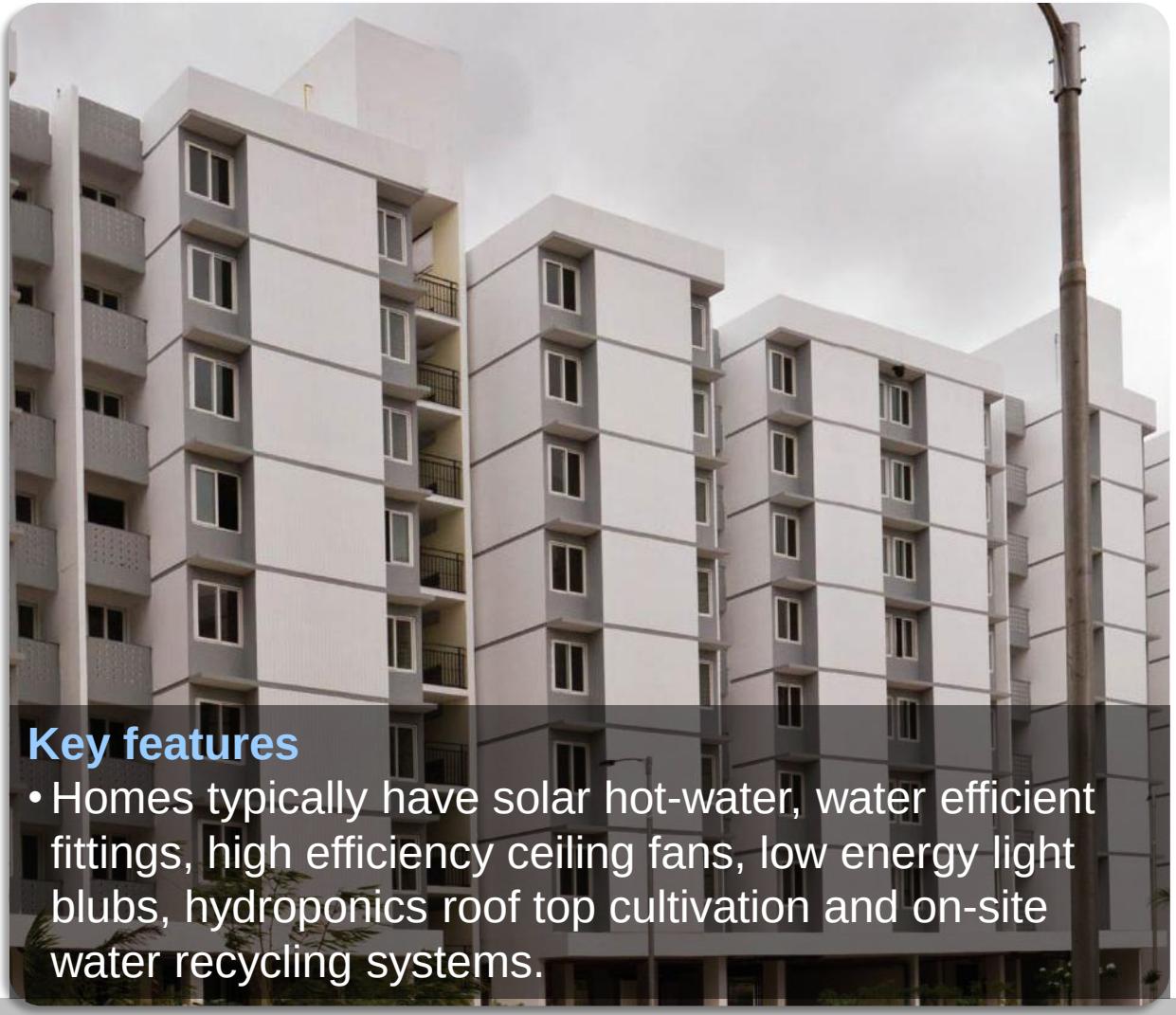
COMMERCIAL CASE STUDY

3-Star Hotel Property in Southeast Asia

Energy Efficiency Measures	Energy Savings
Glazing percentage Window-to-wall ratio on façade	7%
Solar shading Horizontal & vertical devices	5%
Glass performance Solar & thermal properties	11%
Efficient air-conditioner Higher chiller COP	6%
Heat recovery Adding unit to fresh air inlet	1.5%
Solar collectors For hot water	5%
Low-energy lights Limiting power density	6%
T5 fluorescent lamps For back-of-house lighting	0.4%
Movement control sensors For corridors	0.5%

Incremental Capital Costs	$300,000
Cumulative Energy Savings	30%
Energy Cost Savings	$144,000
Payback Time	2 years

Value Budget Housing, India

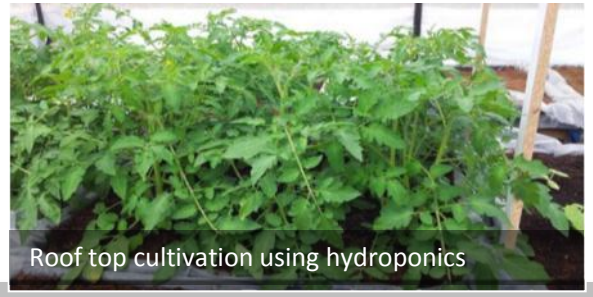


Key features

- Homes typically have solar hot-water, water efficient fittings, high efficiency ceiling fans, low energy light blubs, hydroponics roof top cultivation and on-site water recycling systems.

- Business: Housing developer
- Committed to getting all its homes EDGE certified.
- IFC provides long term equity capital

•<u>IFC Financing:</u>
•US$11 million equity

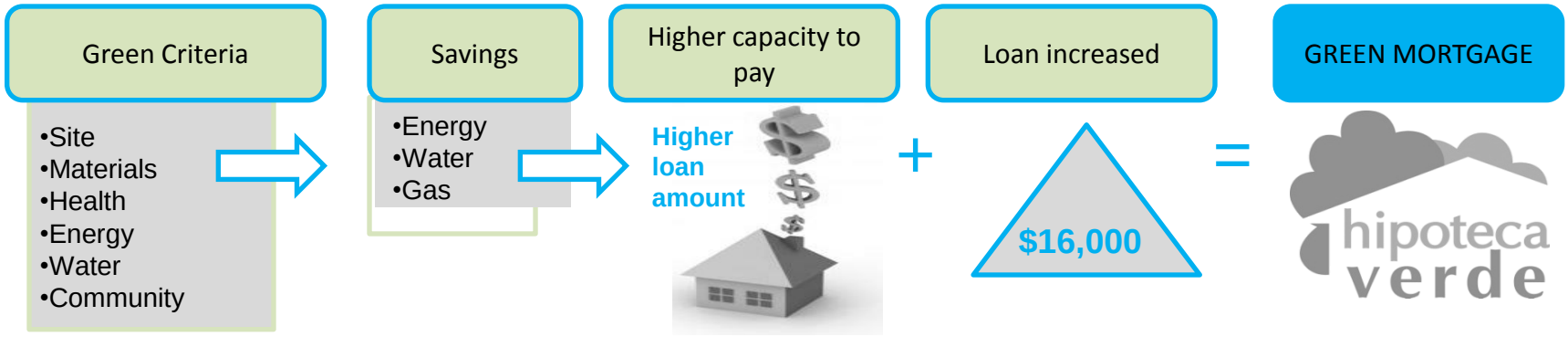


Roof top cultivation using hydroponics

Green Mortgages: Mexico Case Study

- The Infonavit"s* ***Green Mortgage Program*** was initiated in 2007, to provide an extra credit to buy new houses which incorporate sustainable and energy efficient technologies, such as Solar hot-water, CFLs, water saving faucets, and thermal insulation.
- The Program targets state-aided house buyers with ***low-income*** *for* homes that cost less than $43,000.

GREEN MORTGAGE MODEL



RESULTS

In 2010, 100,025 green houses financed
In 2011, all Infonavit mortgages were Green Mortgages

Table 7: Green mortgages provided by INFONAVIT until September, 2010

2007	2008	2009	2010 ytd
647	1,131	105,104*	100,025*

Source: CONAVI, 2010

Example of IFC's Green Building Client: Artha Capital, Mexico

Key Features:

- 80% of developments to be within 200 meters of public transportation options.
- 50% of all street lighting to use solar-powered LED lighting.
- 60,000 homes to be constructed with low-energy lighting (CFLs) and solar water heaters.

Artha Capital provides investments in real estate developments for integrated and sustainable communities in Mexico.

IFC's equity investment helped this property fund to acquire land and provide basic infrastructure for 60,000 homes with low-energy lighting and solar water heaters. By taking an approach that integrates industrial, retail, tourism, and residential, Artha Capital creates employment opportunities in communities with high environmental standards, enabling people to live near their place of work.

IFC Financing:
US$25 million equity

Significance: First example of a green building element in a property fund.

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Example of IFC's Green Building Client: Vinte, Mexico

Green Homes

Business: Housing developer with affordable and sustainable home design as an integral part of its business model.

- VINTE's attractive, well-planned developments are a major step up—and affordable through Mexico's Green Mortgage program that provides incentives for purchasing energy-efficient homes. The program recently won the International Star of Energy Efficiency Award from the Alliance to Save Energy, a business-led global NGO.

IFC's first direct investment in a sustainable housing developer

Key features

- Homes typically have solar hot-water, water efficient fittings, low energy light blubs and smart meters.

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Photo courtesy of Fernando N. Escárcega ,*Real del Sol-VINTE Project*.

IFC is responding through investment with FIs

e.g. green building finance: Housing Finance Bank, Kenya

Low energy lights for all living spaces

Low-Flow showerheads

Dual Flush for Water Closets

Solar hot water heaters

IFC's first investment in a financial institution for green construction finance: US$16 million credit line + $4m concessional loan.

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Example of IFC's Green Building Investment: Actis Africa RE Fund 2

One Airport Square, Accra, Ghana

Actis has adopted IFC 's mandatory Green Building standards* for all sites and has put in place sustainability guidelines applicable to all of the Fund's property investments.

Key Features

- Building over 50% more energy efficient than peer group in Accra
- Natural light and natural ventilation to minimise energy demand
- Rainwater harvesting
- Overhangs provide shading from intensive solar radiation
- Heat recovery through centralised fresh air system
- Ear-marked to be first Green Star rated building in West Africa

* Note: IFC's suggested minimum performance for 'Green Buildings' is based on CO2/energy criterion defined as a green field building that has 25% less energy consumption and/or 25% less CO2 emissions compared to an equivalent benchmark

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Ciputra Homes and retail development, Indonesia

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Edge For Greater Efficiencies Homes

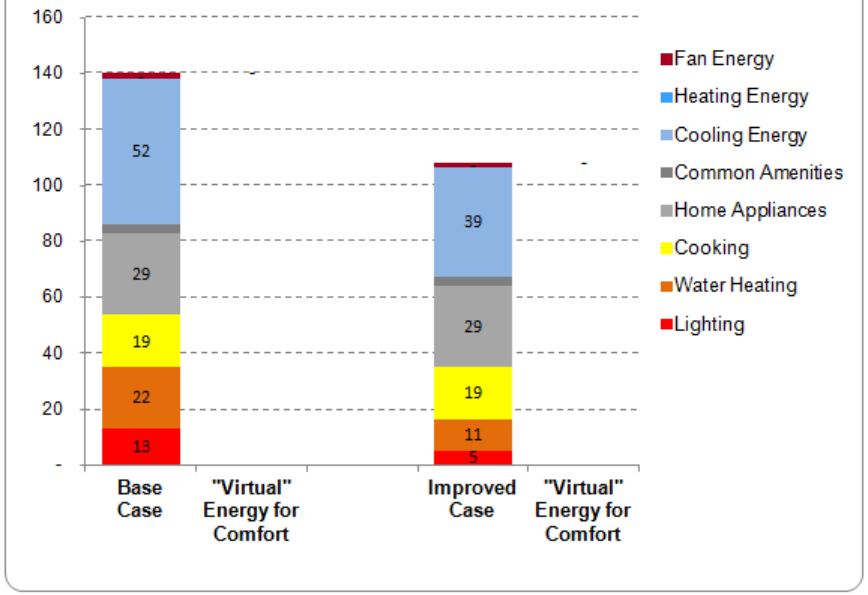
RESULTS								
Final Energy Use	901	kWh/Month	Operational CO2 Savings	2.4	tCO2/year	Base case utility costs	81.4	$/month
Final Water Use	20.8	m3/Month	Embodied Energy Savings	-	MJ	Utility costs reduction	15.6	$/month

Energy Efficiency Measures

22.9% ENERGY SAVING — Meets EDGE energy standard

Select option from the list below

EM01	☐	Reflective Paint/Tiles for Roof		
EM02	☐	Reflective Paint for External Wall		
EM03	☑	External Shading Devices with HSA or VSA of 70 degrees		
EM04	☐	Insulation of Roof Surface		
EM05	☐	Insulation of External Wall		
			Edit default values, if req.	
EM06	☐	Single Low-E, Solar Control glass	U Value [W/m2 K]	3.00
			SHGC	0.45
EM07	☐	Double Low-E, Solar Control glass	U Value [W/m2 K]	1.95
			SHGC	0.28
EM08	☐	Design Cross ventilation (Living spaces with opening on >2 orientations)		
EM09	☐	Install Ceiling Fans in all habitable rooms		
EM10	☐	Install efficient (VRV/VRF) Cooling (< 0.34 kWe/kWt)		0.29
EM11	☑	Solar Water Heaters - User to enter % value of total heating requirement		50%
EM12	☐	High efficiency gas boiler for Space Heating @ >80% Eff. User to enter %		80%
EM13	☐	High efficiency gas boiler for hot water heating @ >80% Eff. User to enter %		80%
EM14	☑	Low energy [CFL/LED/T5] Light Fixtures for all Living Spaces		
EM15	☑	Low energy [CFL/LED/T5] Light Fixtures for Corridors & Outdoor Common area		
EM16	☐	Automatic Controls for all Corridors & Outdoor Lighting		
EM17	☐	Solar Photovoltaics to meet of annual electricity use - User to enter %		50%



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Autif Sayyed

Regional Green Building Specialist IFC

asayyed@ifc.org