

# DRIVING TRANSFORMATION TO ENERGY EFFICIENT BUILDINGS

*Policies and Actions: 2<sup>nd</sup> Edition*



In collaboration with:



WORLD GREEN BUILDING COUNCIL

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# THE INSTITUTE FOR BUILDING EFFICIENCY

*An Initiative of Johnson Controls*



The Institute for Building Efficiency is an initiative of Johnson Controls providing information and analysis of technologies, policies, and practices for efficient, high performance buildings and smart energy systems around the world.



Existing Building Retrofits



Green Buildings



Smart Grids & Smart Buildings



Renewable & Distributed Energy



Clean Energy Finance



Energy & Climate Policy

# PROJECT PARTNERS

*Driving Transformation Together*



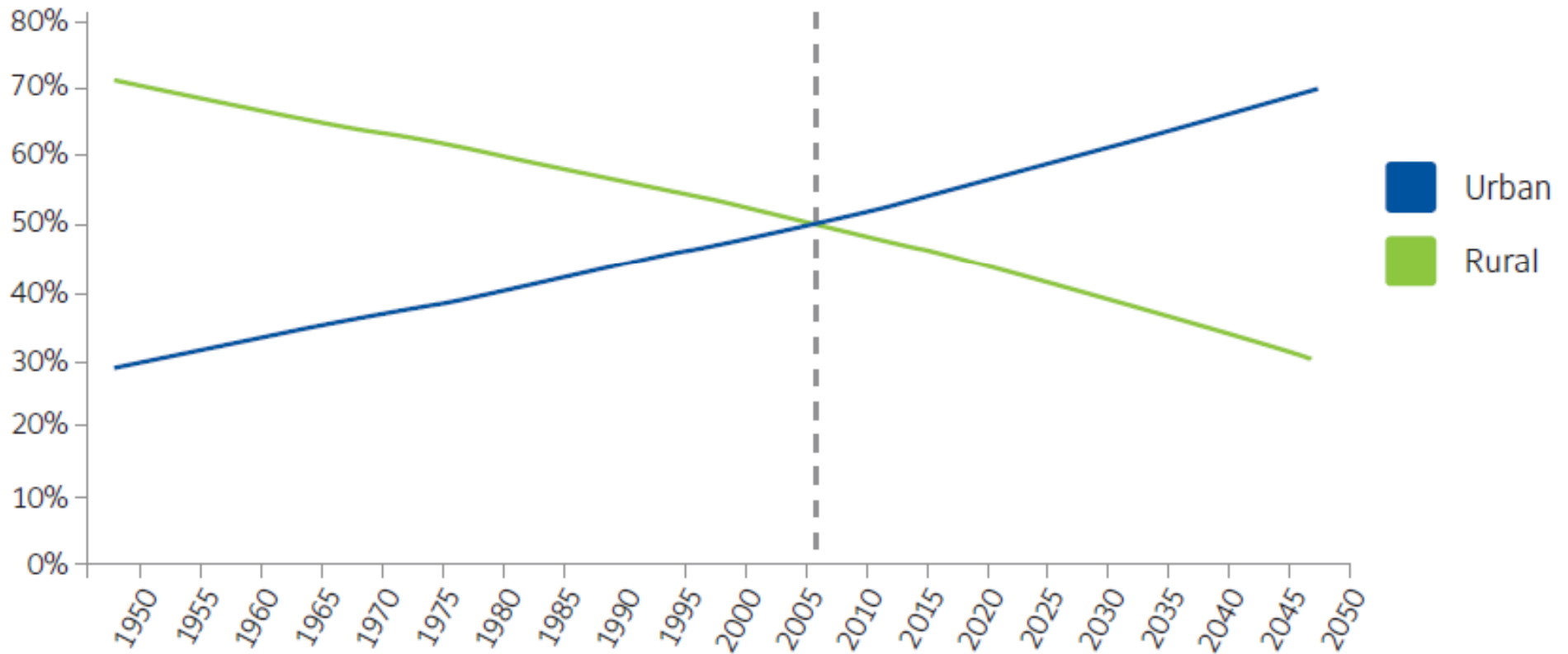
WORLD GREEN BUILDING COUNCIL

# TOMORROW'S CITIES BEING BUILT TODAY

## *Rapid Urbanization*



### Percentage of World Population





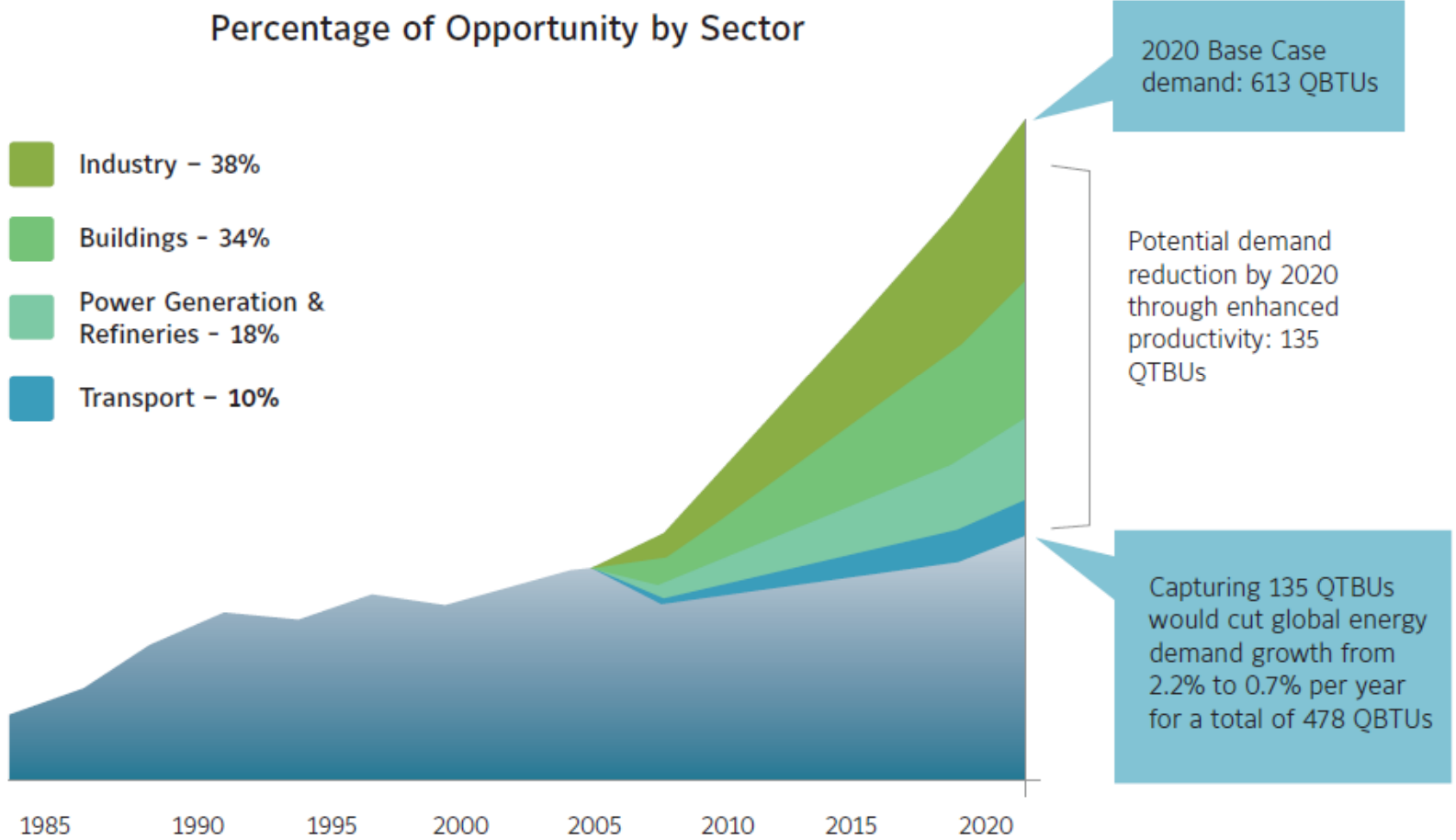
# SLOWING ENERGY DEMAND GROWTH

*Efficiency key to universal energy access - \$1 invested in efficiency avoids \$2 spent on supply*



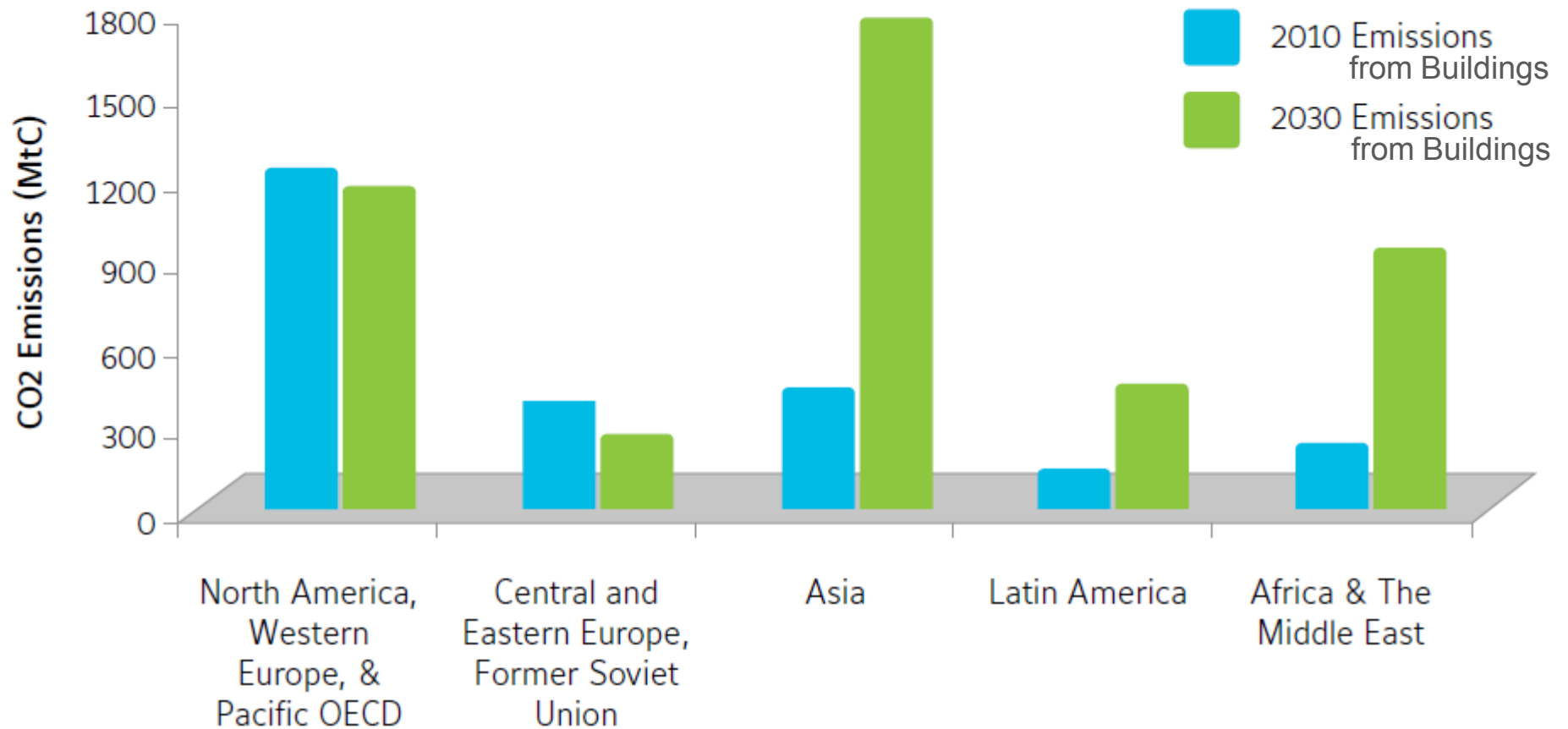
Percentage of Opportunity by Sector

- Industry - 38%
- Buildings - 34%
- Power Generation & Refineries - 18%
- Transport - 10%



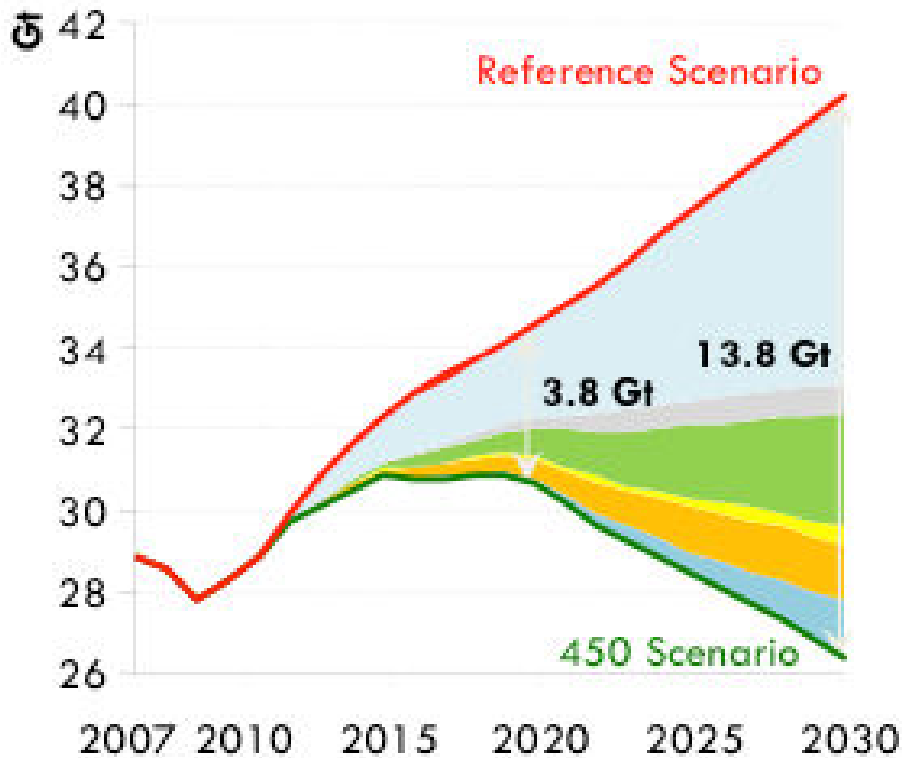
# CLIMATE ACTION AND BUILDINGS

*Building Emissions Rising in Asia, Latin America, Africa & the Middle East*



# CLIMATE ACTION AND BUILDINGS

*Efficiency: The largest abatement potential to 2030*



Share of abatement %

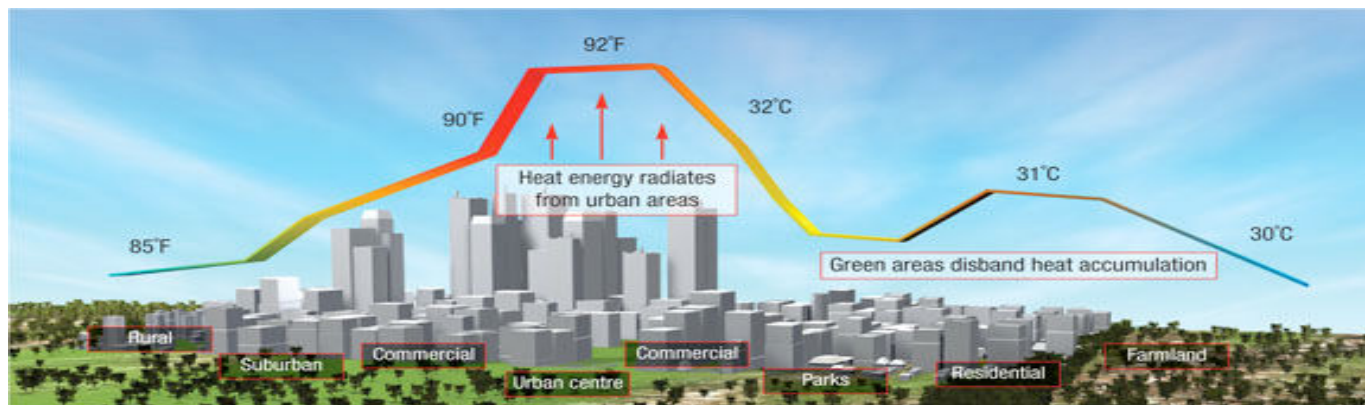
	2020	2030
Efficiency	65	57
End-use	59	52
Power plants	6	5
Renewables	18	20
Biofuels	1	3
Nuclear	13	10
CCS	3	10

# RESILIENCE TO CLIMATE IMPACTS

## *Extreme Weather – Heat and Cold*



- Better design makes building easier to keep cool on hot days and warm on cold days, increasing occupant comfort.
- Exteriors designed to reduce heat gain in the summer to better handle heat waves
- Insulation that allows poor households to stay warm during extremely cold winters
- Passive cooling reduces heat islands in the summer.
- Water usage efficiency to help tackle freshwater scarcity.



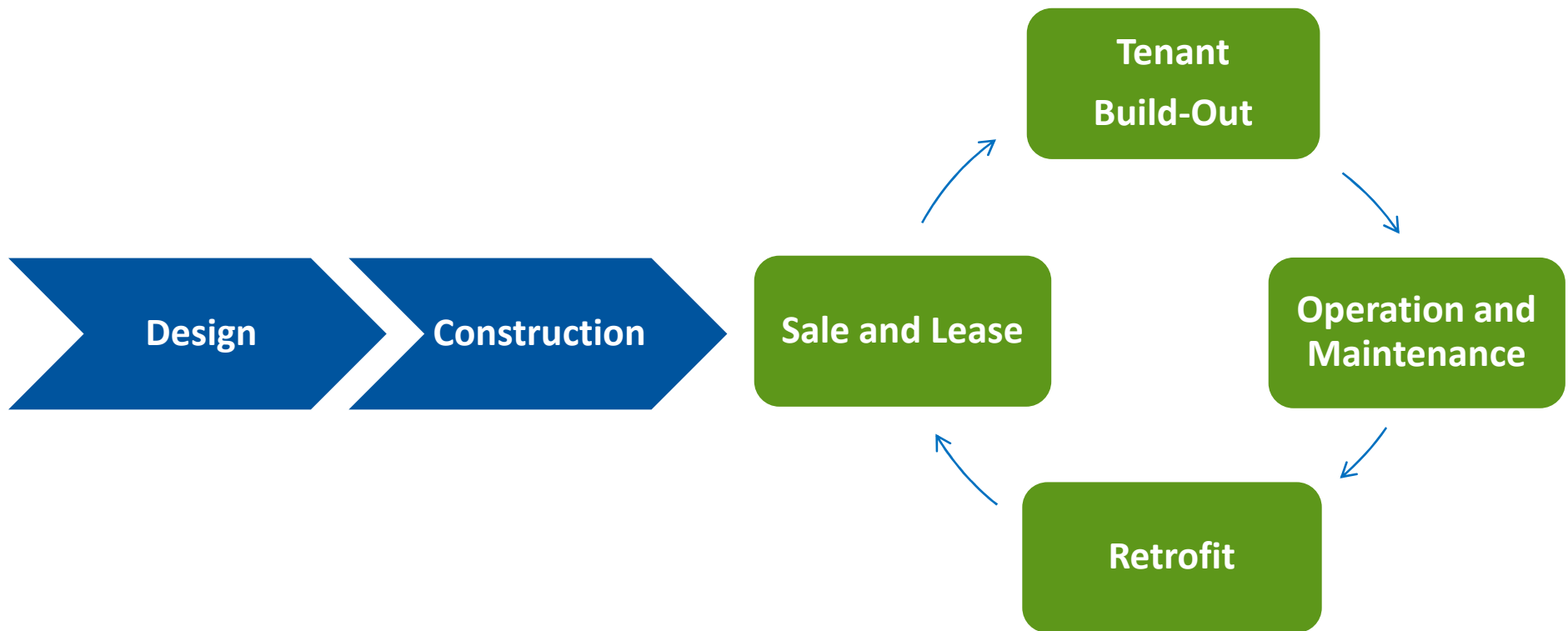


# POLICIES HELP BRIDGE THE EFFICIENCY GAP



# TRANSFORM BUILDINGS

*The Lifecycle of a Building*



# TRANSFORM BUILDINGS

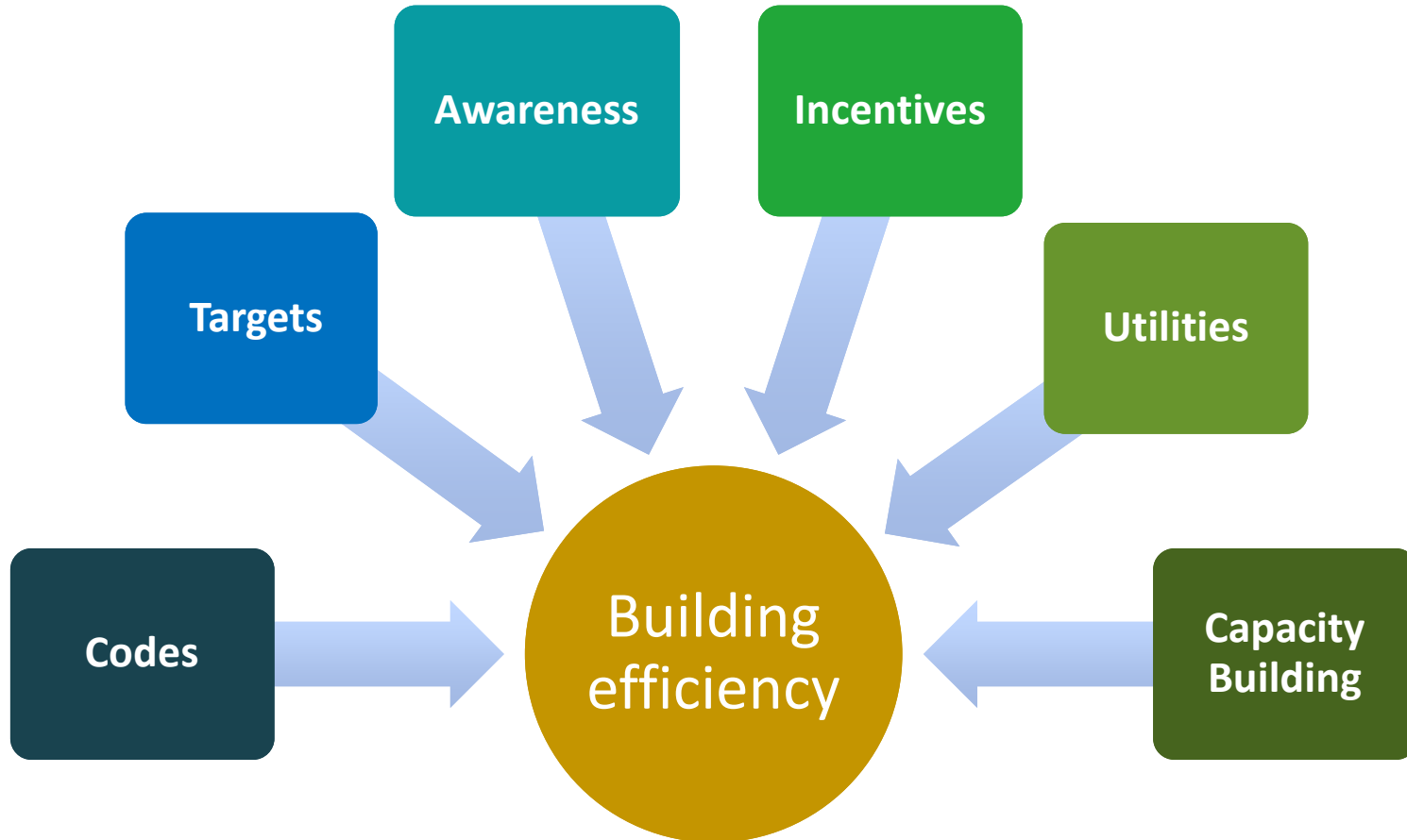
## *Barriers to Energy Efficiency*



<b>Market</b>	<ul style="list-style-type: none"><li>• Split incentives</li><li>• Transaction Costs</li><li>• Dispersed Market Involving Many Sectors</li><li>• Price Distortions in Energy Market</li></ul>
<b>Financial</b>	<ul style="list-style-type: none"><li>• Up-front Cost, Constrained Budgets</li><li>• Perception of Investment Risk</li><li>• Low Financial Institution Awareness</li><li>• Lack of External Finance</li><li>• Small Transaction Size</li></ul>
<b>Technical</b>	<ul style="list-style-type: none"><li>• Lack of Technical Capacity in Market</li><li>• Lack of Affordable Technology in Market</li></ul>
<b>Awareness</b>	<ul style="list-style-type: none"><li>• Lack of Information about Energy Performance and Improvement Opportunities</li></ul>
<b>Institutional</b>	<ul style="list-style-type: none"><li>• Low Government Capacity on New Policy</li><li>• Inter-agency Coordination Challenges</li><li>• Little Public-Private Coordination</li></ul>

# TRANSFORM BUILDINGS

*Policies can enable transformation*



# CODES AND STANDARDS

*Establishing minimum levels of energy performance*



Codes

Targets

Awareness

Incentives

Utilities

Capacity Building

**Building codes and appliance standards improve the cost-effectiveness of new buildings through decreased energy costs over the lifetime of the building.**

## **Building Energy Codes**

- Sets standards for building design and construction, may also tackle existing buildings
- Avoids “lock in”

## **Appliance and Equipment Standards:**

- Increasing appliance and equipment efficiency reduces energy demand





# SETTING AN EFFICIENCY IMPROVEMENT TARGET

Codes

**Targets**

Awareness

Incentives

Utilities

Capacity Building



**A national energy efficiency improvement target or goal can align interests and spur action.**

## Efficiency Targets

- Energy Efficiency Resource Standards - Mandates utilities and energy distributors to seek energy reductions over time – avoiding the need for power generation (“negawatt”)
- Energy Efficiency Scheme – Energy consumption reduction obligations applied directly on large electricity end-users.

## Government Leadership

- Government efficiency standards for public buildings build capacity in the market and reduce energy costs.



# INFORMATION AND MARKET TRANSPARENCY

*Creating conditions for policy and market development*



Codes

Targets

**Awareness**

Incentives

Utilities

Capacity Building

**Greater information and data on energy consumption in buildings enables owners, operators and tenants to make informed energy management decisions. Transparent, timely information can help track performance against goals.**

## **Data Collection and Baseline Development**

- The collection of general statistical information about the buildings energy use will enable better policy and program design.

## **Competition and Awards Programs**

- Competitions incentivize participants to develop benchmarking capabilities and reward the best performers .

## **Audits - Voluntary or Mandatory**

- Audits provide information on the technologies and building structure that drive energy consumption. They offer analysis of efficiency improvements that can be achieved by upgrading specific building components.

# INFORMATION AND MARKET TRANSPARENCY



- Codes
- Targets
- Awareness
- Incentives
- Utilities
- Capacity Building

## Rating and Certification Programs

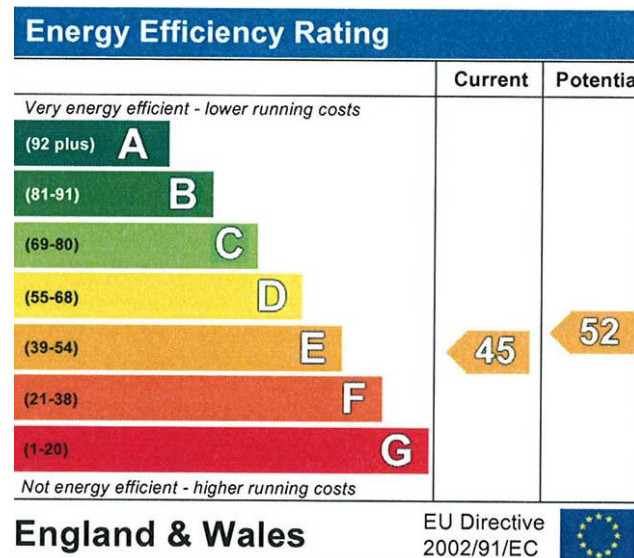
- Rating and certification programs organize building data and information into a format that enables benchmarking across a number of buildings. Benchmarking is increasingly used to differentiate buildings in the real estate market.

## Disclosure of Energy Performance Certificates

- Performance certificates share energy consumption information, enabling energy efficiency information to be factored into real-estate decisions. Depending on design, disclosure may occur at point of building sale as part of a real estate transaction, in a public space, or via an on-line database.

## Public Awareness Campaigns

- These campaigns seek to raise awareness among users and owners about the benefits of energy efficiency



# FINANCIAL INCENTIVES

## *Tackling barriers against investments in building efficiency*



Codes

Targets

Awareness

**Incentives**

Utilities

Capacity Building

**Funding energy efficiency efforts remains a significant challenge around the world. A variety of programs can be designed to support energy efficiency investments.**

### **Rebates or Grant funding**

- Rebates pay down costs of systems/equipment, R&D, commercialization.
- Utilities manage most rebate programs supporting energy efficiency. Amounts vary widely by technology and program administrator

### **Risk Mitigation Guarantee**

- The government can lower the cost of capital for investments in energy efficiency by agreeing to guarantee a certain, low level of risk to banks.

### **Revolving Loan Fund**

- Public funds used to finance energy efficiency investments, or used to lower the interest rate or guarantee a bank's investment in energy efficiency.

# FINANCIAL INCENTIVES

## *Using fiscal policy to promote building efficiency*



Codes

Targets

Awareness

**Incentives**

Utilities

Capacity Building

### **Energy performance contracting (EPC) enabling legislation**

- EPC's are a financing mechanism that allows energy efficiency investments to be repaid through energy savings over time.
- Policies can promote standardized, streamlined, and transparent project development and vendor selection process, create umbrella contracts and ESCO pre-selection, provide project facilitators or consultants, and standardize measurement and verification procedures.

### **Tax incentives**

- Often a tax deduction is given to cover expenditure related to building efficiency incurred by owners or tenants, includes retrofit expenses

### **Tax lien financing**

- Property owners borrow money to pay for energy efficiency improvements and repay it over years through a special tax assessment on the their property (Known as Property-Assessed Clean Energy or PACE in the US)





# ACTIONS FOR UTILITIES

## *Tackling consumer energy demand to stimulate reductions*



Codes

Targets

Awareness

Incentives

**Utilities**

Capacity Building

**Utilities have access to energy customers and have the potential to meet the energy needs of those customers by investing in demand reduction.**

### **Public-benefit billing charges**

- A fund for energy efficiency and renewable energy project support is generated through a small additional charge on electricity bill. The fund may support technical assistance or subsidize the purchase of energy-efficient products.

### **On-bill Financing**

- Requires that utilities allow energy efficiency retrofits to be repaid as a line-item on the energy bill, allowing one bill for energy efficiency investments and energy purchases.

### **Revenue Decoupling**

- Utility pricing approach which changes utility incentives: rather than having profitability increase through increased energy demand, utilities implement a rate adjustment mechanism so that they can be profitable if energy demand decreases.

# ACTIONS FOR UTILITIES



Codes

Targets

Awareness

Incentives

**Utilities**

Capacity Building

## Advanced Metering Infrastructure

- Deploy systems that measure, collect and analyze energy usage through two-way communication metering devices. Such smart meters enable time-of-use pricing and demand response.

## Time-based pricing

- Electricity pricing policies such as time-of-use pricing whereby prices are set for a specific time period on an advance, and dynamic pricing whereby electricity prices may change as often as hourly. This encourages conservation at peak times.

## Demand Response

- Mechanisms used to encourage consumers to reduce demand, thereby reducing the peak demand for electricity. Consumers receive payments for demand reduction.



# CAPACITY BUILDING

*Implementation requires technical and institutional capacity*



Codes

Targets

Awareness

Incentives

Utilities

Capacity Building

**Government and private sector capacity building and workforce skill training are essential elements of energy management and energy efficiency.**

## **Direct technical assistance**

- Helps build expertise inside governments covering multiple areas of policy development (data collection, development of policy, governance, legal frameworks, implementation, evaluation, stakeholder facilitation).

## **Workforce training**

- Programs that increase the skills of workers and job-seekers by providing education or training in energy efficiency.



# PRIVATE SECTOR PERSPECTIVE

*Factors that influence investment in emerging economies*



- Size of the market
- Market enabling regulatory regime
- Stable investment framework
- Integrity of the business community
- Small /mid-sized companies available and willing to enter into partnerships
- Public funding and incentives
- Availability of a skilled workforce
- Government willingness to support public-private partnerships for training and capacity building
- Adequate intellectual property protection and enforcement policies

# PRIVATE SECTOR PERSPECTIVE

## Priority Policies

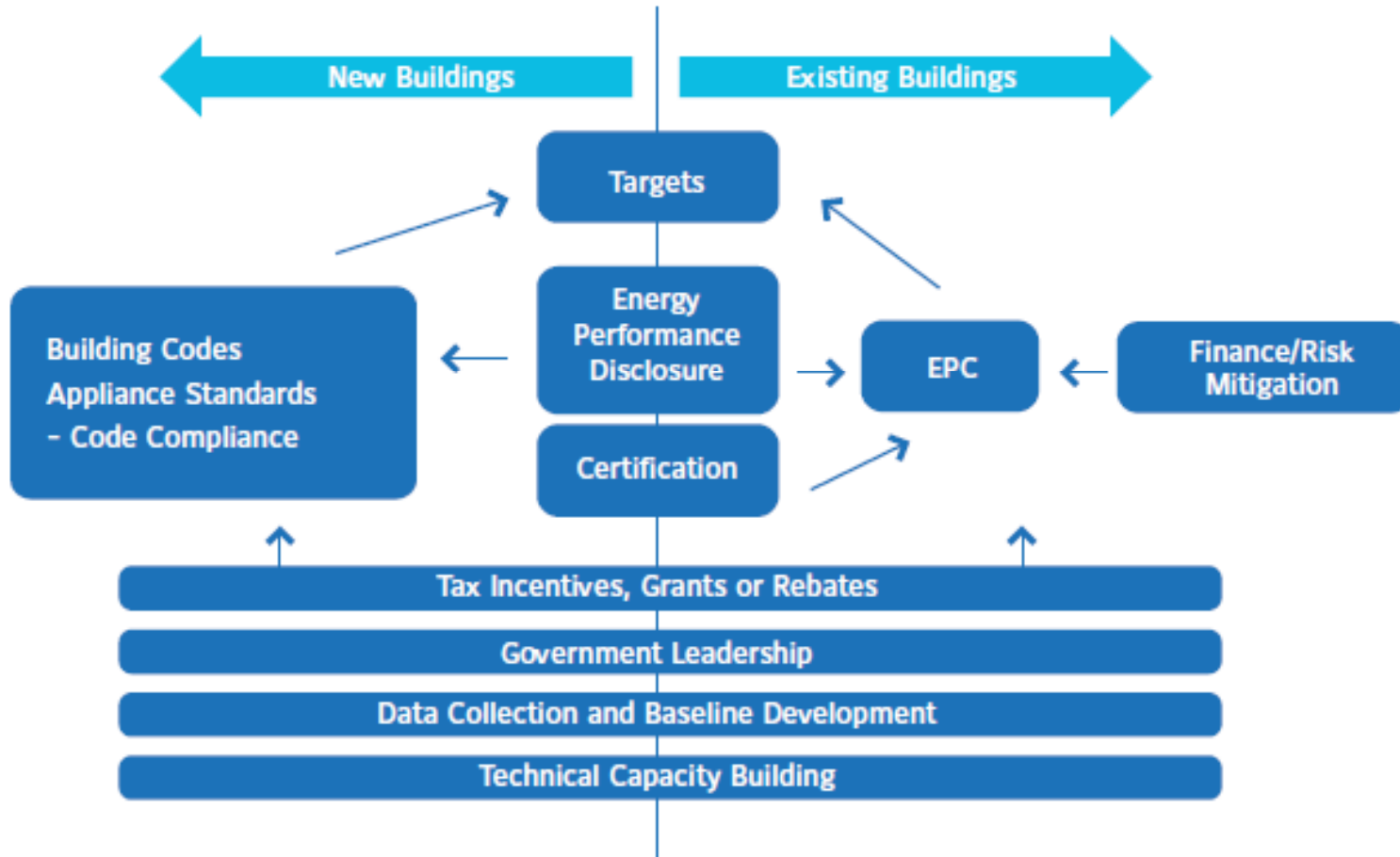


Private Sector Role and Impact	Informs Policy Design	Assist in Policy Implementation (Public Private Partnership)	Direct Impact on Growth in Building Efficiency Industry	Indirect Impact on Growth in Building Efficiency Industry
Building Efficiency Targets	■			■
Building Energy Codes	■		■	
Building Energy Performance Disclosure	■		■	
Building Rating Systems or Building Certification Programs	■	■		■
Tax Incentives, Grants or Rebate Programs	■		■	
Government Leadership Programs	■	■	■	
Energy Performance Contracting Enablers	■	■	■	
Risk Mitigation	■	■	■	
Data Collection And Baseline Development	■			■
Technical Capacity Building Programs/Performance Training and Education	■	■		■



# PRIVATE SECTOR PERSPECTIVE

## *Interactions Among Policies*



# CASE STUDY – THAILAND

## *ENCON Fund – Revolving Loans – Tax Incentives*



### ■ ENCON Fund

- Energy Conservation Promotion Fund (ENCON Fund) was financed by a levy of US\$0.001/litre on petroleum products.
- Supports all EE/RE promotion activities – R&D, subsidies, soft loans, awareness campaign, capacity building, and the following programs:

### ■ Energy Efficiency Revolving Fund

- Provides capital at no cost to Thai banks, which then provide low interest loans to energy efficiency projects

### ■ Tax Incentives

- Exemption of import duties – for equipment related to RE/EE
- Exemption of corporate income tax for 8 years for EE/RE manufacturers or businesses
- Reduction of corporate income tax for business that improve their EE or utilize RE up to 70% of investment costs.

# CASE STUDY – EASTERN EUROPE

*European Bank for Reconstruction and Development*



- EBRD has provided technical assistance, regulatory preparation, and financing for energy performance contracts (EPC).
- In Romania, technical assistance combined with the €10 million EBRD loan has helped to catalyze a pipeline of €45 million in projects to be implemented over the next 10 years, including:
  - energy efficient street lighting
  - cogeneration projects in municipal hospitals
- In the Ukraine, EBRD identified and facilitated the regulatory reforms needed to fully enable the uptake of EPCs.



**European Bank**  
for Reconstruction and Development



# CASE STUDY – INDIA

## *Energy Performance Contracting*

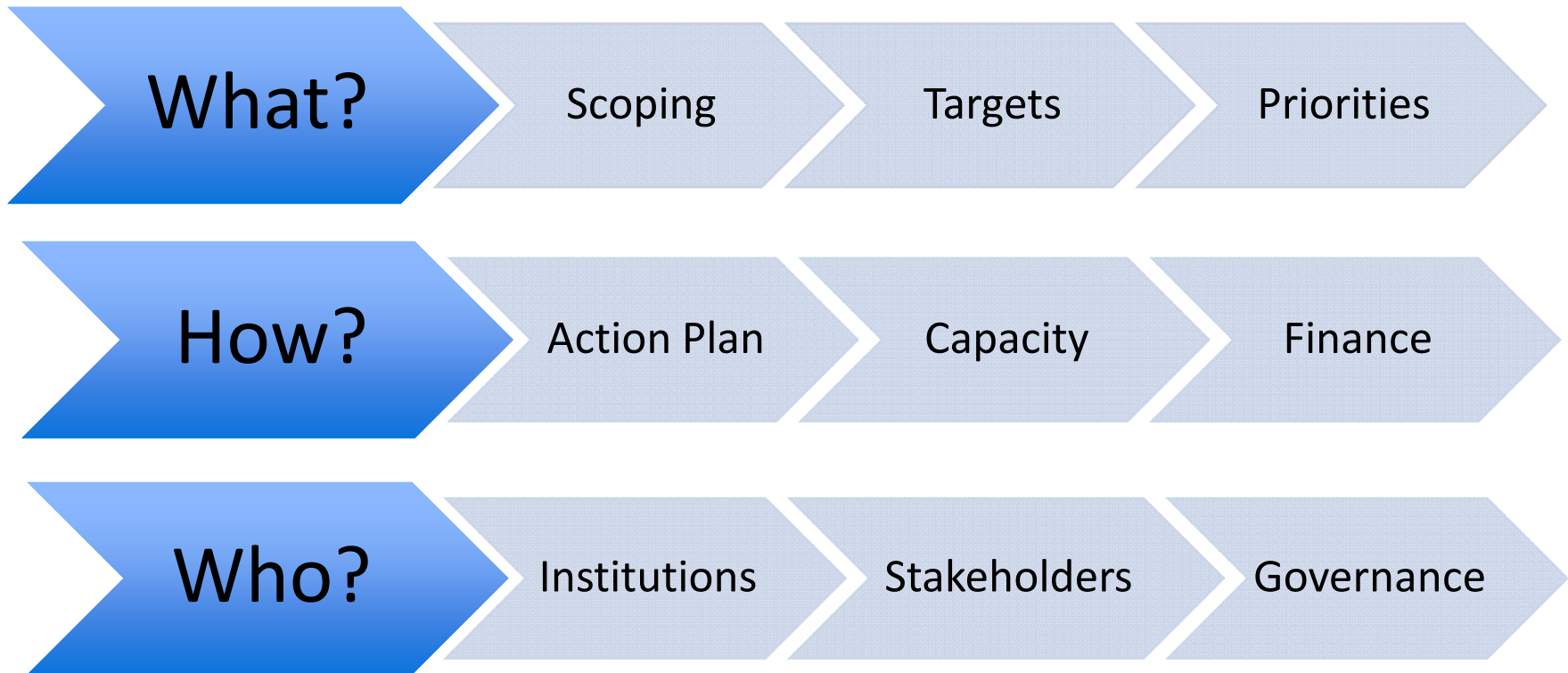


- Inorbit Mall - Largest mall in Mumbai (50,000 m<sup>2</sup>)
- First EPC project completed in Asia as part of the Clinton Climate Initiative's energy efficiency building retrofit program (EEBRP)
- Comprehensive improvement measures
  - Replace chilled water and condenser pumps
  - Installed variable speed drives in air handlers
  - Enhanced building automation including peak demand limiting and night time set backs
  - Lighting retrofit including LED fixtures in car park
  - Submetering and monitoring system
  - Solar powered educational LCD kiosk showing real time performance and benefits of the project
- 2.8 years simple payback on investment



# GET STARTED

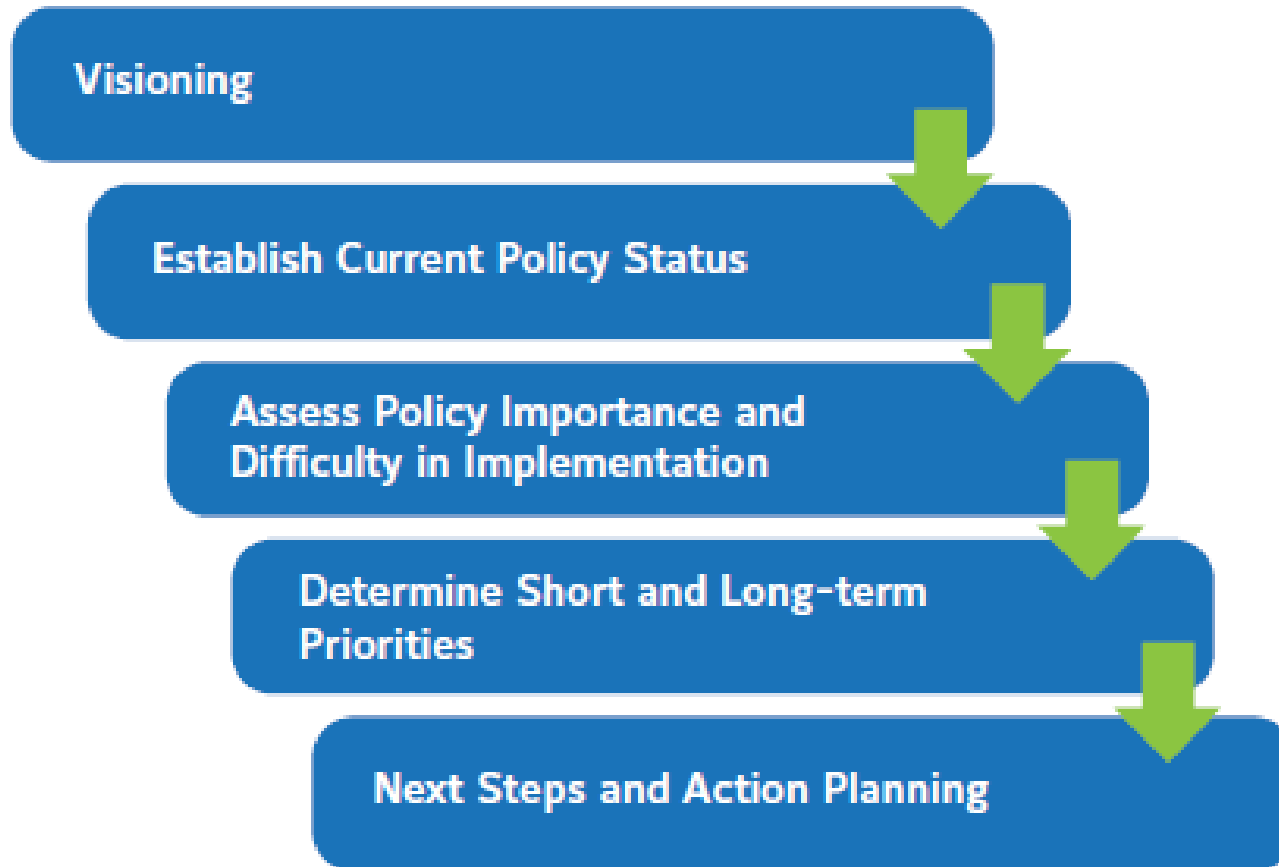
*Pillars of a pathway for building-efficiency policy*





# BUILDING EFFICIENCY POLICY ASSESSMENT TOOL

## *Flow of a Policy Workshop*



# BUILDING EFFICIENCY POLICY ASSESSMENT TOOL

## *Planning for a policy workshop*



- The policy workshop is designed to support consensus-based, multi-stakeholder collaboration and uses visual tools to build consensus and prioritize building efficiency policy options and strategies.
- The policy workshop has been designed around a nominal half-day format but can be easily expanded or shortened to meet any time frame.
- The most important step in organizing a policy workshop is inviting the right set of stakeholders - public sector, private sector, and NGO.
- Workshops that include 15-30 diverse stakeholders will be large enough to facilitate active collaboration without being so large as to inhibit discussion.
- The tool includes a facilitators guide for how to run a workshop, templates and analysis tools.

# BUILDING EFFICIENCY POLICY ASSESSMENT TOOL

## *Visioning*



- The first exercise is a visioning exercise to get the participants thinking positively about how policy can enhance the efficiency of the built environment.
- The facilitator asks the following: “If we transported ourselves ten years into the future and were interviewed by a reporter, what would we like to say we had accomplished because of enacting new building efficiency policies?”
- Every participant writes a couple of future accomplishments or desired outcomes on individual sticky notes. The facilitator then asks for volunteers to share their ideas with the group while grouping the sticky notes into categories on flip chart paper.
- When all ideas are shared, the flip charts are hung on the wall and the first assessment exercise begins.

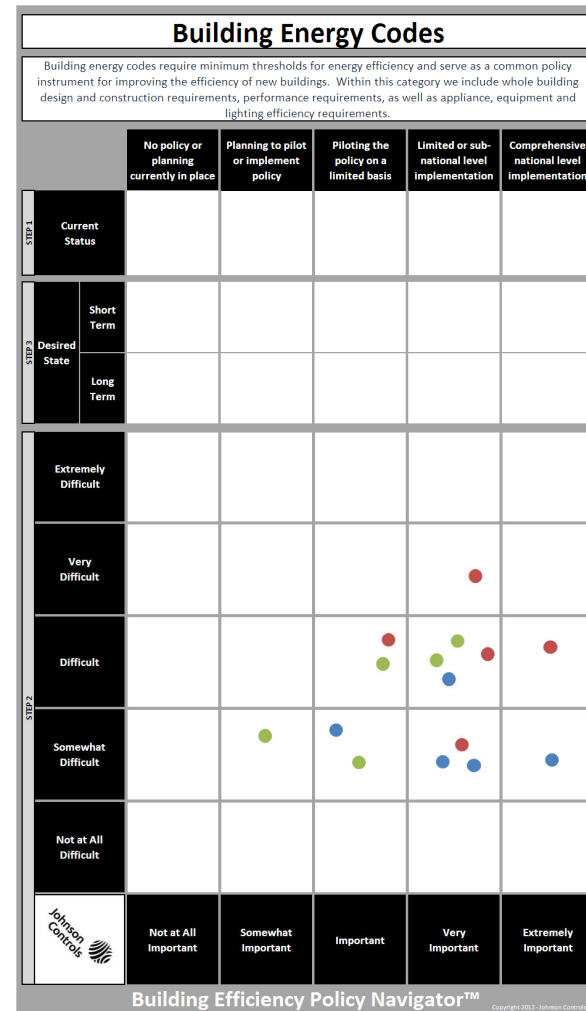


# BUILDING EFFICIENCY POLICY ASSESSMENT TOOL

## Step 2 - Policy Importance and Difficulty of Implementation



- The next exercise assesses the relative importance and difficulty in implementing each policy
- The importance depends on the ability to:
  - Generate energy and carbon reductions
  - Reduce energy costs for home and building owners
  - Drive economic development and attract private capital
- Identify the key barriers and challenges facing implementation of each policy and discuss ideas to overcome these obstacles.



Key:

- Private Sector
- Public Sector
- Non-Governmental

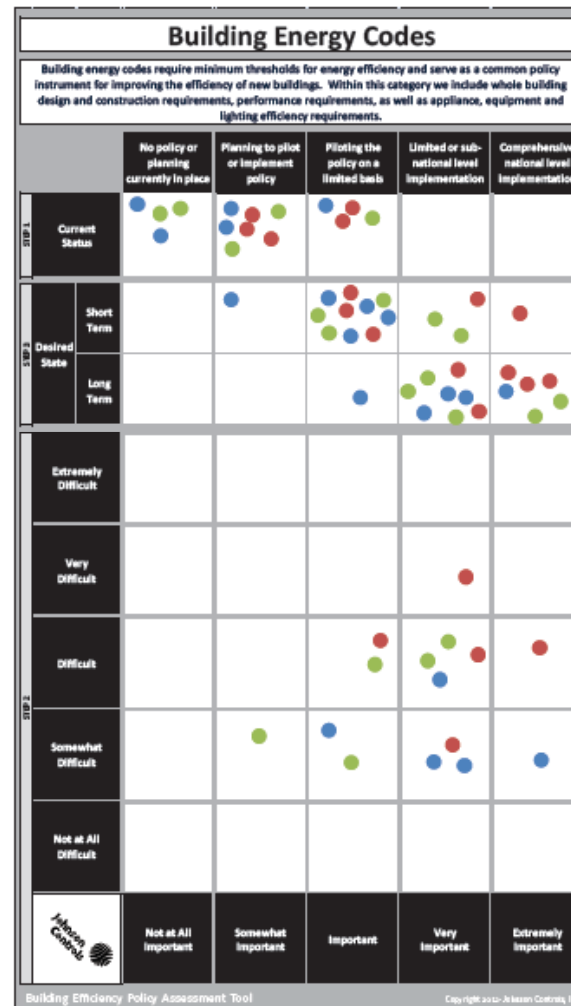


# BUILDING EFFICIENCY POLICY ASSESSMENT TOOL

## Step 3 - Desired Short-Term and Long-Term Policy States



- Define the desired future states of each policy in the short and long term.
- Define short and long term so that all participants are using the same criteria. If the policy workshop is focused on policies at a national level, then longer time frames are probably appropriate
- The final exercise in the assessment activity is to facilitate a discussion about which policies should be implemented in combination in order to maximize the beneficial impact and improve the chances of success.



Key:  
● Private Sector  
● Public Sector  
● Non-Governmental





# BUILDING EFFICIENCY POLICY ASSESSMENT TOOL

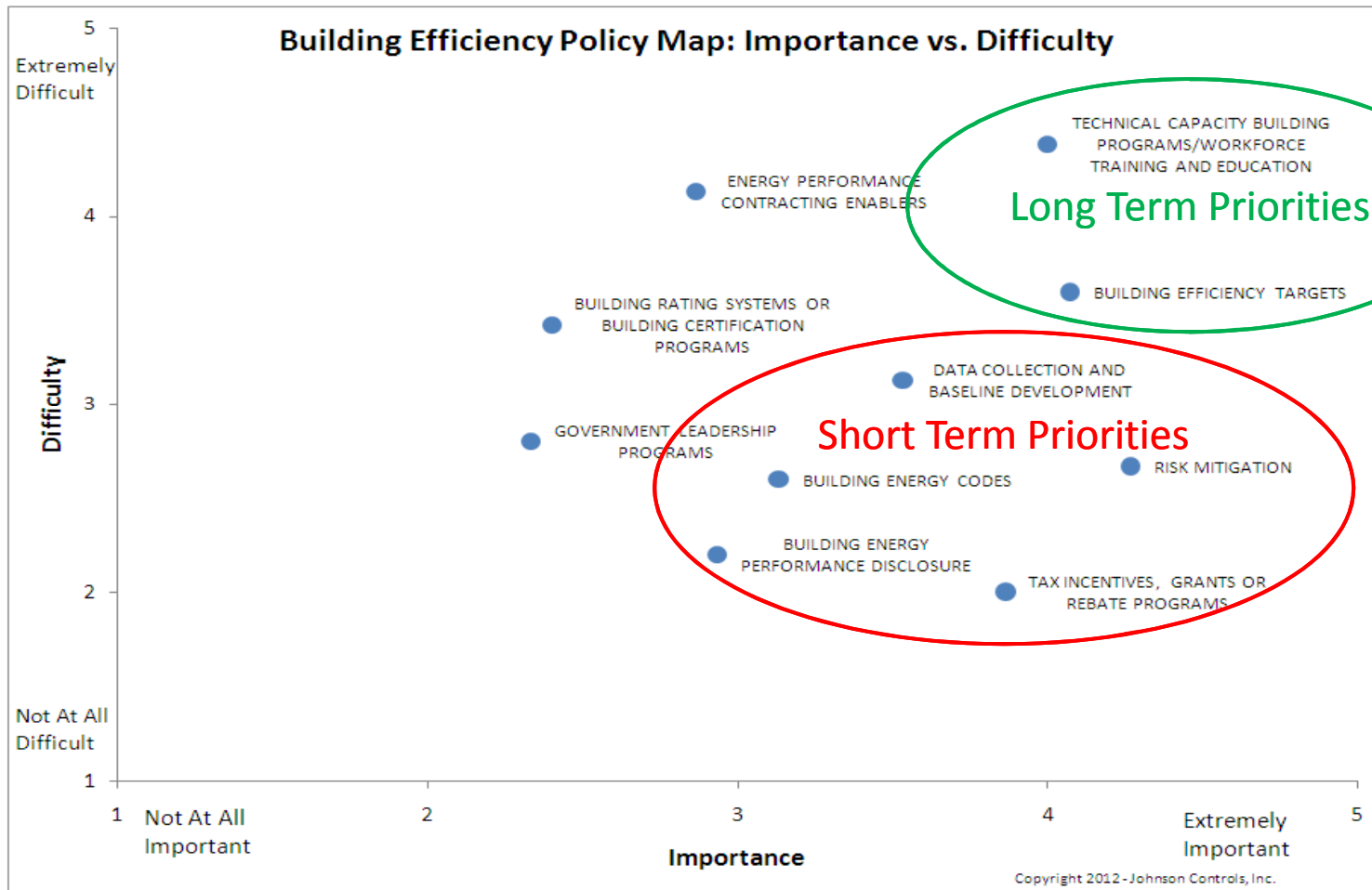
## *Next Steps and Action Planning*



- After the assessment exercises are complete, the facilitator should lead a discussion on the next steps and actions the group should take to maintain interest and momentum in the transformation process.
- Schedule a time for the group to review the results of the workshop and develop a strategy and detailed action plan.
  - Who
  - What
  - When
  - Where
  - How
- A spreadsheet-based report generator is available in English at <http://bit.ly/K8CDNP>, and in Spanish at <http://bit.ly/Lp59H4>.

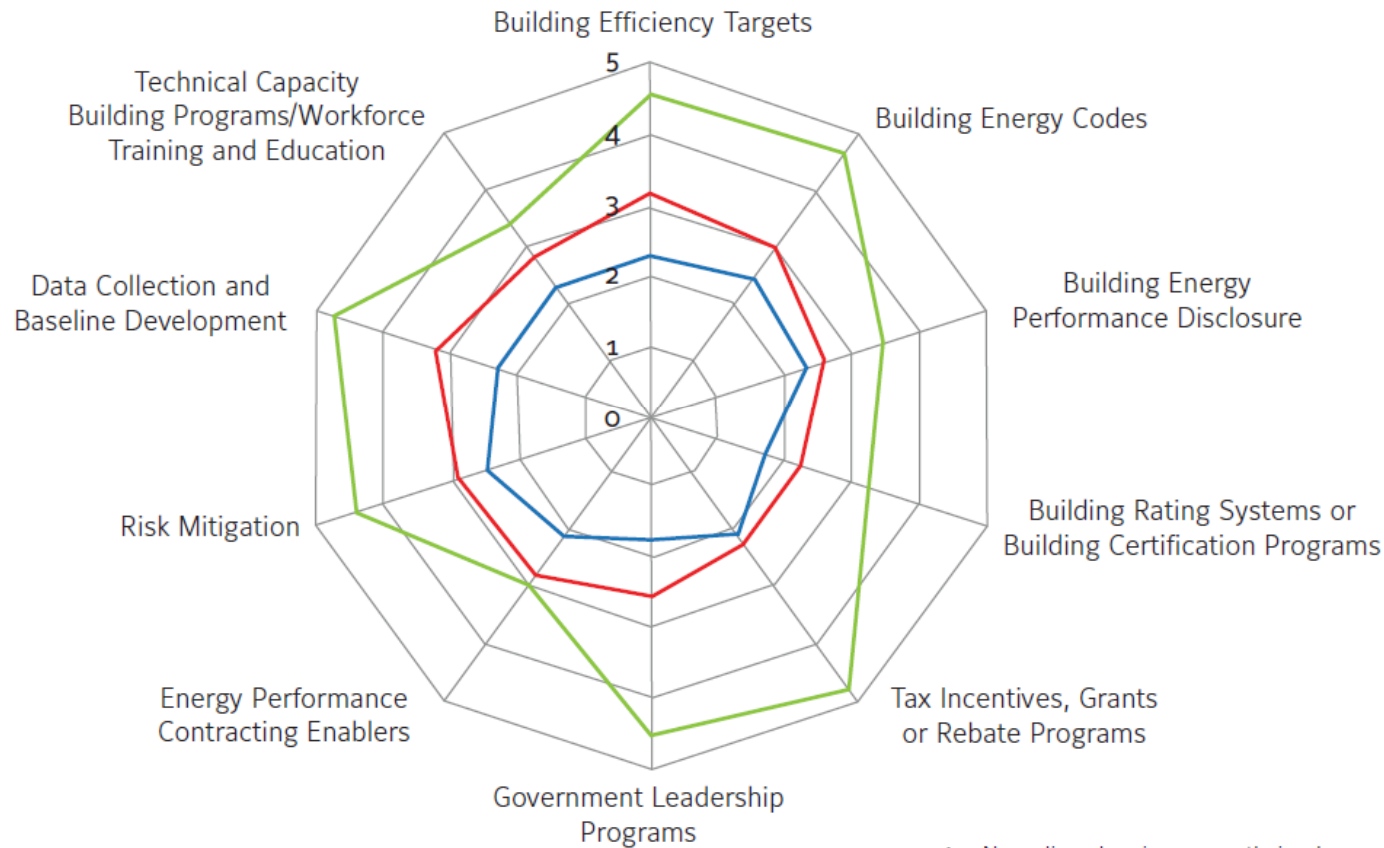
# BUILDING EFFICIENCY POLICY ASSESSMENT TOOL

## Policy Map – Importance vs. Difficulty



# BUILDING EFFICIENCY POLICY ASSESSMENT TOOL

## Policy Map – Current, Short Term, Long Term



- 1 = No policy planning currently in place
- 2 = Planning to pilot or implement policy
- 3 = Piloting the policy on a limited basis
- 4 = Limited or sub-national level implementation
- 5 = Comprehensive national level implementation

— Current Status    — Desired Short Term    — Desired Long Term



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The Driving Transformation to Energy Efficient Buildings report can be found on the Institute for Building Efficiency website or at:

<http://www.institutebe.com/energy-policy/Driving-Transformation-Energy-Efficient-Buildings2.aspx?lang=en-US>