

Tracking Implementation of Building Energy Codes & Certification

Types of Code & Certification

July 29 2016

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Overview

- Building Energy Codes & Certification in Context
- Types of Codes & Compliance
- Types of Certification



Building Energy Efficiency Task-Group (BEET)



Building Policies for a Better World




Building Energy Codes Context

STRATEGY

- Building Energy Efficiency Codes
- Policy Targets: Low-zero & positive energy buildings
- Integrated Planning & Design, district heating-cooling
- Building Design: Bio-Climatic, Bio-Positive, Adaptive, Resilience & integrated solar thermal & P.V.
- High-Efficiency envelope, heating & cooling technologies
- Compliance enforcement, monitoring and reporting
- Life-cycle Approach to greening the Value-Chain, labeling & MEPS
- Behavior Change

SAVINGS

- <30% - 70%
 - <79%
 - <30%
 - <30%
 - <30-50%
 - <50% of legally req.
 - US\$+50 to -\$250/MtCO₂
 - <40%
- 
- <100% to +ve

Source: IPCC AR5

Types of Code & Compliance

Prescriptive:

- Set specific energy performance requirements on individual building components (i.e. walls, ceiling, insulation, ventilation and windows)
- Compliance is predominantly checked through reviewing the building design against prescribed requirements.

Simple Trade-Off:

- Specific rules on overall performance values such as U-Value to typically allow trade-offs between elements of the building envelope such as trading off less efficient insulation for more efficient windows.
- Compliance is predominantly checked through reviewing the building design against prescribed requirements or compliance tools that help to calculate the overall mandatory performance level is being achieved. Points systems are also sometimes used where points are assigned, depending on the components used.

Types of Code & Compliance

Performance-Based:

- Typically sets an energy performance requirement for the whole building such as kWh/m². A proposed design is run in building energy simulation software to simulate energy use, which is compared either to a reference building or to a specified target
- Compliance is commonly checked by comparing the predicted energy performance of a design with a model of energy use in a reference building of a certain type.

Outcome-Based Code:

- Requires demonstration that the actual energy use of a building in operation meets the energy performance requirements of the code. Few full-scale examples of this as yet.
- Compliance could be recognized through the awarding of energy performance certificates, or through mandatory disclosure programs.

Implementation Process

Design Review: Ensures the proposed design meets code requirements

On-site inspections: Verifies building materials and labels with the proposed design, and checks installation quality

How comprehensive and frequent are the inspections?

Commissioning: End-of-pipe tests check for proper installation & compliant operation

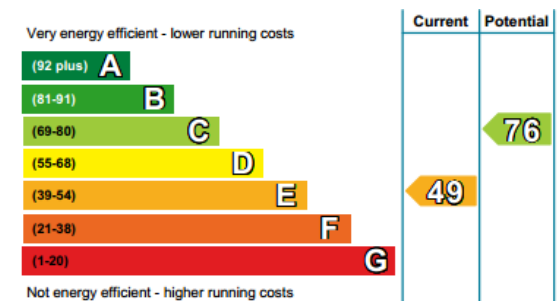
- Local governments play a key role in enforcing the building energy codes.
- Codes have become more stringent and complex over time, which can make implementation more difficult – **important to keep it simple**
- Compliance software can be an important tool to mainstream compliance.
- Building material testing, rating and labeling constitute an important component of any building energy code system.

- Blower-door tests (U.S. for commercial buildings; France)
- Commissioning of HVAC equipment
- Energy auditing requirements (Korea)

Energy Performance Assessment & Certification

	Australia	Canada	China	E.U.	U.S.
Assessment system	Rating	Labeling	Rating	Certification	Benchmarking; Rating
Evaluation methodology	Rating	Rating	Rating	Rating	Rating
Result of evaluation	Rating; Score	Rating; Score	Rating	Class; Rating	Rating; Score
Physical product of assessment	Label	Label	Label	Label; Certificate	Label; Rating; Statement

No international consensus on terminology or methodology.



*“...overarching frameworks which govern the evaluation, comparison, and labeling of a building’s energy efficiency are called **“performance assessment systems”**.”*

“Performance,” usually expressed as relative efficiency, refers to the responsible use of energy.

“Rating” refers to the methodology or tool used for the efficiency evaluation;

The result of such an evaluation is a **“score”**. The physical product relating this score is a building **“label”** – or Certificate.

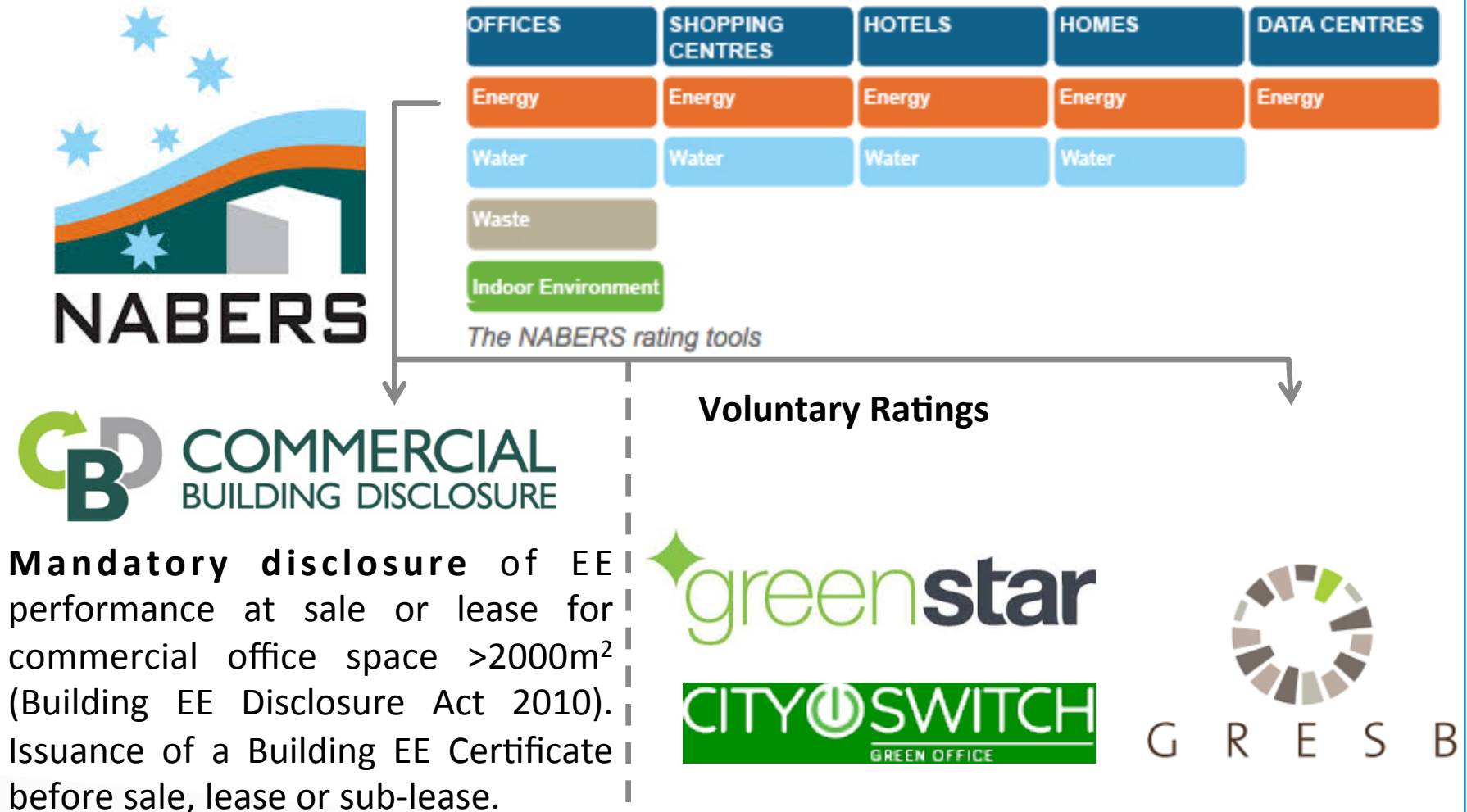
Source: IMT, 2013

Basic Components

All certification systems have **6** basic components:

1. **Quantification of Energy** consumption (Measured or Simulated)
2. **Energy Measurement Methodology** (Total, Delivered or Final Energy)
3. **Floor Area** (Conditioned or Conditioned + Unconditioned) – (Rentable, Gross or Net)
4. **Building Type** (New/Existing; Public/Private; Residential – SF or MF/Non-Residential)
5. **Comparability Metric** (Absolute Reference eg zero kWh/m² or Relative to code/average etc)
6. **End Uses** (HVAC, Lighting, Plug Loads, DHW etc)

Example Rating & Disclosure: Australia



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On-Line Tools to Support Policy Development

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Building Policies for a Better World



Implementing Actions

1. Stock Taking
2. Scenario analysis & Goal setting
3. Implementation Support & Capacity Building



Building Policies for a Better World

Stock-Taking



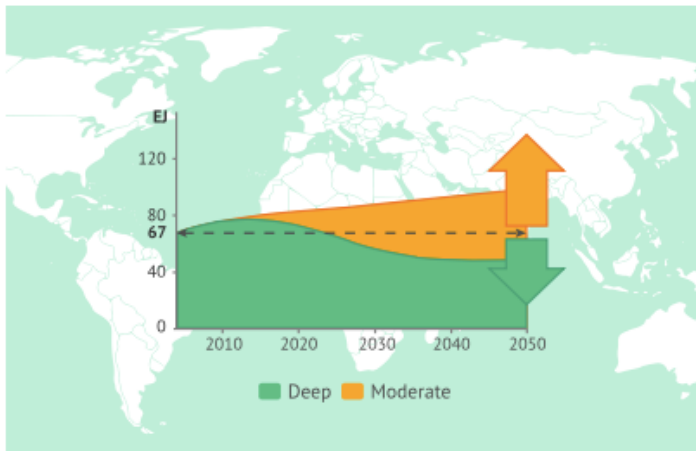
EU – Building Stock & Code Data



International Rating & Disclosure Policy Database

Scenario Analysis & Goal Setting

BUILDING ENERGY PERFORMANCE SCENARIOS



This tool enables you to interactively compare your situation with modeled data for three possible energy mitigation scenarios for the building sector, globally and per region up to 2050. Enables analysis by building type, vintage & climate zone.

Includes open source data-sets.

Coming Soon:



MRV Base-Line & Scenario Tool for
Building Energy Related GHG emissions

Implementation Support & Capacity Building

POLICY TOOL FOR NEW BUILDINGS



POLICY TOOL FOR RENOVATION



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**ipeec**
International
Partnership for
Energy Efficiency
Cooperation

A project of the **IPEEC Building Energy Efficiency Taskgroup (BEET)**

Thank you!

Let's stay in touch ...

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Towards a Global Alliance
for Buildings and Construction

BUILDINGS DAY

At COP 21

3 December 2015

Building Energy Codes Portal www.gbpn.org/laboratory/building-energy-codes-portal



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Best Codes still struggle to Implement

Holistic Approach

- Performance Approach
- Includes All Energy
- Energy Efficiency & Renewable Energy

Dynamic Process

- Zero Energy Target
- Revision Cycle
- Levels Beyond Minimum

Implementation

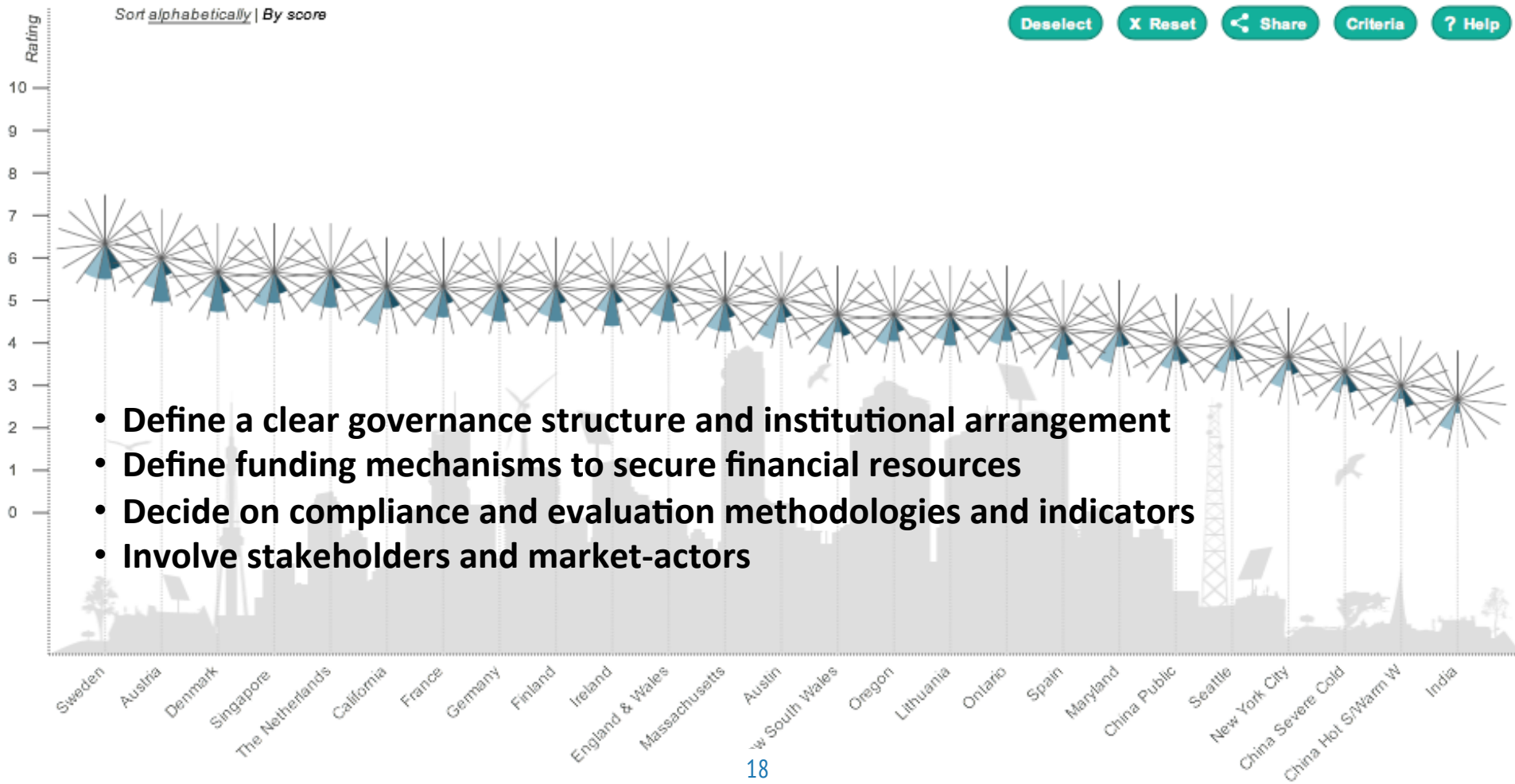
- ✓ Enforcement Standards
- ✓ Certification
- ✓ Policy Packages

Technical Requirements

- Building Shell
- Technical Systems
- Renewable Energy Systems

Overall Performance

- On-site energy
- Primary Energy
- GHG Emissions



Best Codes are revised toward targets

Holistic Approach

- ☐ Performance Approach
- ☐ Includes All Energy
- ☐ Energy Efficiency & Renewable Energy

Dynamic Process

- ☒ Zero Energy Target
- ☒ Revision Cycle
- ☒ Levels Beyond Minimum

Implementation

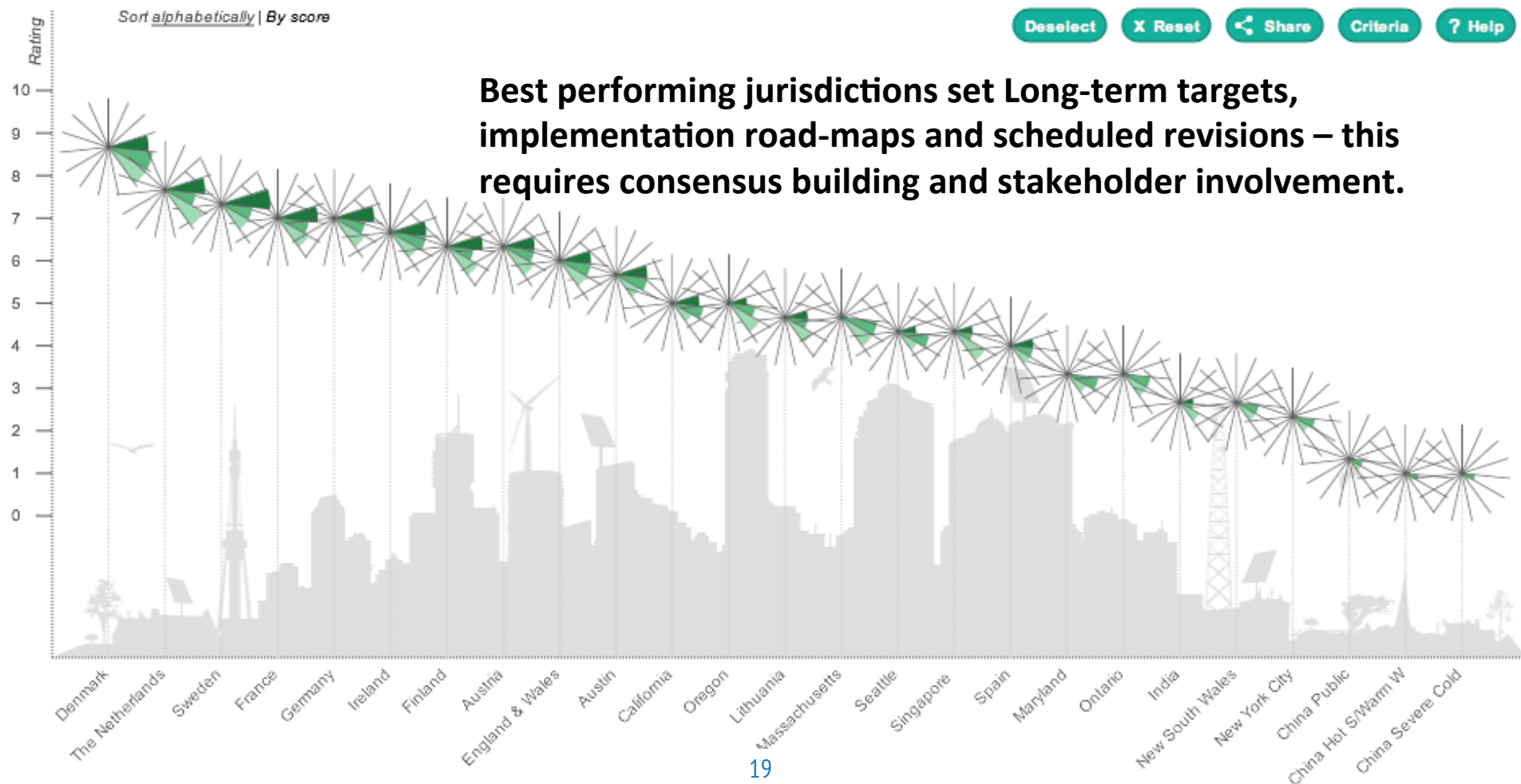
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Technical Requirements

- ☐ Building Shell
- ☐ Technical Systems
- ☐ Renewable Energy Systems

Overall Performance

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- ☐ Primary Energy
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Best Codes take a Holistic Approach

Holistic Approach

- ☒ Performance Approach
- ☒ Includes All Energy
- ☒ Energy Efficiency & Renewable Energy

Dynamic Process

- ☐ Zero Energy Target
- ☐ Revision Cycle
- ☐ Levels Beyond Minimum

Implementation

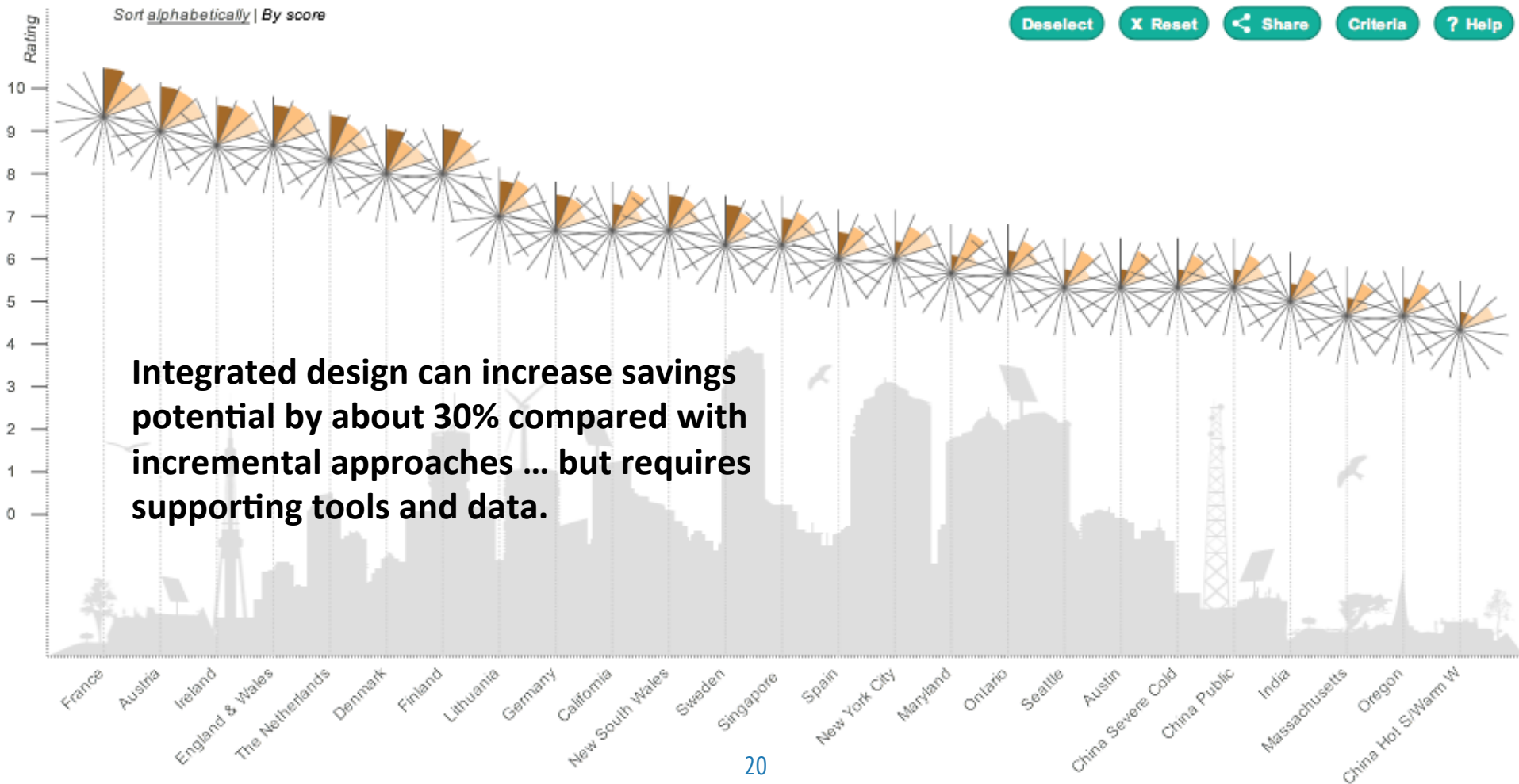
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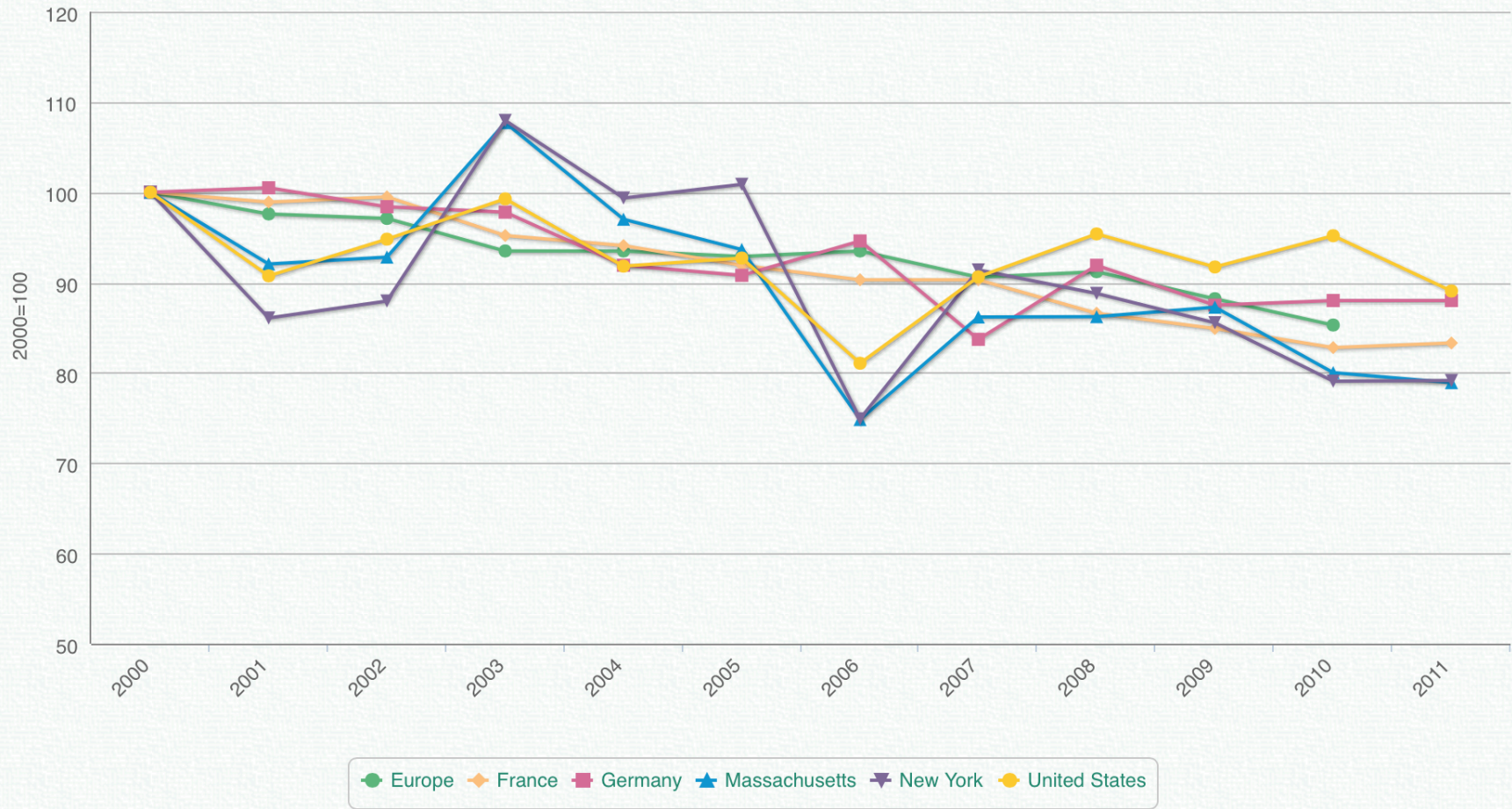
Overall Performance

- ☐ On-site energy
- ☐ Primary Energy
- ☐ GHG Emissions



Best Practice Residential Renovation Policy Packages

Consumption per dwelling



Best Renovation Policy Packages

Regulatory Measures

- ☒ Overall National Targets
- ☒ Residential Buildings
- ☒ Public Buildings

Building Assessment

- ☒ Code Requirements
- ☒ Labelling Schemes

Financial Instruments

- ☒ Incentive Schemes
- ☒ Taxation Mechanisms

Economic Instruments

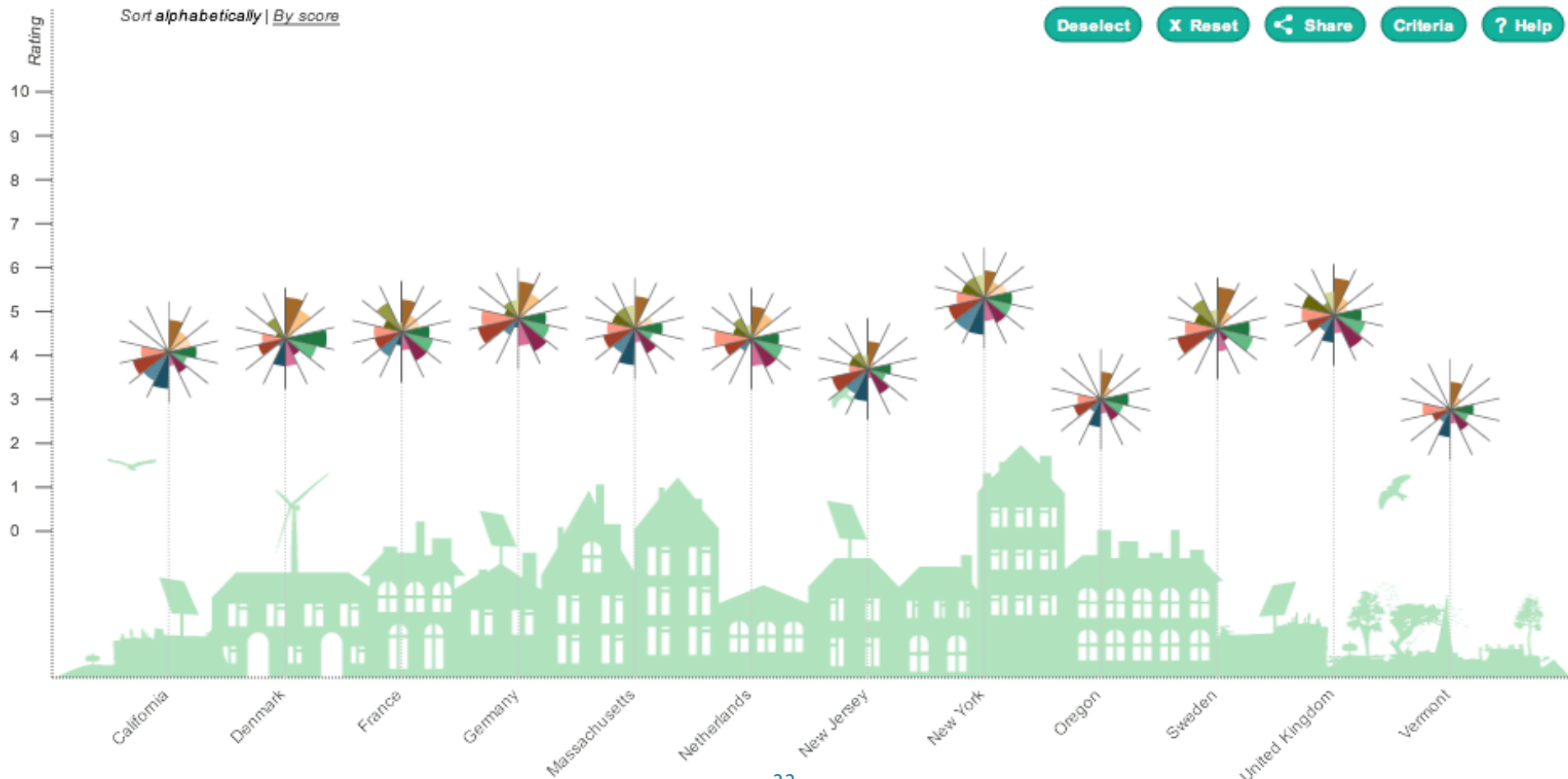
- ☒ Utility-Funded Programmes
- ☒ Market Instruments

Capacity Building

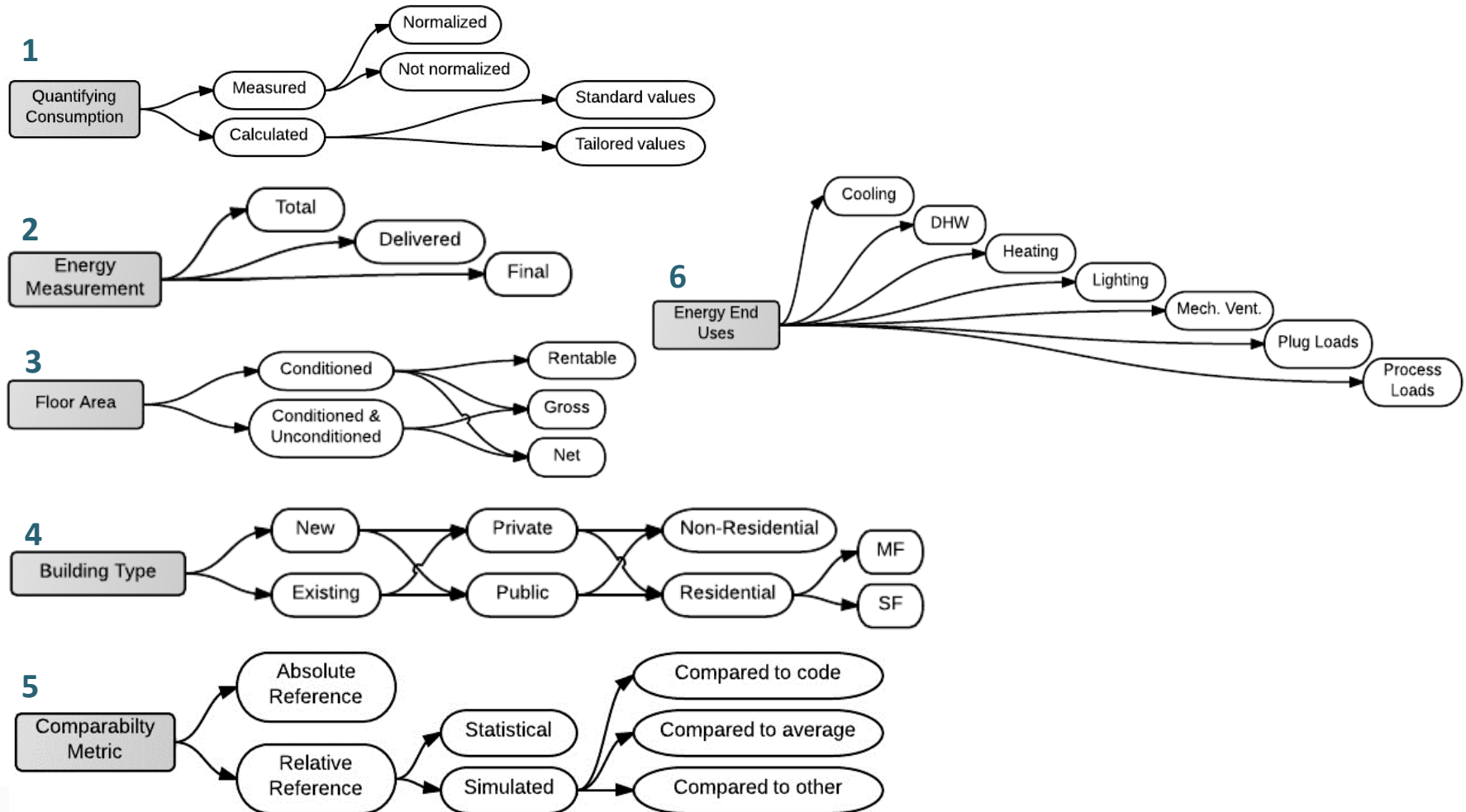
- ☒ Training and Education
- ☒ One Stop Shop

Overall Performance

- ☒ Consumption/Capita
- ☒ Consumption/Unit
- ☒ Total Consumption



6 Basic Components



Key Observations

- Countries increasingly recognize the need to strengthen implementation to achieve goals
- Codes have become more stringent and complex over time, which can make implementation more difficult – **important to keep it simple**
- Most jurisdictions require the review of building designs for compliance with the building energy code; some also inspect buildings to ensure code compliance; Post occupancy or 'outcomes-based' assessment is rarely practiced.

Common Elements of Implementation Systems

1. Capacity Building and Education
2. Compliance Checking Systems: Design, Construction and Commissioning (Note: many jurisdictions only check building design, but growing understanding of need for more extensive, yet cost-effective checks to produce energy efficient buildings)
3. Compliance Checking Tools: Mainstreaming Compliance
Compliance-checking software, clear rules for simulation-based compliance
User guides
4. Building Material Testing and Labelling
Test protocols: tailor to local conditions (e.g. India)
Independent labs
Clear labels to make compliance easier
5. Evaluation of the Overall Process