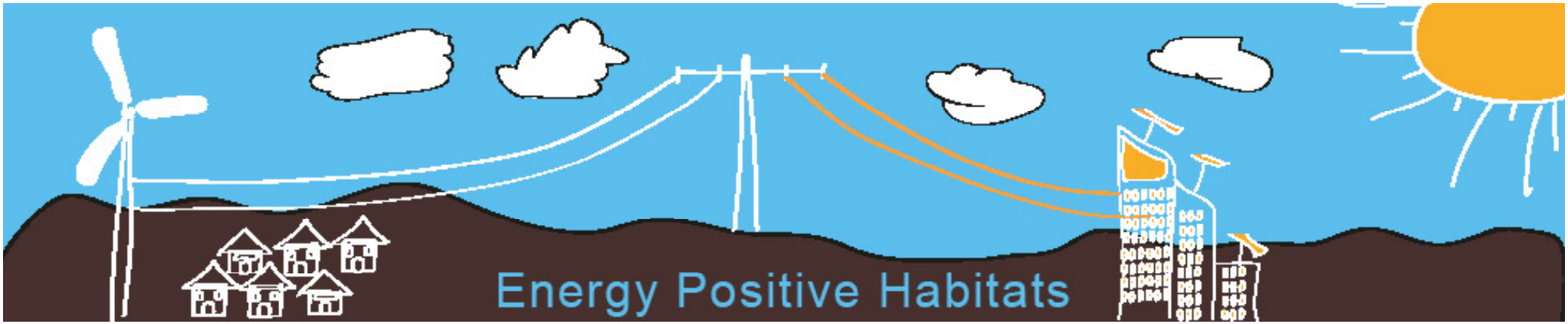
Auroville Green Practices

A Hands-on-Workshop
30 Aug to 1 Sept, 2012
Auroville (near Pondicherry)



‘Human Habitats today have become centers of energy consumption. By conserving energy with appropriate building design, reducing energy by efficient energy management and producing energy with decentralized systems that allows feeding surplus energy into the grid, we can create a shift towards energy positive habitats. Essential to this movement is the fact that humans have to change their life styles to consume less energy.‘

htpp://agp.aurovilleconsulting.com

Energy Efficient Design

Energy Positive Habitats

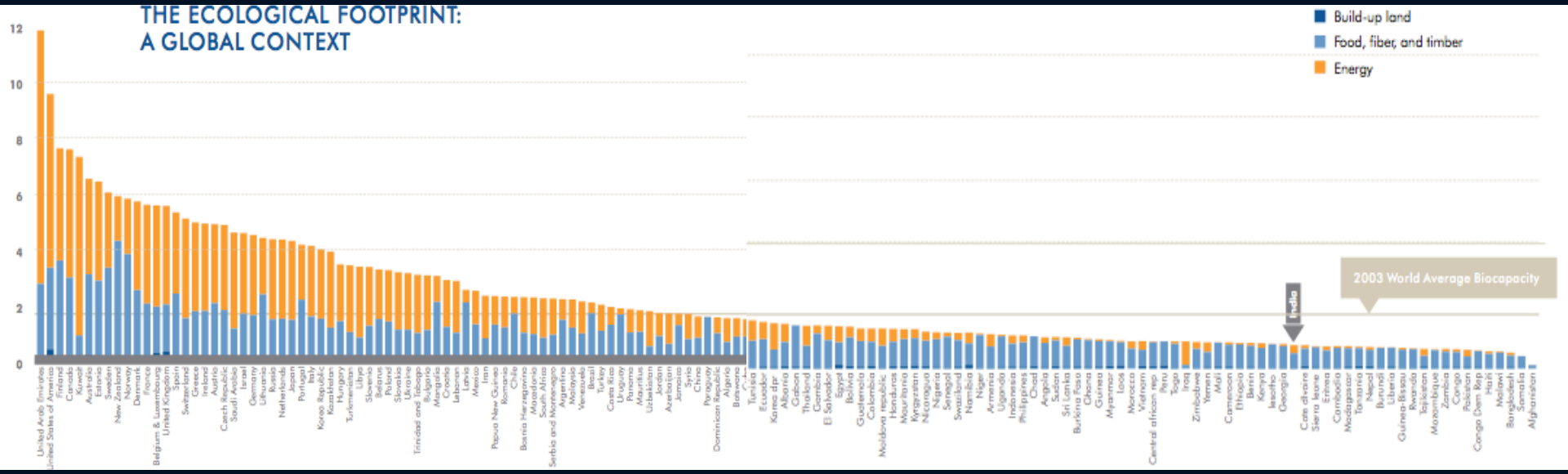
30 August 2012|Auroville

Tanmay Tathagat

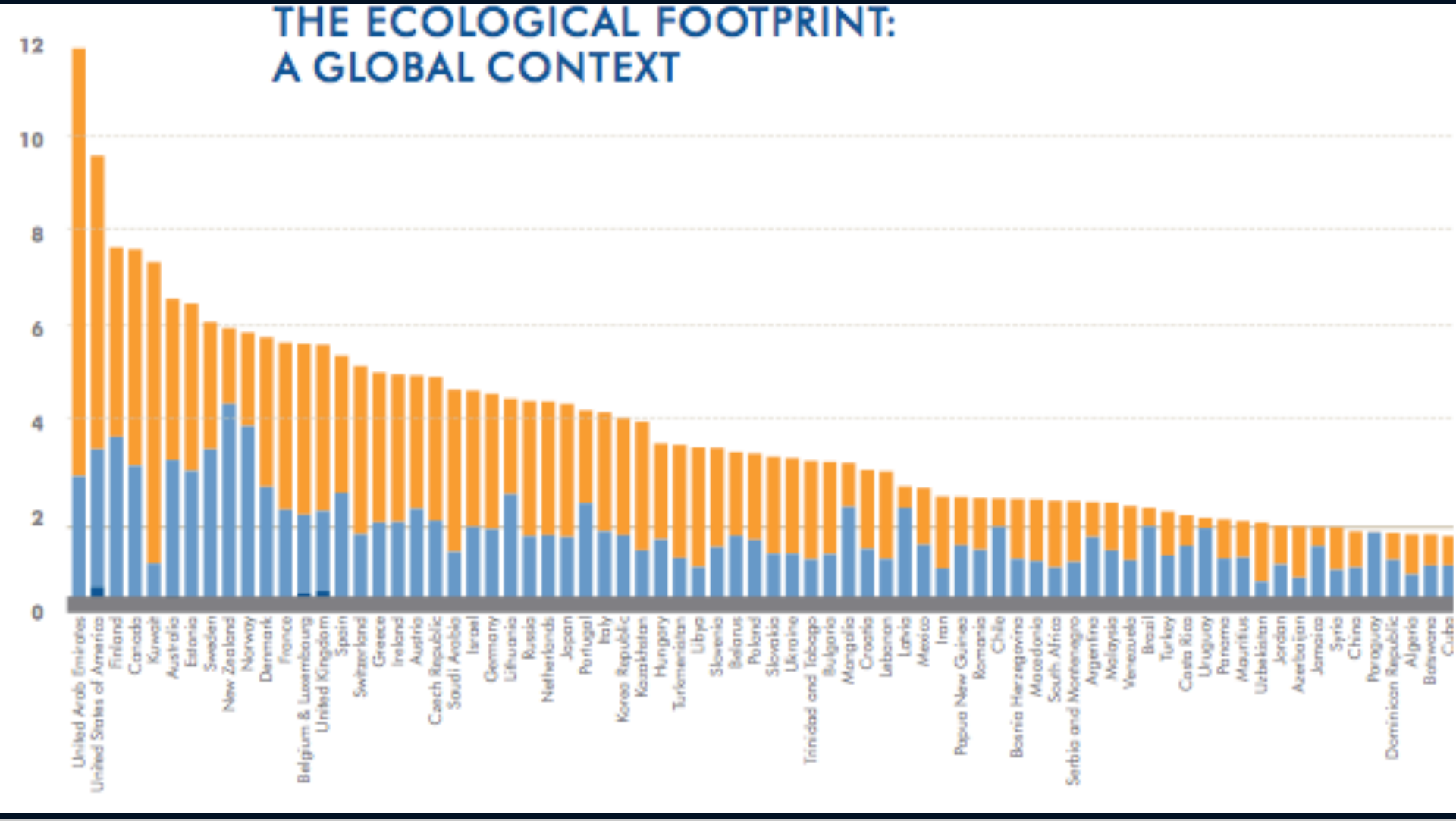
Environmental Design Solutions Pvt. Ltd

⊙Delhi ⊙Mumbai ⊙Pune ⊙Bangalore ⊙Chennai ⊙Washington DC

Ecological Footprint



Ecological Footprint Per Person (2003)



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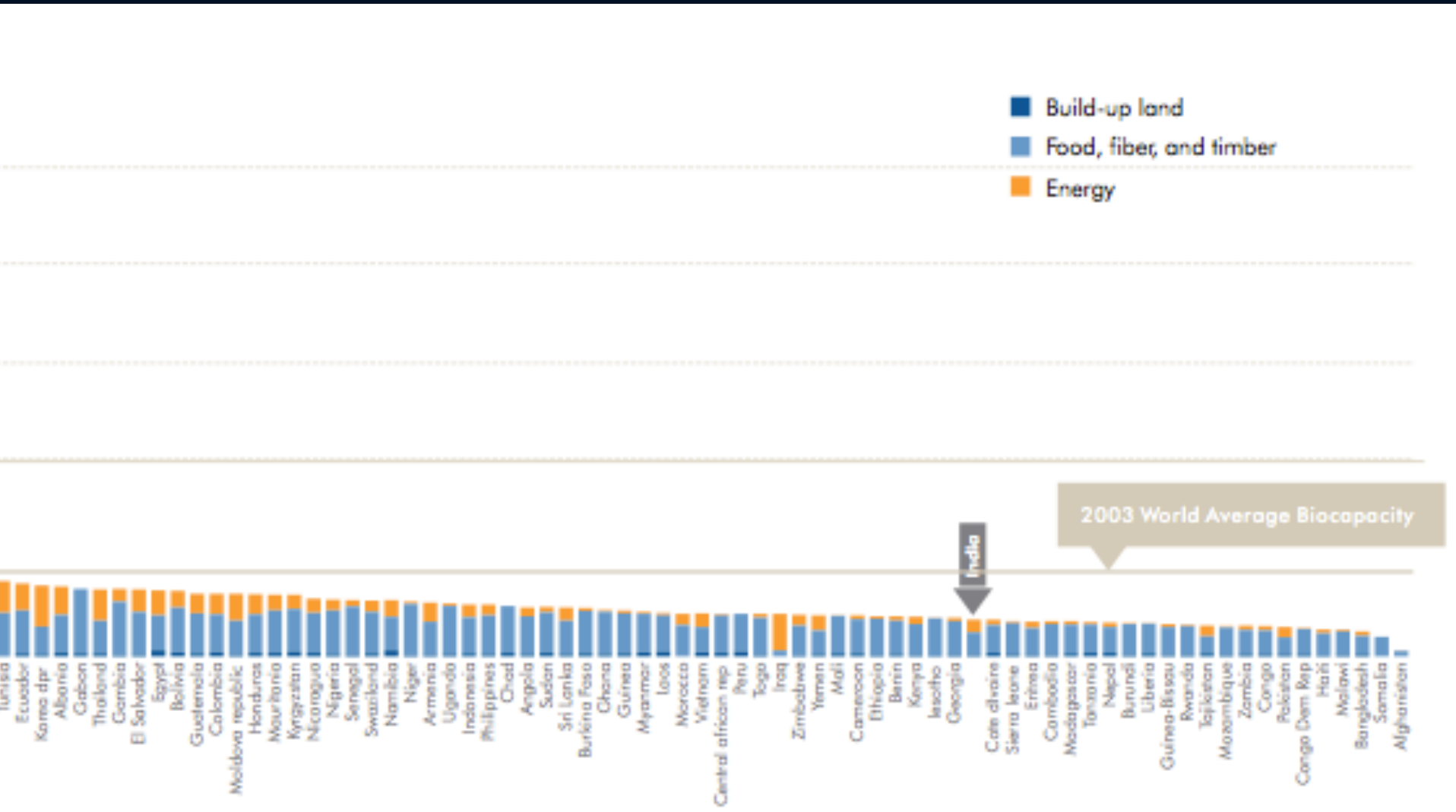
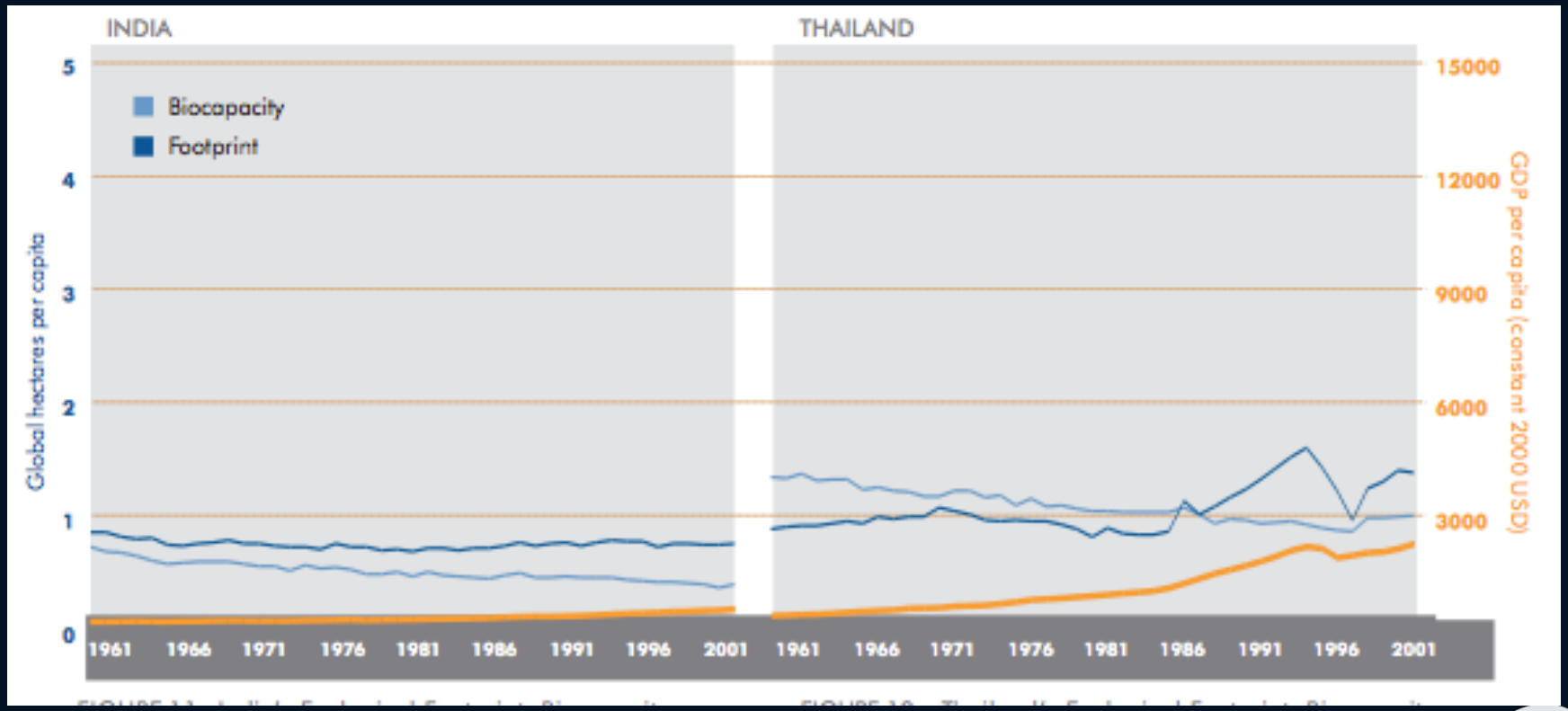
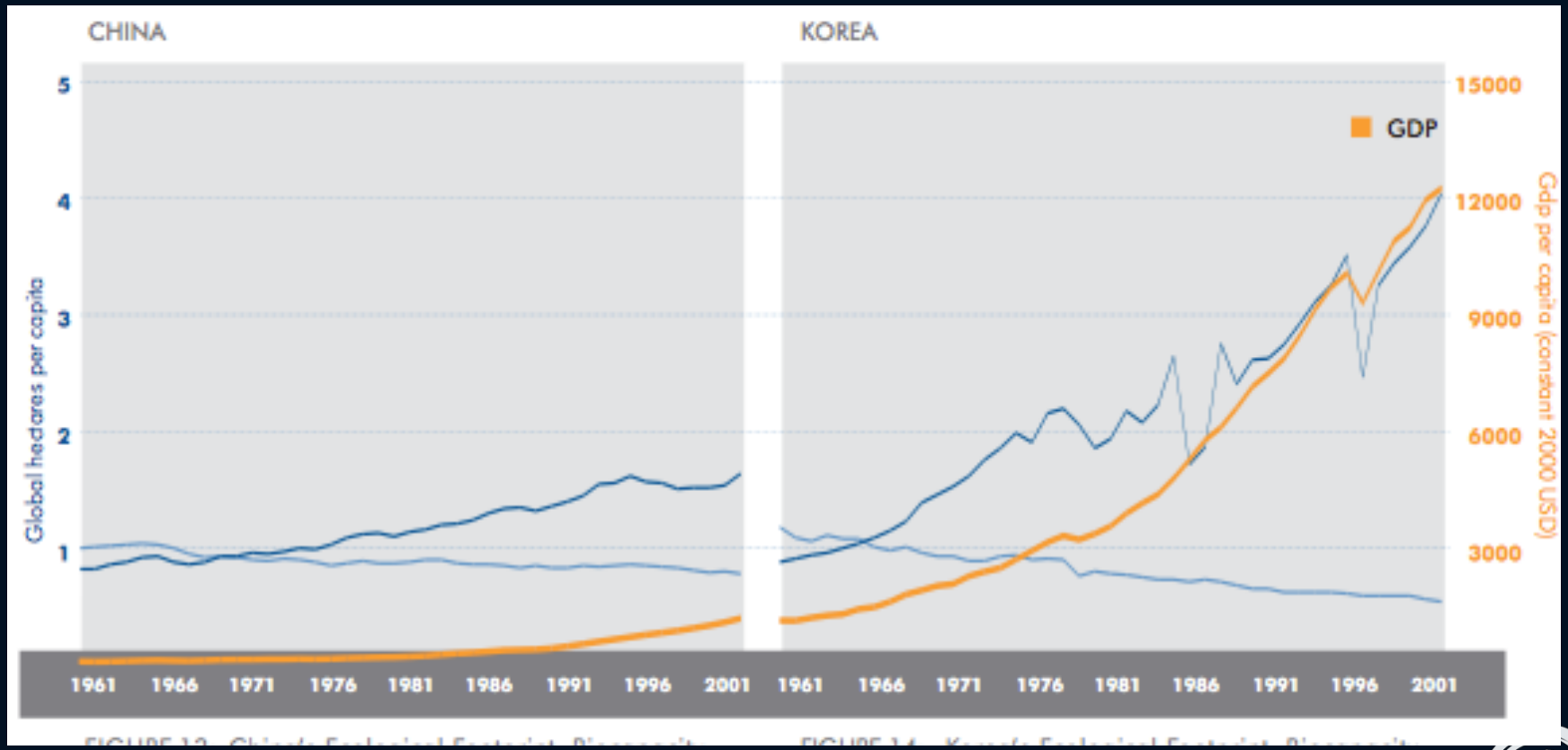
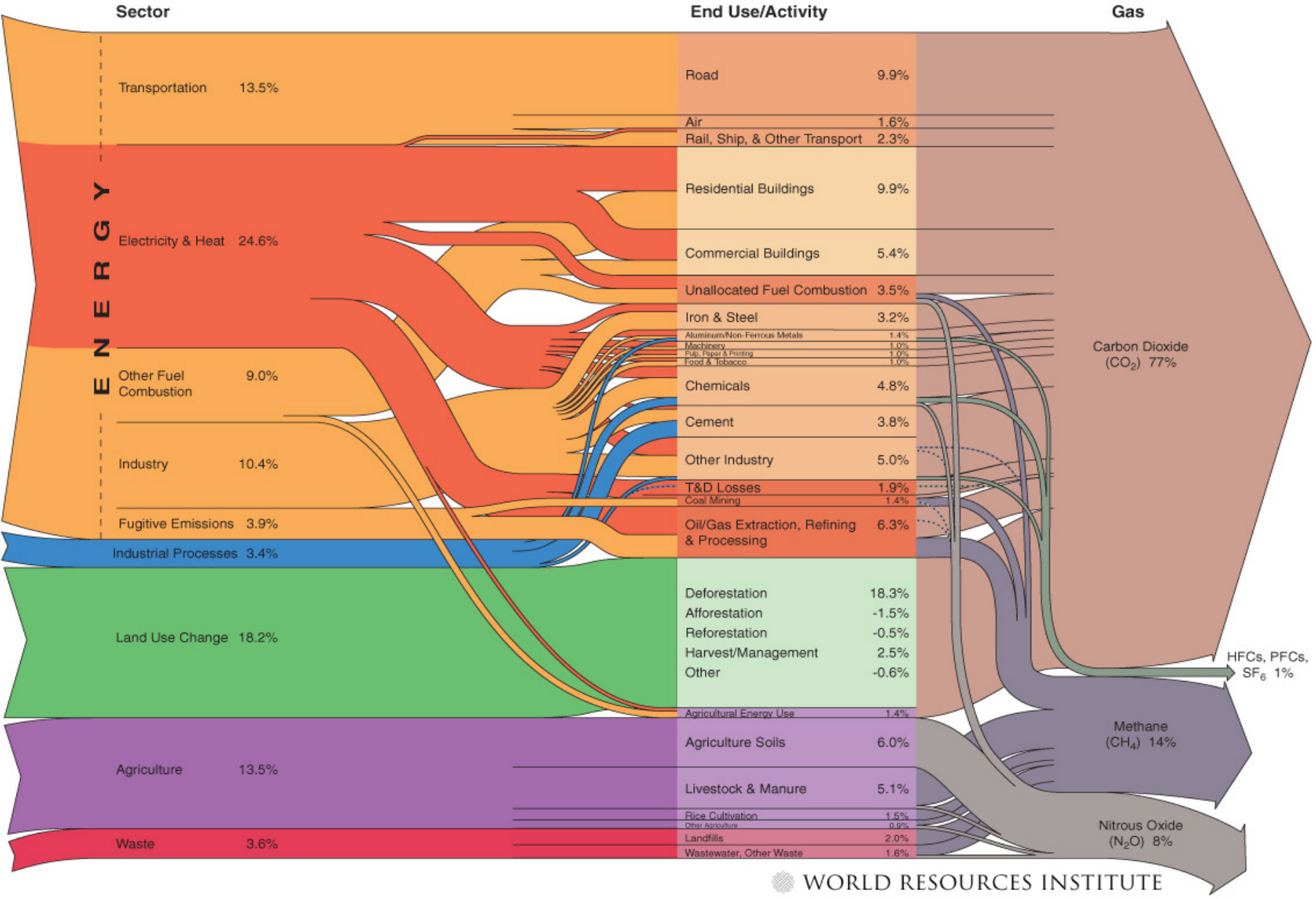


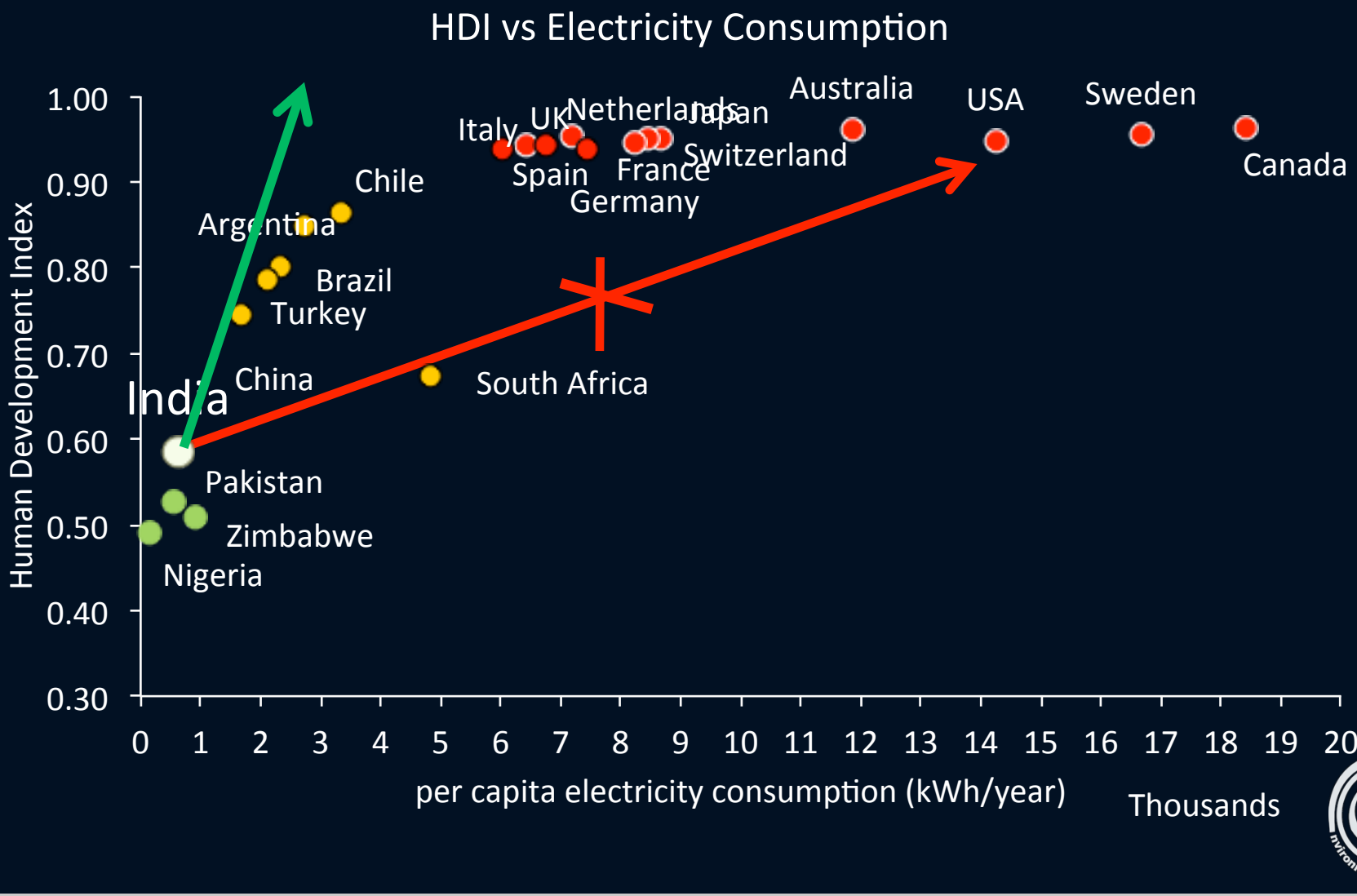




World GHG Emissions Flow Chart

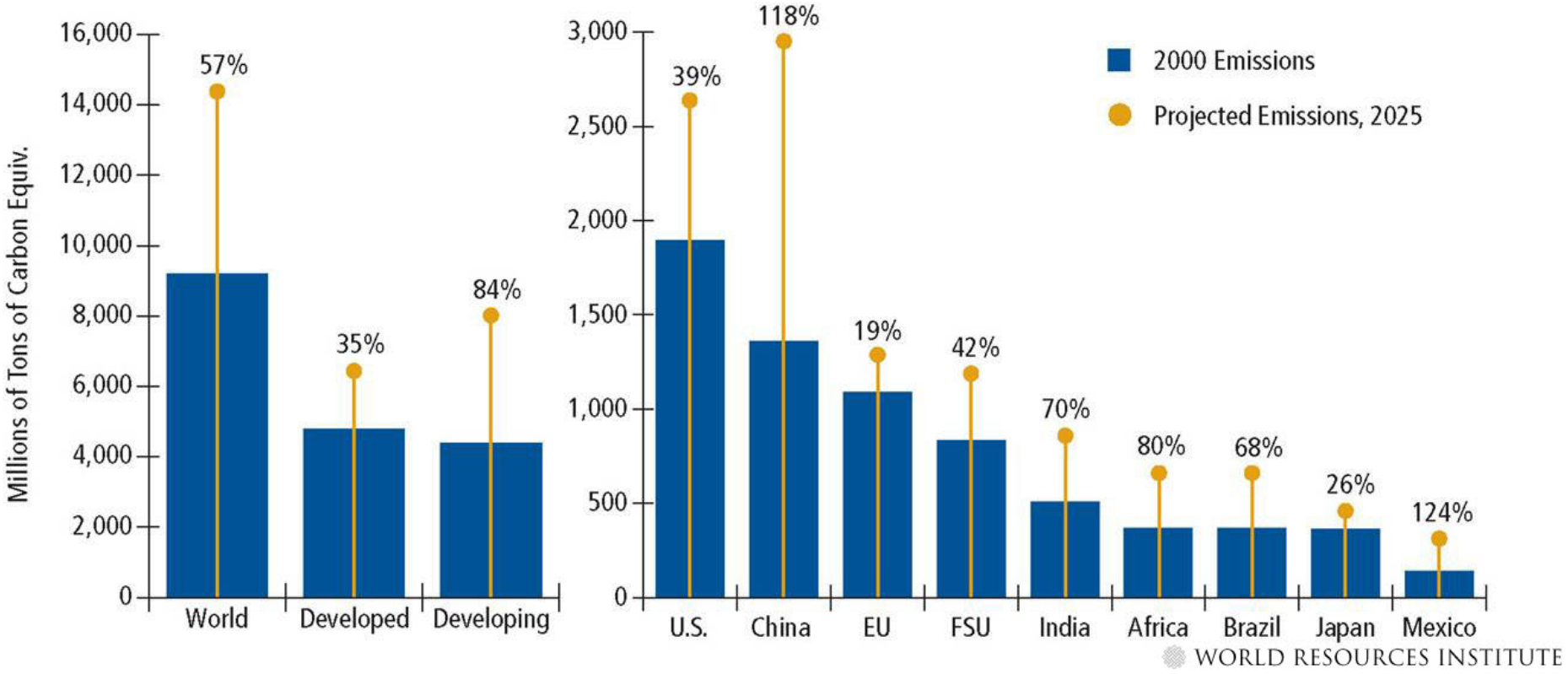


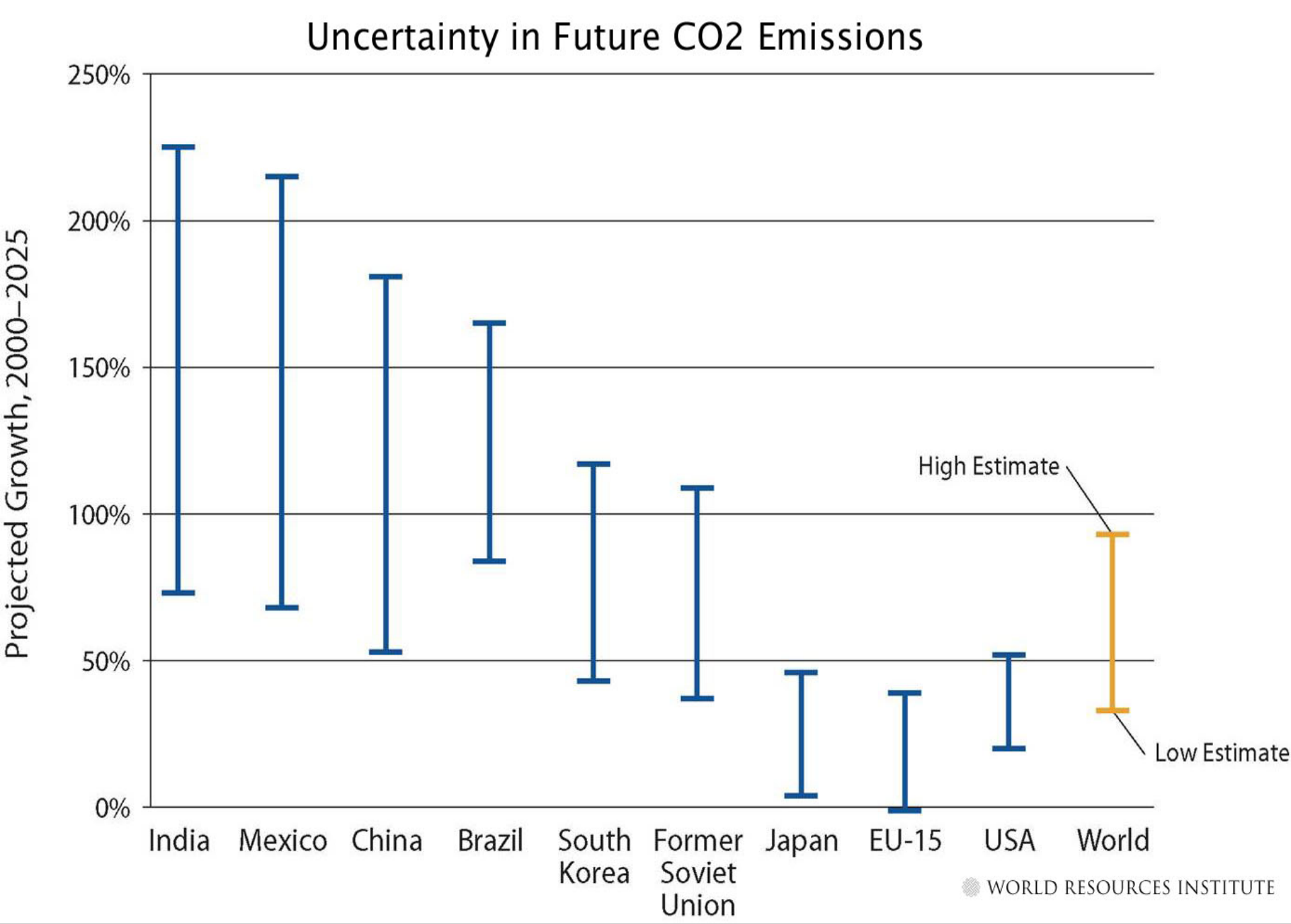
Alternate Future with Low Impact



Global Habitat Scenario

Projected Emissions of GHGs in 2025





Lifestyles & Aspirations

- The affluent in ALL countries have to make sacrifices in many wasteful areas but can still have a good quality of life;
- Those developing economically esp in large nations must aspire for a better quality of life without taking the same wasteful and resource intensive path

Impact of the Built Environment

Impact of the built environment

- 40% of the world's energy
- 25% of the timber harvested
- 16% of the fresh water used
- 50% ozone depleting CFC's
- 30% of raw materials used
- 35% of CO2 emissions
- 40% of landfill waste

Sustainability: Fulfilling needs in the present w/o compromising the potential to meet future needs

- Reducing
- Recycling
- Renewable resources
- Redefining creative solutions for common problems

Ecological Building: What can be learnt from history?

- In the past, human beings lived in harmony with their environment
  - Comfort requirements were different
  - Small population meant ample space, modest requirements, low energy needs and emissions
  - Waste products mostly recyclable & bio-degradable
  - Mobile communities
  - Low threat to the environment

Nomadic life & sparse requirements drove the architecture of the past and made it sustainable

The Modern Building ecosystem

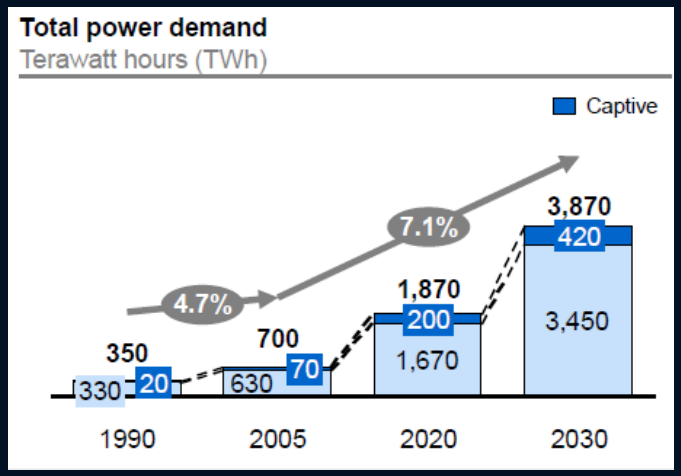
building materials	→	used materials
energy	→	wasted heat. CO_2, CO, SO_2
water	→	gray water, sewer
consumer goods	→	waste, recyclable materials
solar radiation	→	warm air
wind	→	polluted air
rainwater	→	storm water

Growth and Energy Savings Potential

Building Sector in India

Almost a third of India's electricity is used in buildings

Category	Electricity consumption (% of total)
Domestic (Buildings)	21.1
Commercial (Buildings)	7.6
Industry	45.1
Public Lighting	1.1
Transport	2.1
Agriculture	19.0
Water Works	2.2

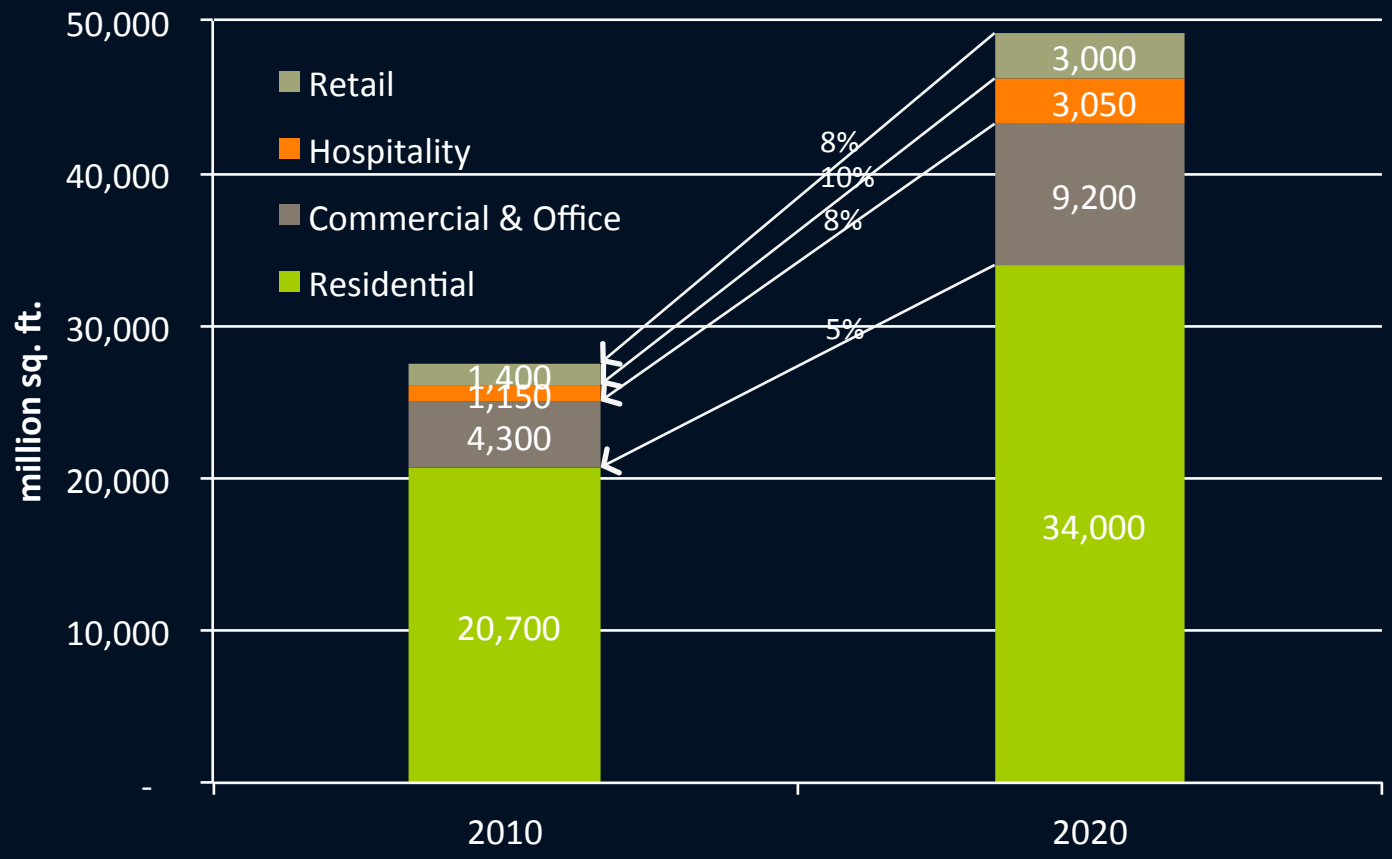


Source: Mckinsey Report

- Installed Capacity = 1,62,366.8 MW *
- Projected Capacity = 8,00,000.0 MW (2030)

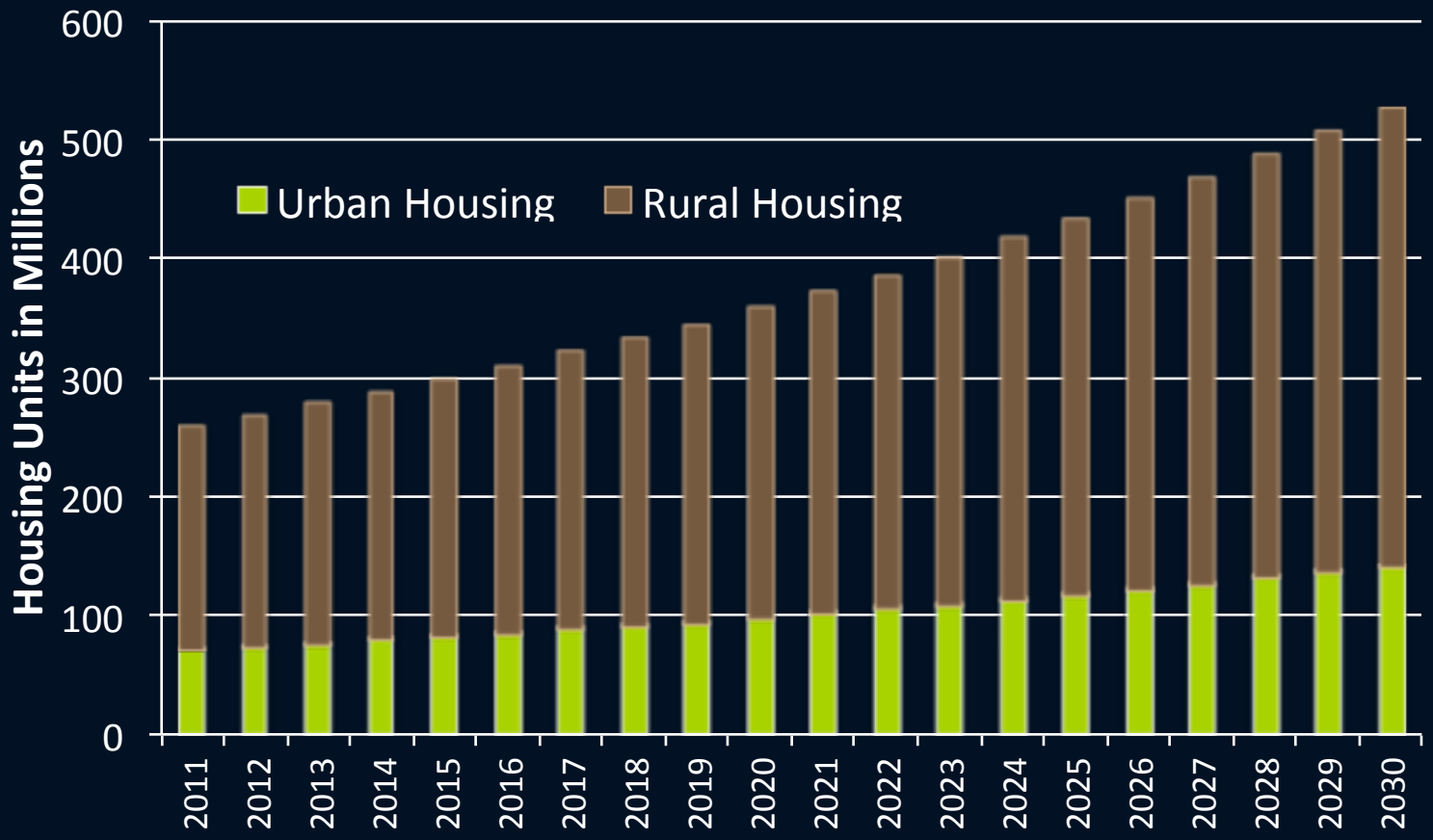
** Source: Central Electricity Authority General Review 2006 & 2009 and Planning Commission's Integrated Energy Policy Report 2006*

Growth Trend of Building Sector in India



Source: Cushman & Wakefield Sector Report 2010 & EDS Analysis

Housing Demand Growth in India



Source: Planning Commission 11th Plan Report & EDS Analysis

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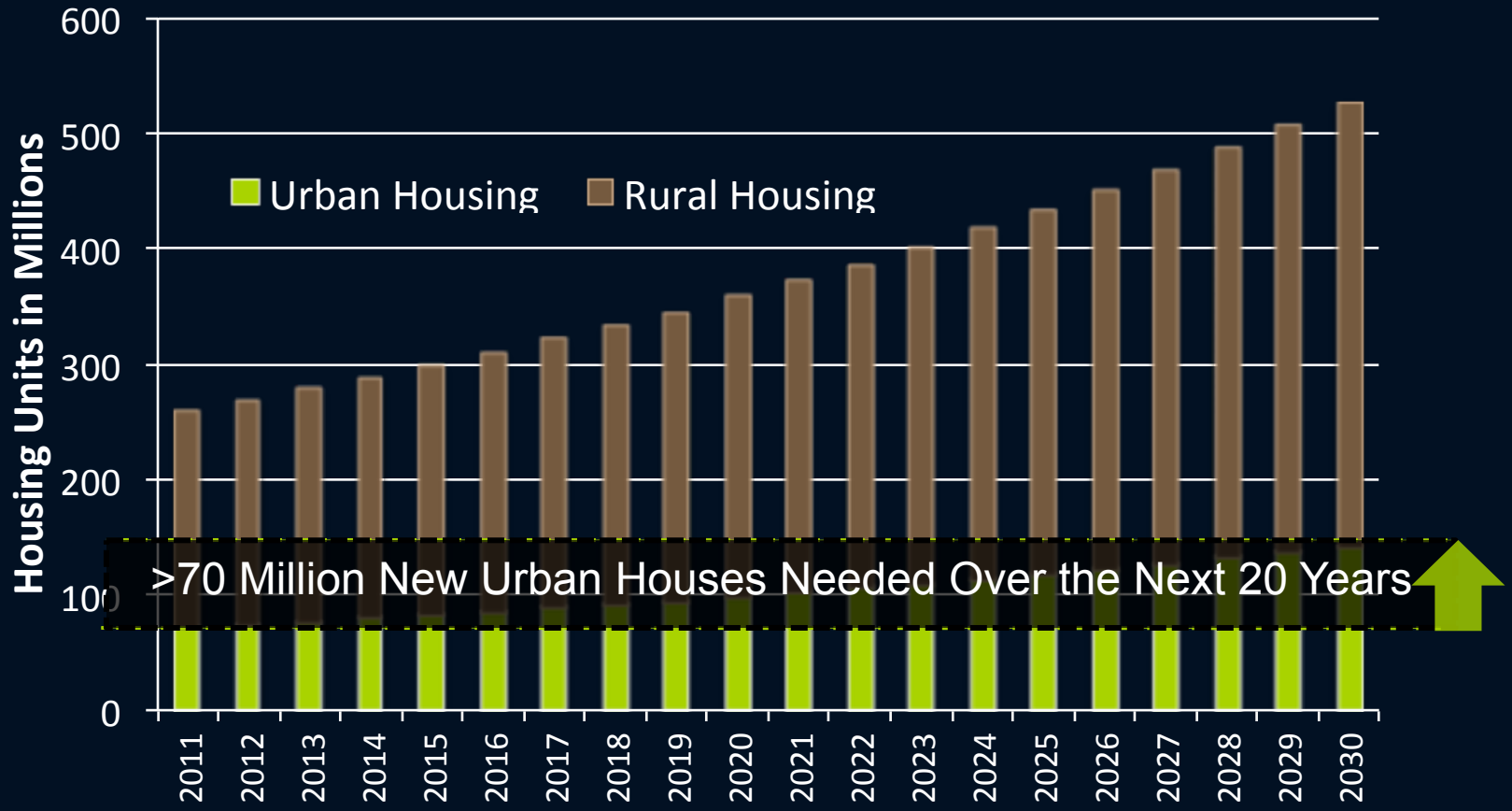

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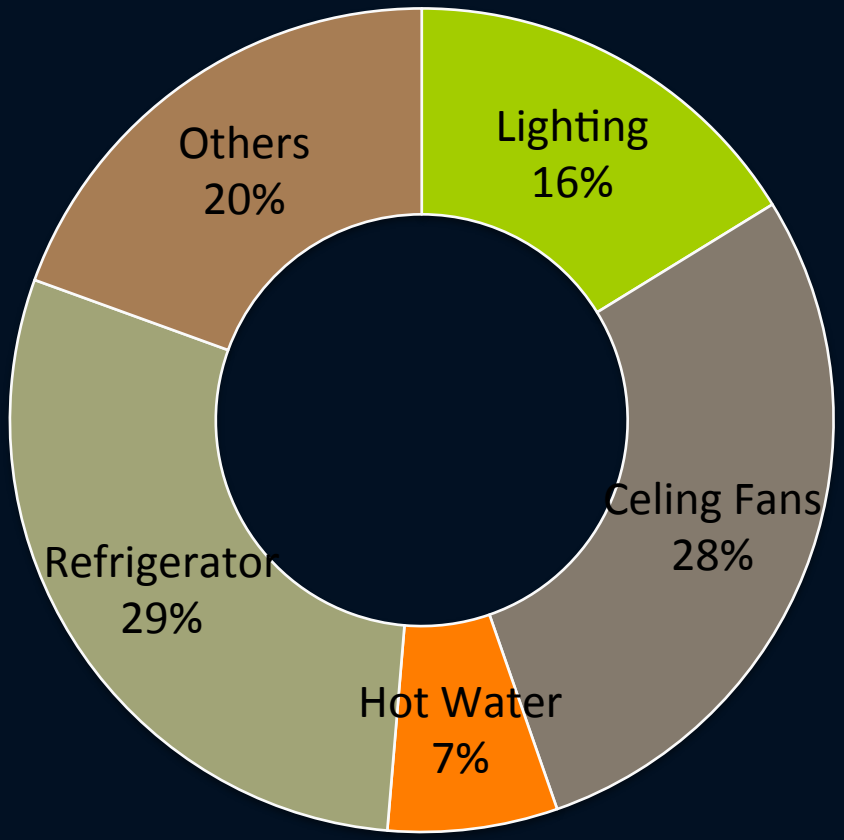
Energy Use of a Typical Residential Unit



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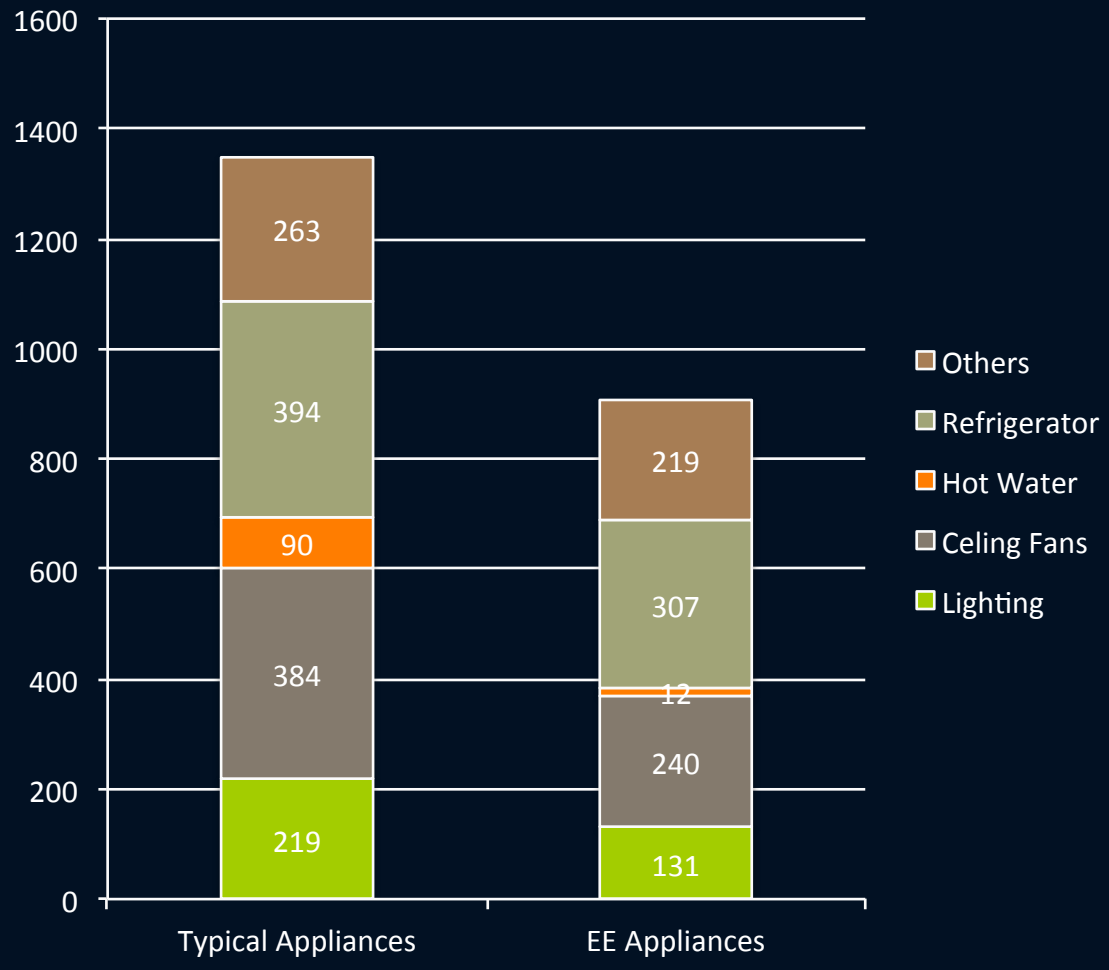

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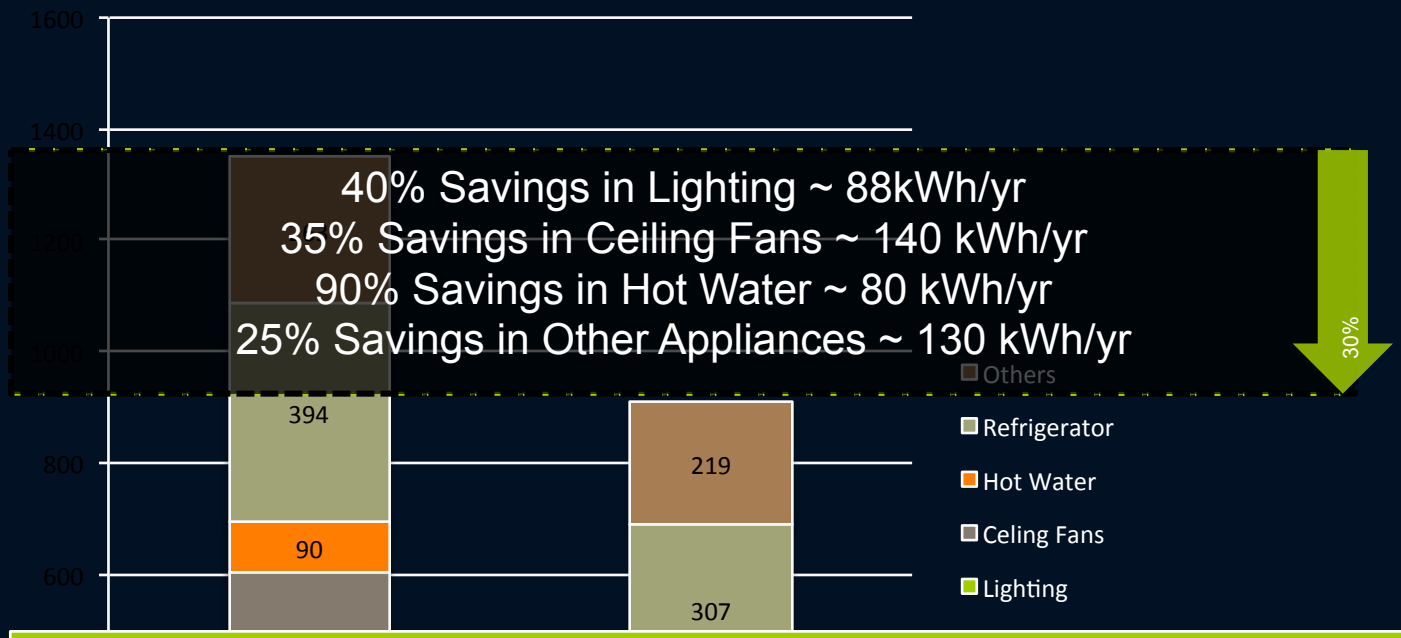
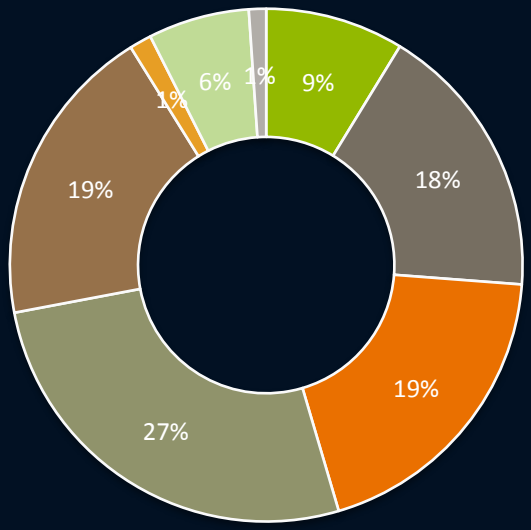
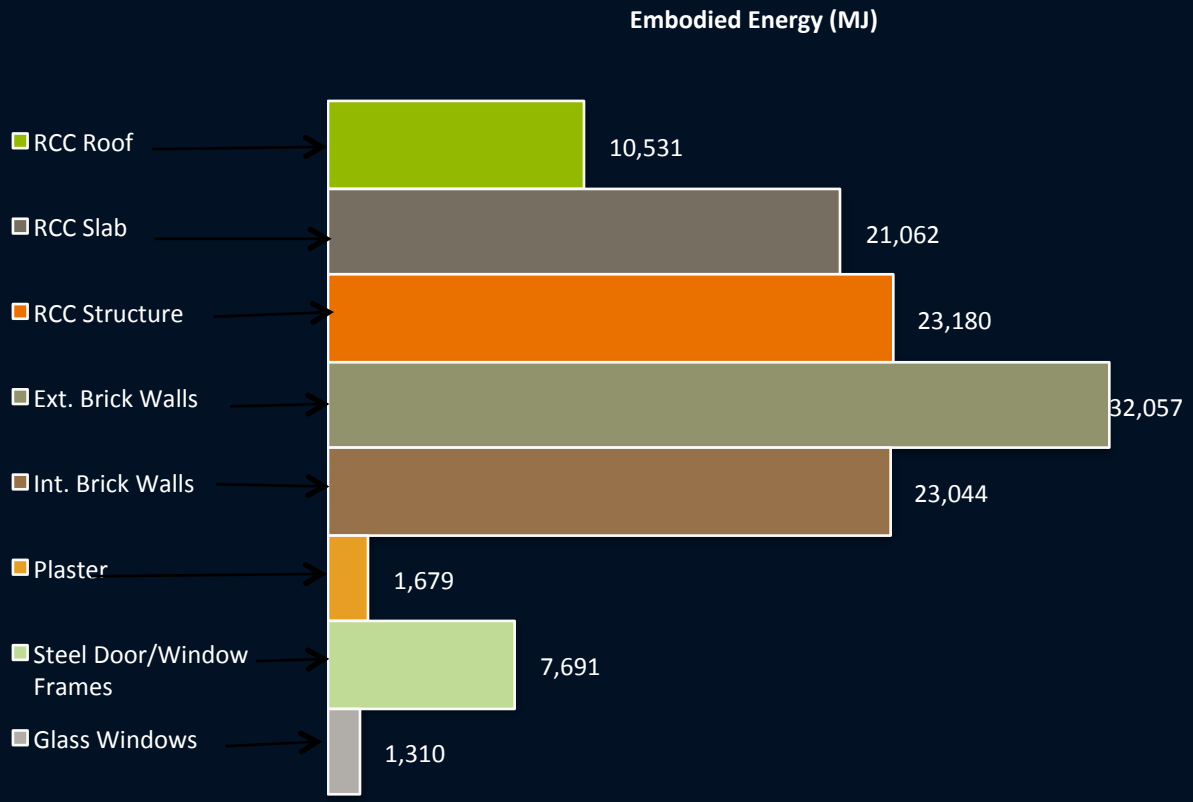


Savings of Over 300 kWh/yr ~ 900 Rs/yr due to efficient Lighting, Ceiling Fans and Solar Hot Water

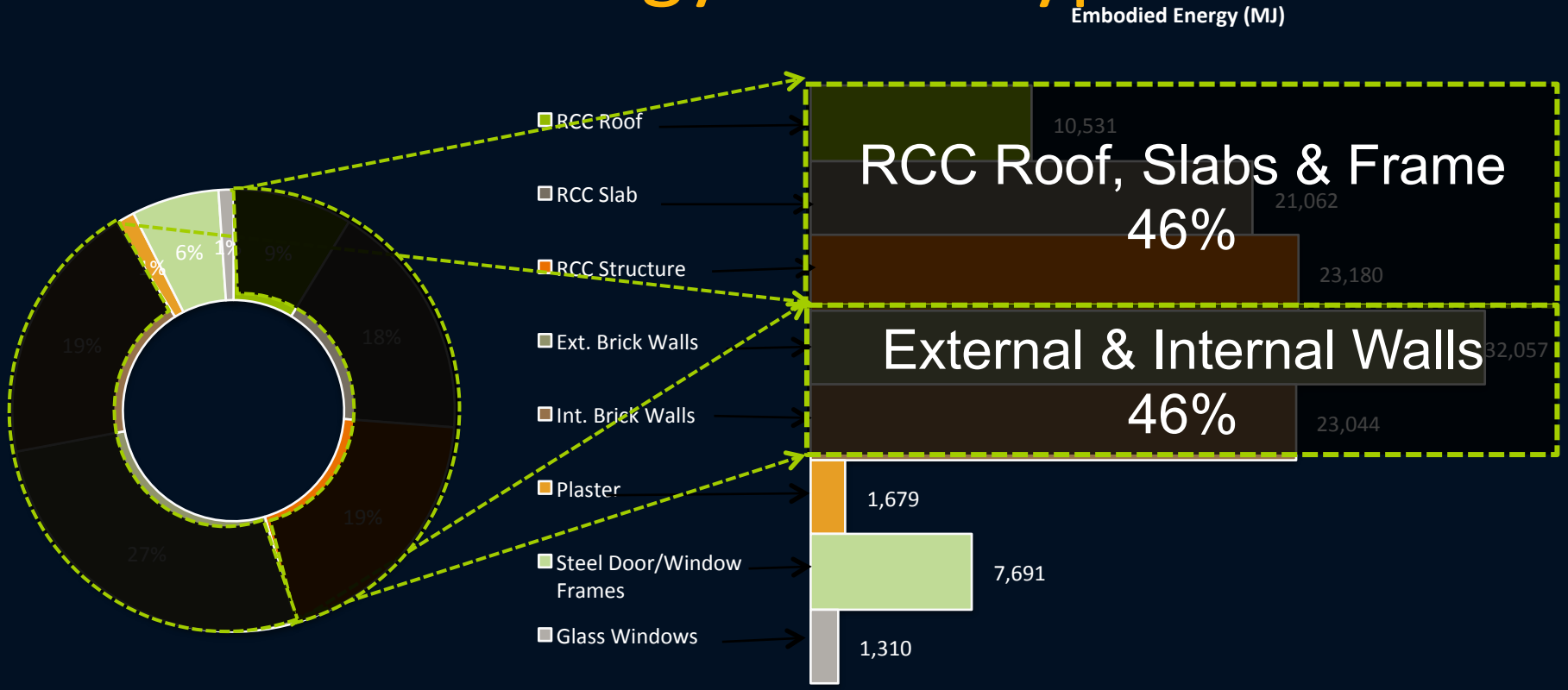
Domestic Air Conditioner Sales Growing at over 25% per year

Embodied Energy in the Typical Unit





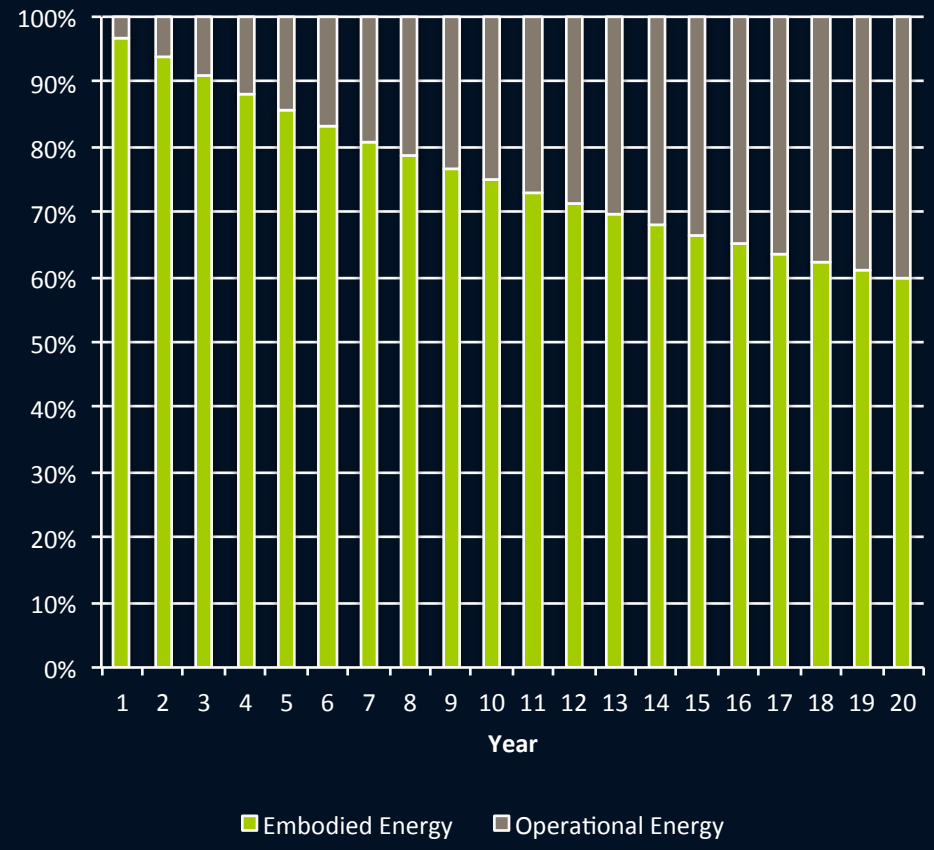
Embodied Energy in the Typical Unit



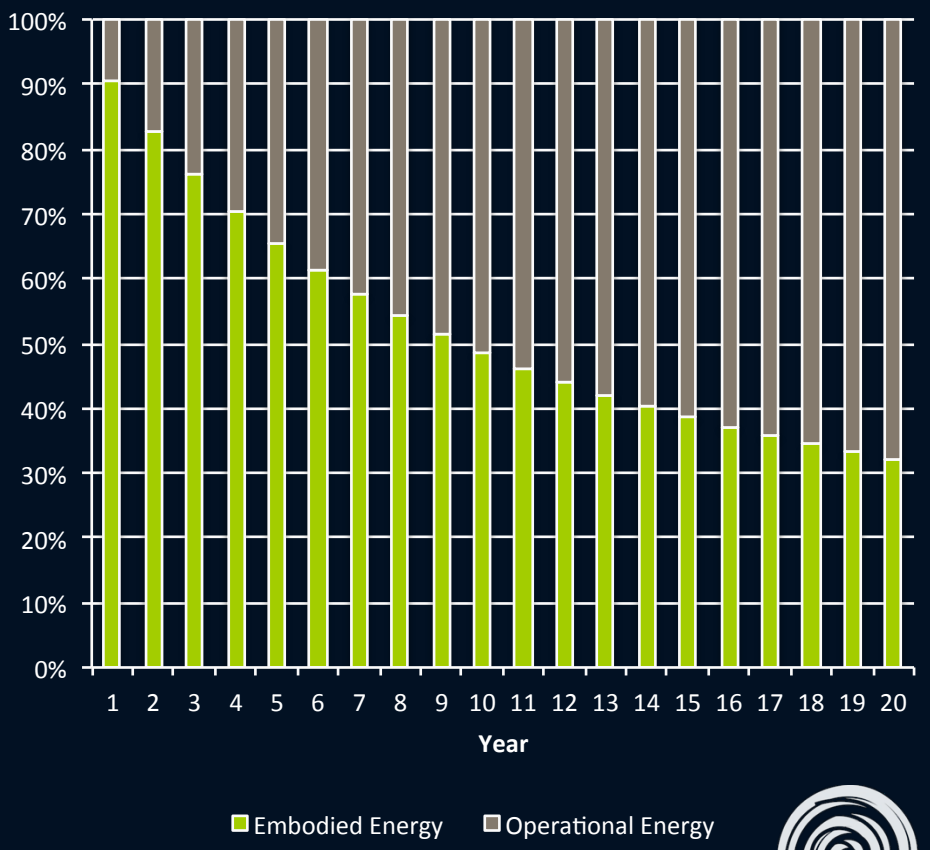
Alternate Walling & Roof/Slab Materials and Technologies will yield the Most Benefit

20 Year Life Cycle Energy Use: Importance of Embodied Energy

Unconditioned



Air Conditioned



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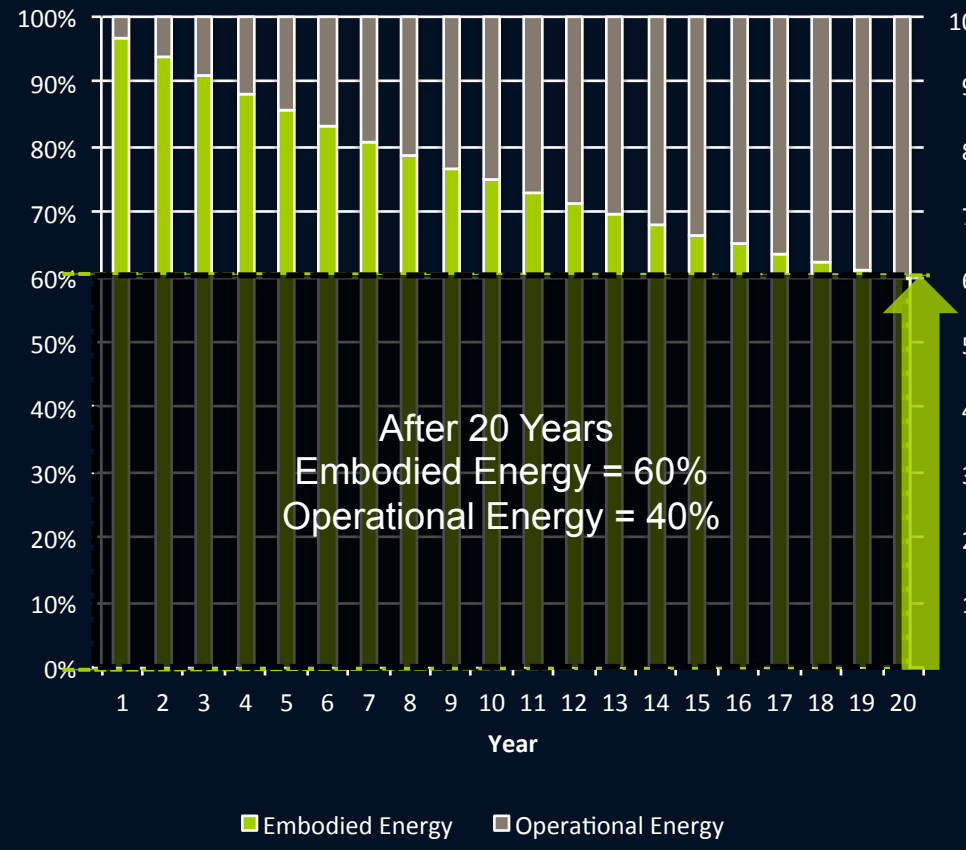

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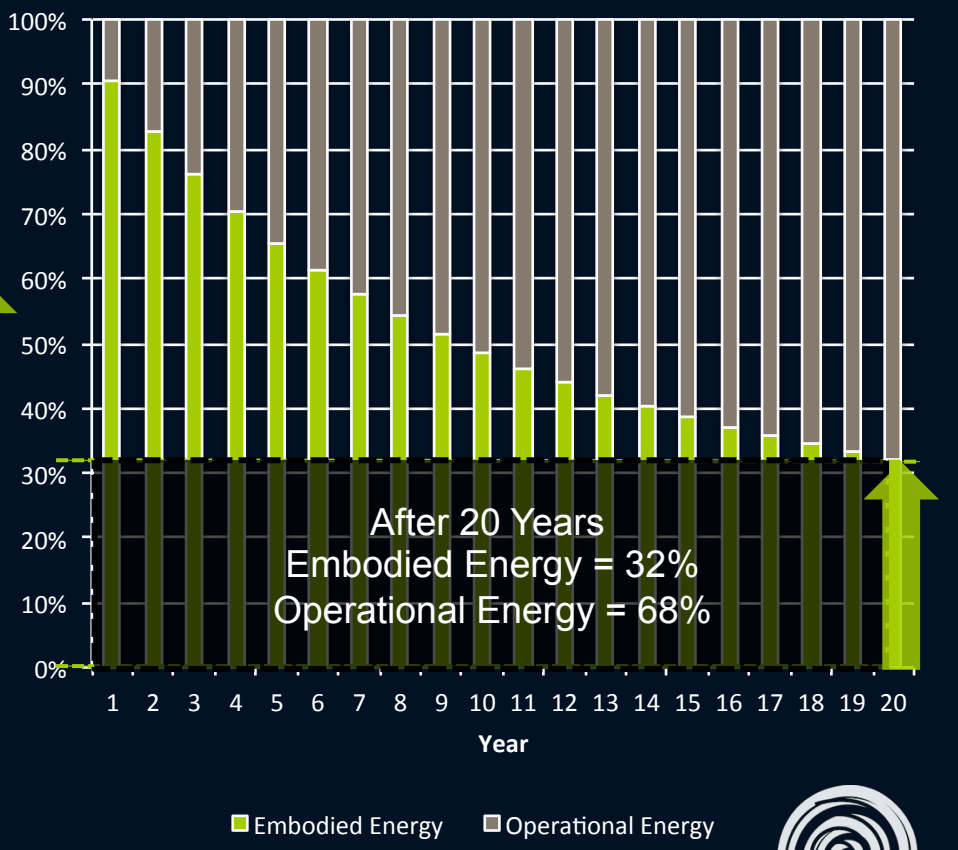


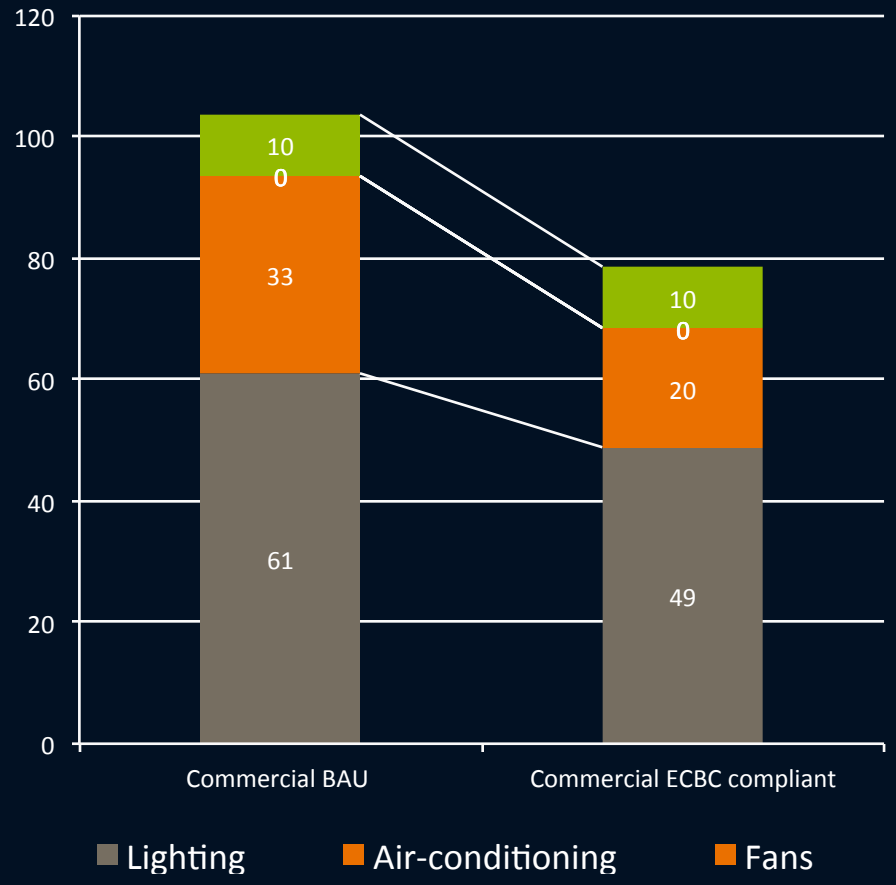
Current Policies and Initiatives

India

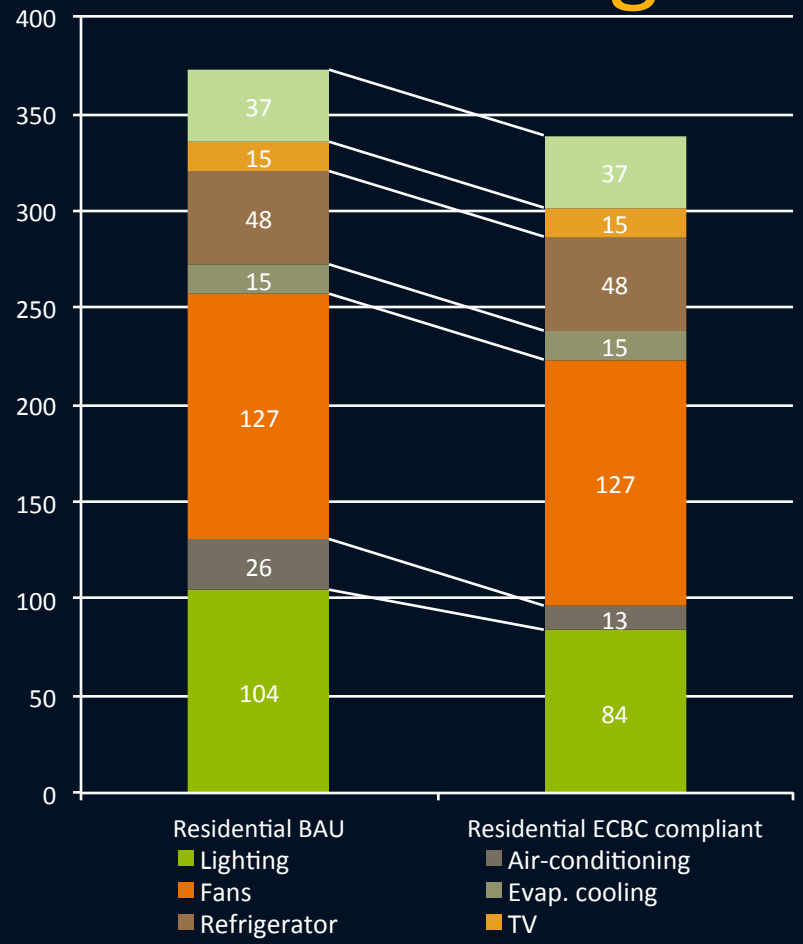
Lack of Resources is the key Driver for Energy Efficiency

- Acute water and electricity shortage in most cities
- Poor air/water/power-quality
- Overloaded infrastructure
- Global environmental concerns
- Awareness of business opportunities among the building industry
- Interest of the national/international agencies

GHG Mitigation Potential in Buildings



Commercial

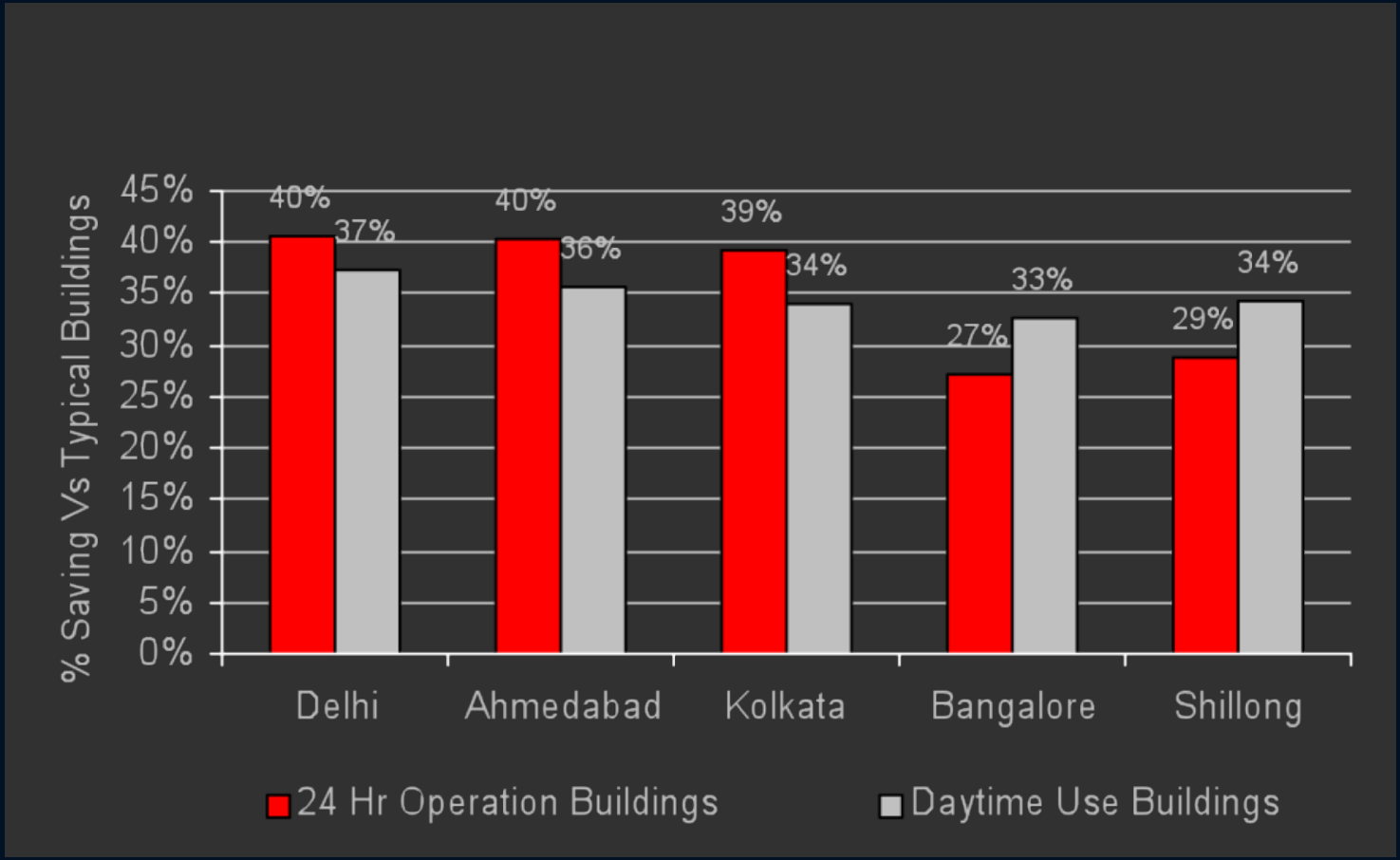


Residential

Current Building EE and GHG Mitigation Initiatives

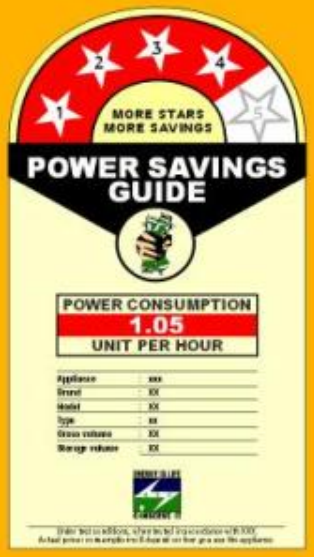
- Policies
  - Energy Conservation Act
  - Integrated Energy Policy
  - National Mission on Climate Change
  - State Level Initiatives (DSM, SDAs)
- Programs, Codes, and Standards
  - Energy Conservation Building Codes
  - National Building Code
  - Environmental Impact Assessment and Clearance
  - Appliance/Equipment Labeling and Standards

25%-40% EE Potential with ECBC



National Energy Savings = Code Stringency X Level of Compliance X Adoption Rate

INTRODUCING BEE LABEL. THE NEW SIGN OF ENERGY EFFICIENCY.



Energy Labeling for Appliances and Existing Buildings

Other Initiatives

- Green Building Rating Systems
  - LEED India, GRIHA, Eco-Housing
  - Over 1 billion sft of Green Buildings by 2012
- Labeling and Certification
  - BEE Building Energy Labeling
  - NHB-KfW Program for EE Residential
- Programs for Green Affordable Housing

Financing Green/EE Projects

- NHB-KfW program for Energy Efficient Housing
- Banks and Housing Finance Companies
  - State Bank of India (0.25% concession in interest rate and waiver of processing fees)
- Municipal fee and tax incentives
  - Pune Municipal Corporation (PMC) provides a rebate of 10% on property tax for home owner on Eco-Housing certified projects
- State Electricity Regulatory Commissions (SERC) / Utilities tariff incentives being developed

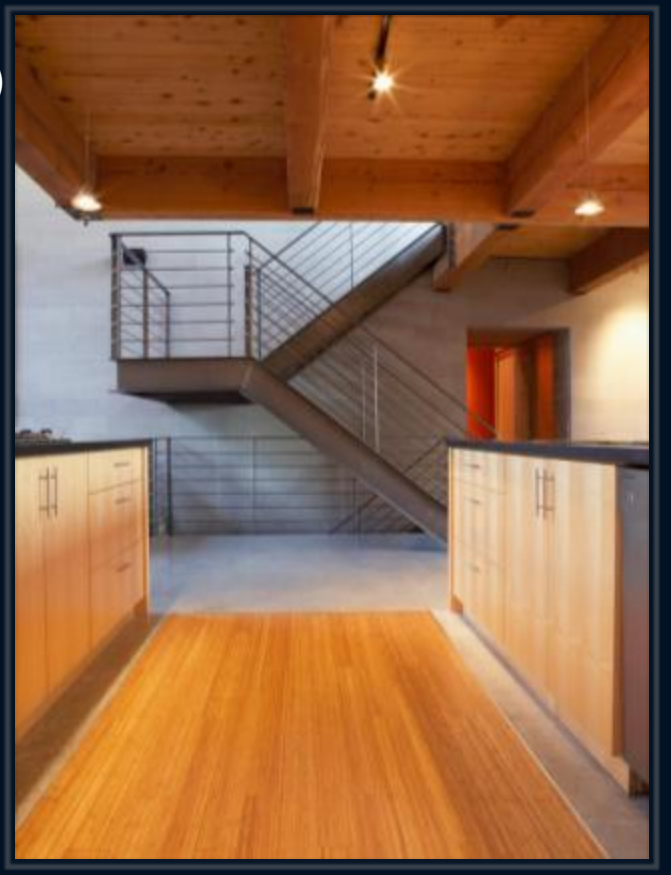
Reducing GHG Emissions in Building

Policy Strategies

Based on study by EDS for Climateworks Foundation

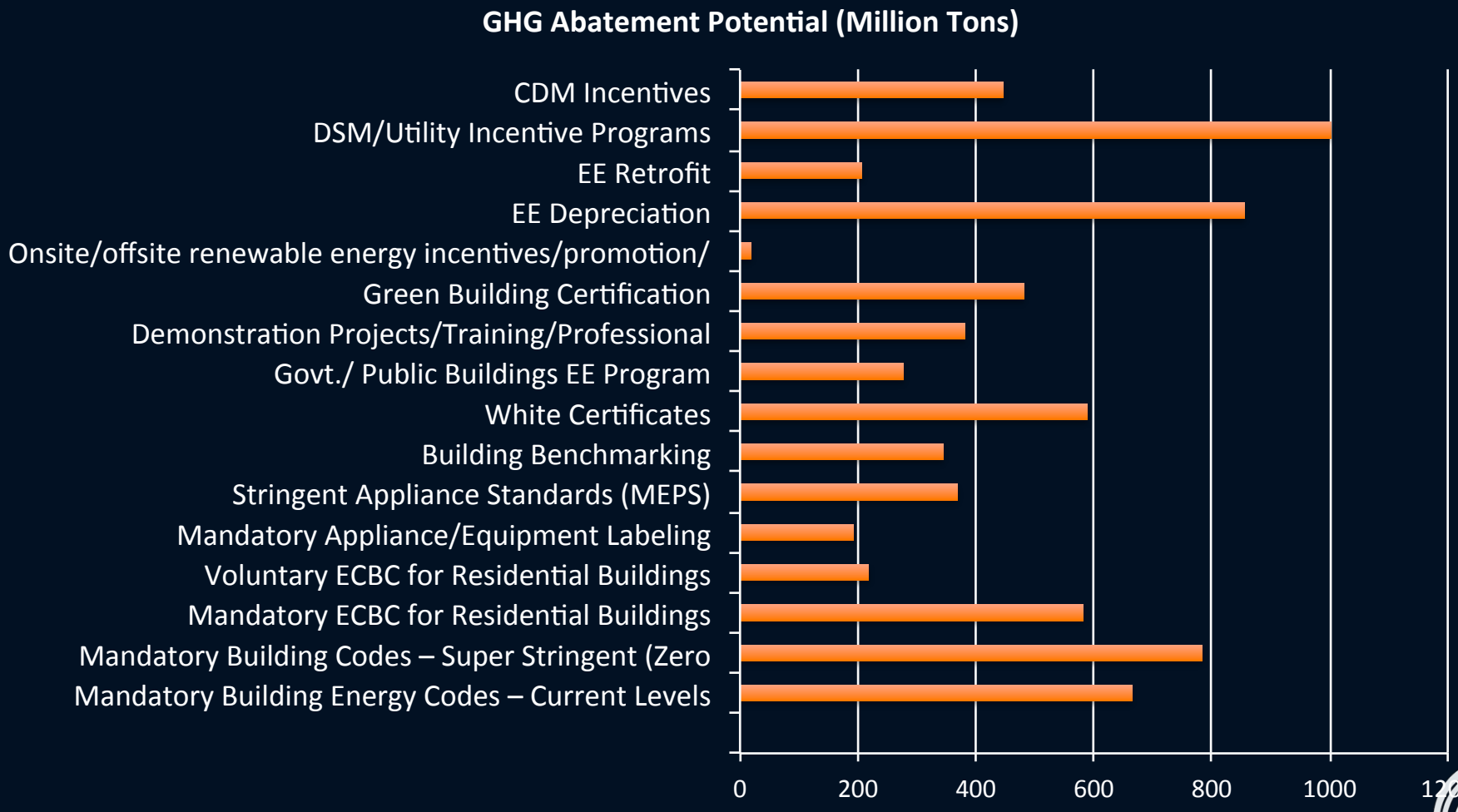
Key Strategies for Reducing Building GHG Emissions

- Mandatory Building Energy Codes – Current Levels
- Mandatory Building Codes – Super Stringent (Zero Energy Target)
- Mandatory ECBC for Residential Buildings
- Voluntary ECBC for Residential Buildings
- Mandatory Appliance/Equipment Labeling
- Stringent Appliance Standards (MEPS)
- Building Benchmarking
- White Certificates
- Govt./ Public Buildings EE Program
- Demonstration Projects/Training/Professional Certification
- Green Building Certification
- Onsite/offsite renewable energy incentives/promotion/standard
- EE Depreciation
- EE Retrofit Incentive Program
- DSM/Utility Incentive Programs
- CDM Incentives
- Sustainable Urban Development Policies (Smart Growth)
- Sustainable Land-Use Policies



Strategy	Barriers				
	Policy and Institutional	Finance	Business and Management	Awareness and	Material and Technology
Mandatory Building Energy Codes – Current Levels	•	•	•		
Mandatory Building Codes – Super Stringent (Zero Energy Target)	•	•	•	•	•
Mandatory ECBC for Residential Buildings	•	•	•	•	
Voluntary ECBC for Residential Buildings		•	•	•	
Mandatory Appliance/Equipment Labeling				•	
Stringent Appliance Standards (MEPS)	•	•		•	•
Building Benchmarking				•	
White Certificates	•			•	
Govt./ Public Buildings EE Program		•		•	
Demonstration Projects/Training/Professional Certification		•	•	•	
Green Building Certification		•	•	•	
Onsite/offsite renewable energy incentives/promotion/standard					
EE Depreciation	•				
EE Retrofit Incentive Program		•	•	•	
DSM/Utility Incentive Programs	•			•	
CDM Incentives		•	•	•	
Sustainable Urban Development Policies (Smart Growth)	•			•	
Sustainable Land-Use Policies	•			•	

GHG Mitigation Potential till 2030

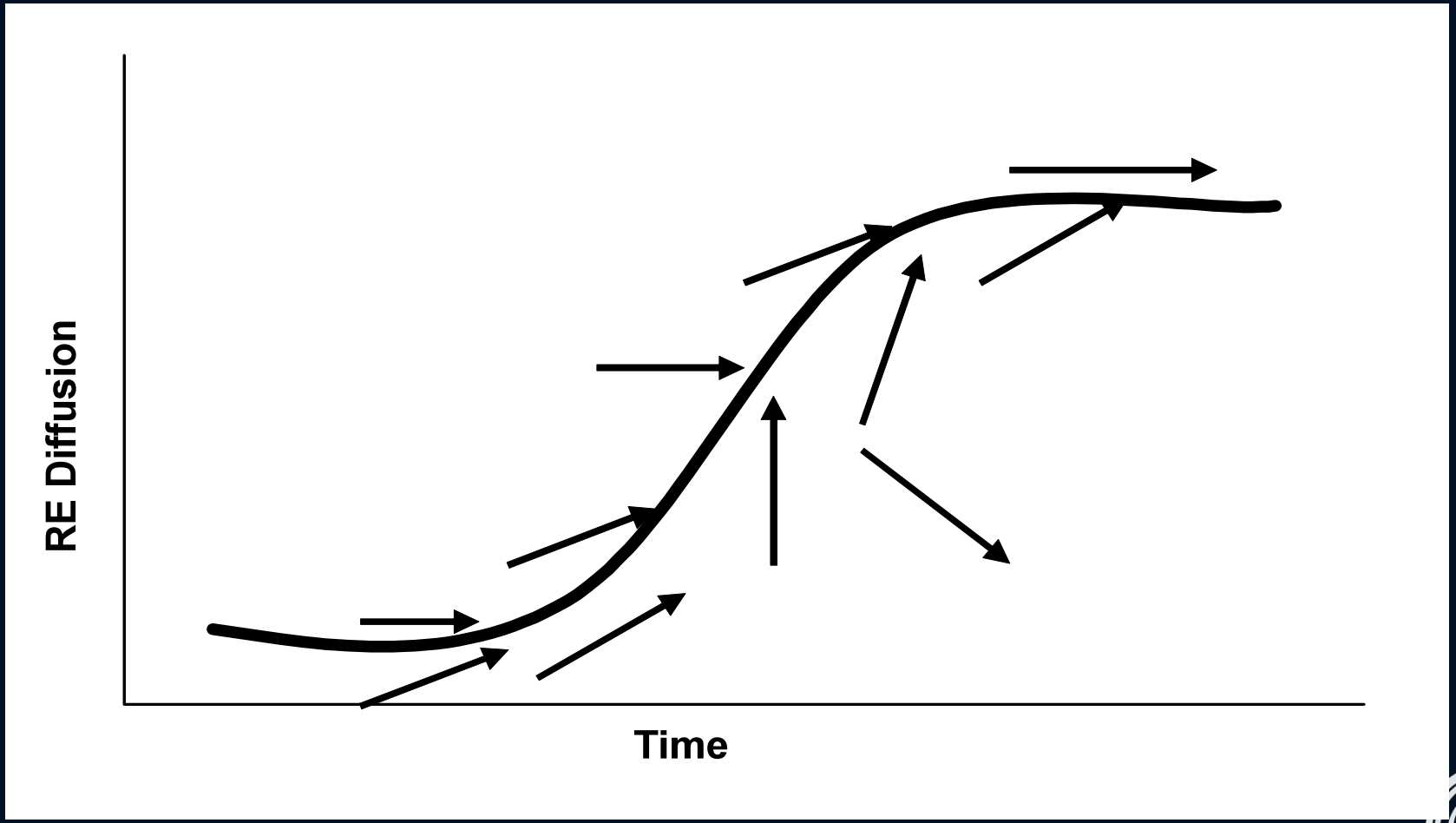


Based on study by EDS for Climateworks Foundation

Key Barriers to Building Energy Efficiency Implementation

- Strong first cost bias
- Split Incentives
- Lack of availability of efficient products
- No easy accounting of Embodied Energy
- Lack of energy expertise
- Lack of awareness, info. and tools
- Electricity rate structures / rural subsidies
- Territoriality by agencies
- Lack of government & utility “Champions”

Mainstreaming - accumulation of multiple influences



Classic reasons for failure of uptake of EE

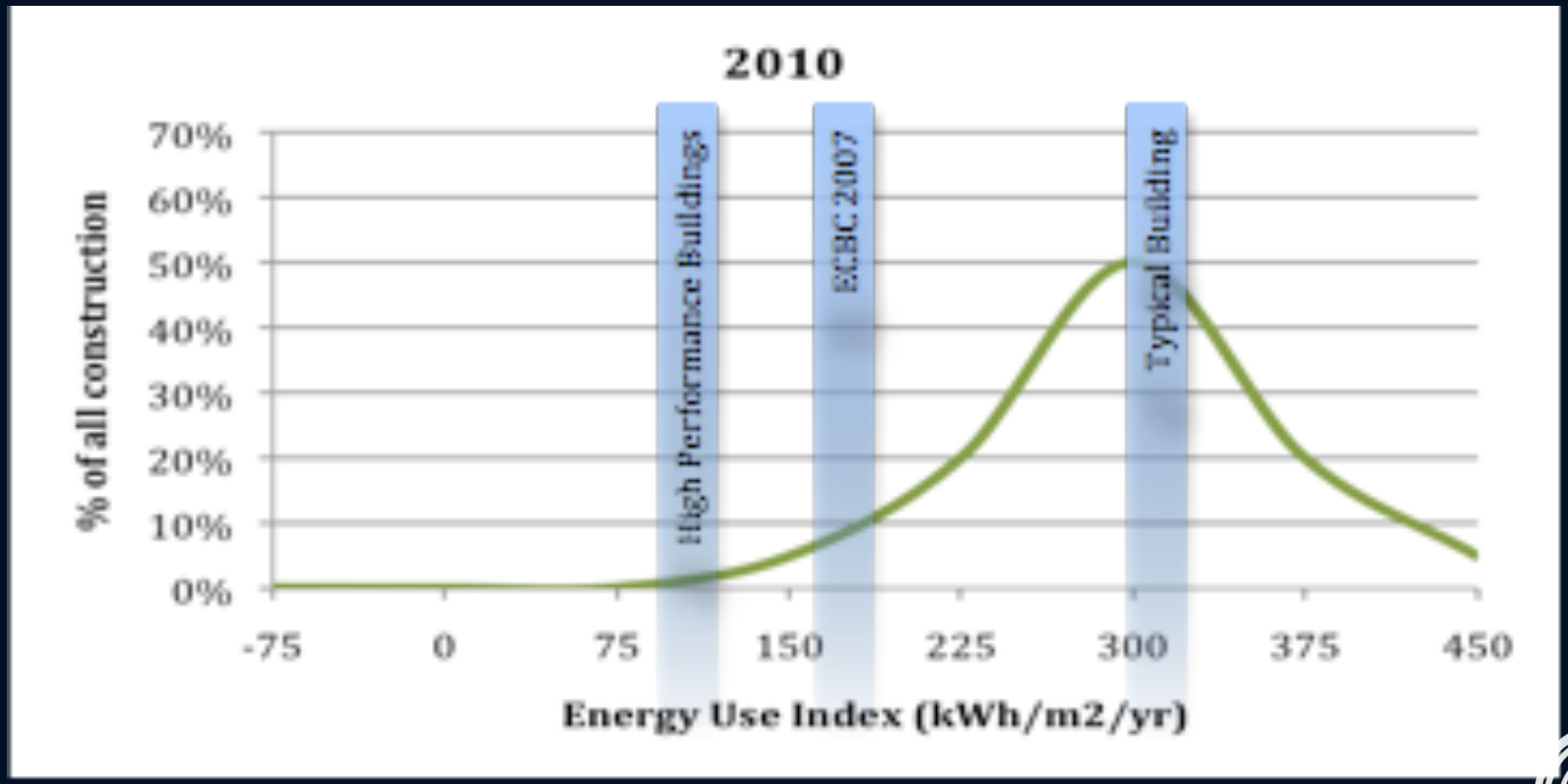
- Market failures:
  - The market produces insufficient information about the performance of different technologies and options.
- Organizational failures:
  - Neglect life cycle costs, high discount rates to evaluate energy efficiency related investments, and provide inadequate incentives
- Limitations on decision-making:
  - Individuals do not make decisions in the manner assumed by economic models, but are instead subject to severe constraints on attention, resources and their ability to process information

Vision 2030

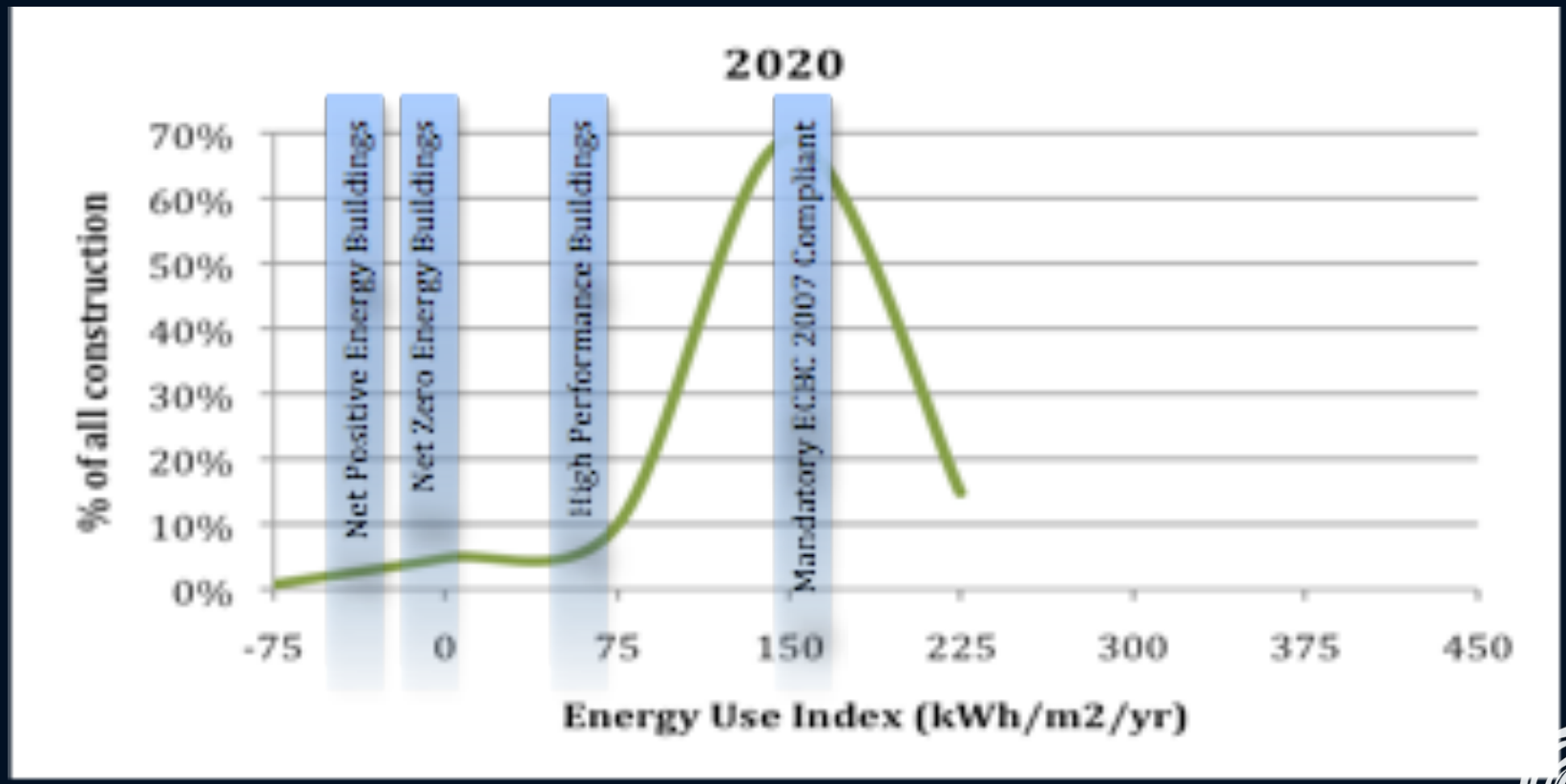
Energy Efficient Buildings

Based on study by EDS for Climateworks Foundation

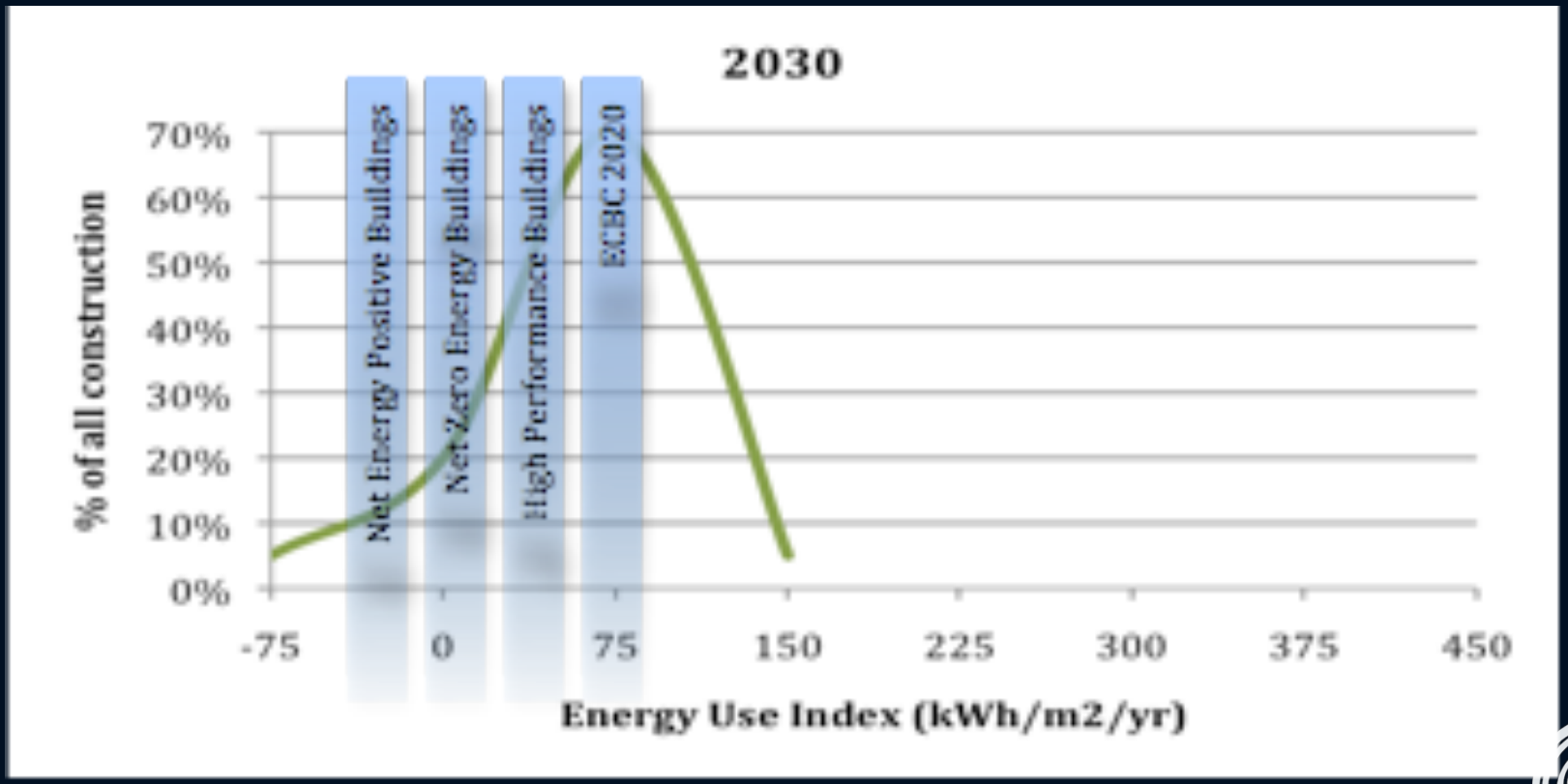
Buildings in India: Vision 2030



Buildings in India: Vision 2030



Buildings in India: Vision 2030



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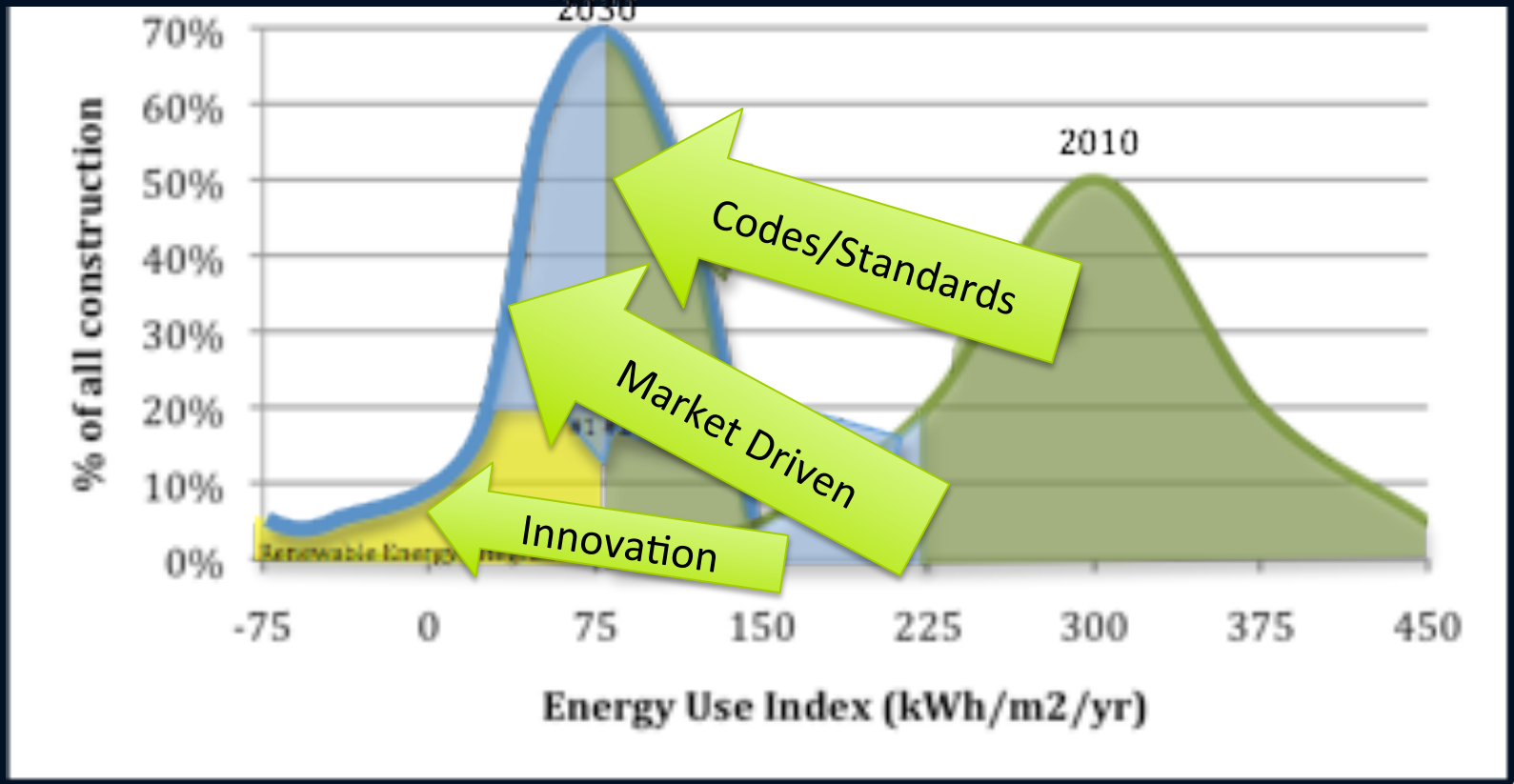
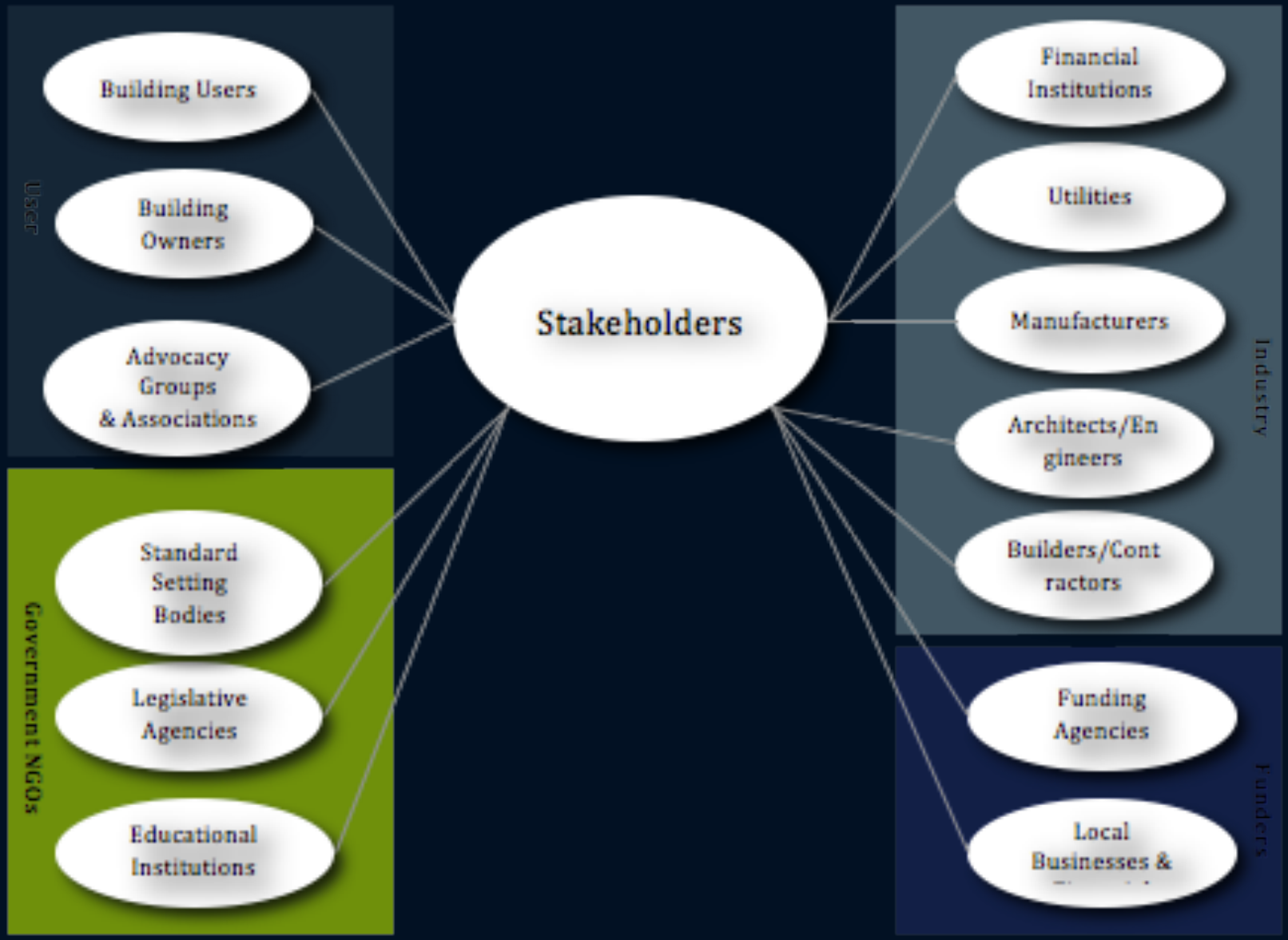


Success Factors

- Clear Quantifiable Goals
- Enabling Policy Framework
- Supporting Fiscal/Financial Mechanism
- Technical Capacity to Deliver
- Robust Checks and Balances
- Awareness and Marketing
- M&V and Refinement

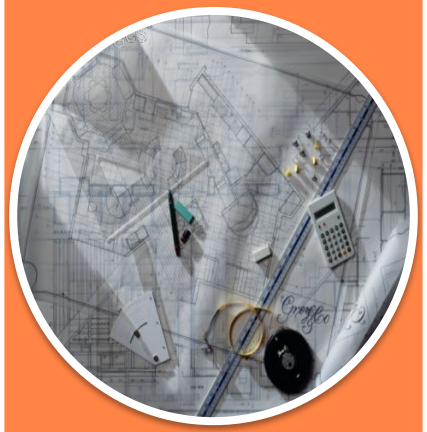


Very Large Number of Stakeholders Involved

Design Process

- Integrated Design Team
  - Architect
  - Owner
  - Builder
  - Mechanical Electrical and Plumbing Engineer (MEP)
  - Structural Engineer
  - Civil Engineer
  - Landscape Architect
  - LEED Consultant/Green-Rater
- Sustainability from Day-1
- Staying focused on goals
- Accepting trade-offs
  - Energy vs. water vs. materials
  - Sustainability vs. cost
  - Up-front vs. recurring costs
- Exploit synergy, know when to stop

Design Phase



Procurement phase

Construction Phase

Post-Construction Phase

Project Life-Cycle

DESIGN PHASE

- Climate Analysis
- Site Level Analysis
- Building Level Analysis
- Solar Analysis
- Energy Efficiency Analysis
- Lighting Analysis
- Conceptual M& Services Analysis
- Renewable Energy Analysis
- Green Building Rating Analysis

PROCUREMENT PHASE

- Technical Specification Review
- Material Specification Review
- Special Clauses Review
- Cost implication & Green Building rating level analysis

CONSTRUCTION PHASE

- Green Education to the Project Team
- Green Education to the vendors
- Green Building strategies implementation
- Green Building Strategies documentation
- Green Building Documentation facilitation
- Fundamental Building systems commissioning

POST CONSTRUCTION PHASE

- Enhanced Building systems commissioning
- Green Building documentation submission
- Coordination with Green building certifying body
- Post occupancy evaluation

The Architectural Design

- Comfort
- Aesthetics
- Efficiency
- Sustainability
- Cost
- Context

Sustainable design is not a reworking of conventional approaches and technologies, but a fundamental change in thinking and in ways of operating - you can't put spots on an elephant and call it a cheetah.

Thank You

Tanmay Tathagat

Environmental Design Solutions Pvt. Ltd

⊙Delhi ⊙Mumbai ⊙Pune ⊙Bangalore ⊙Chennai ⊙Washington DC