STANDARDS, RATING & LABELING

ENERGY EFFICIENCY TOOLKIT – TECHNICAL GUIDE

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LIST OF ACRONYMS

AHRI	Air-Conditioning, Heating, and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
BEE	India Bureau of Energy Efficiency
BUENAS	Bottom-Up Energy Analysis System
CLASP	Collaborative Labeling and Appliance Standards Program
CO2	Carbon Dioxide
CNAS	China National Accreditation Service
EC	European Commission
ECBC	Energy Conservation Building Code
ECO	Energy Conservation and Commercialization
EGAT	Electricity Generating Authority Thailand
EM&V	Evaluation, Monitoring, and Verification
EPA	U.S. Environmental Protection Agency
ESCO	Energy Service Company
HVAC	Heating and Cooling
GBEL	Green Building Evaluation and Labelling Programme
GHG	Greenhouse Gas
IEC	International Electrotechnical Commission
IES	Illuminating Engineering Society
ISO	International Organization for Standardization
LBNL	Lawrence Berkeley National Laboratory
LEED	Leadership in Energy & Environmental Design
MEPS	Minimum Energy Performance Standards
NABL	National Accreditation Board for Testing and Calibration Laboratories
NGO	Non-Governmental Organization
OECD	Organisation for Economic Co-operation and Development
PPP	Private-Public Partnerships
SEAD	Super-efficient Equipment and Appliance Deployment

SEEP	Super-Efficient Equipment Program (India)
SEER	Seasonal Energy Efficiency Ratio
TWh	Terawatt-hour
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNFPA	United Nations Population Fund

VISUAL REPRESENTATION OF SECTORS

Examples of standards, rating, and labeling projects and programs from around the world have been included throughout this guide. Links to full descriptions of these projects are listed in the Project Examples Resources section of the guide. The icons below are used to indicate which sector these projects target.

Industrial

Commercial and Industrial

Residential

Agricultural

Transportation

OVERVIEW

Energy efficiency is an affordable means of approaching sustainable development and climate change mitigation efforts. Widespread adoption of energy-efficient products and building codes can reduce overall energy use at the building and municipal levels and assist countries with achieving emission reduction targets while also improving citizens' quality of life by providing access to reliable electricity. This guide will focus on standards, rating, and labeling schemes that can be applied to products and buildings.

Advancing policies that shift markets toward energy-efficient products is not only beneficial for governments but also for households and businesses who enjoy the resulting energy and cost savings. Rating and labeling schemes help consumers identify efficient products and buildings that cut air pollution emissions by reducing end-use electricity and fuel consumption, which in turn reduces the amount of generation and direct fuel consumed. Some product labeling and standards policies also create other benefits, such as improved equipment performance, health, and quality of life.

Table 1: Business as usual consumption scenarios (TWh/yr) for 2010, 2020, and 2030 for refrigeration equipment (Source: BUENAS)

REGIONS	ENERGY DEMAND (TWH)			GROWTH IN ENERGY DEMAND BETWEEN 2010 AND 2030 (%)
	2010	2020	2030	
North America (including Mexico)	131	163	198	51%
Western, Central, and Eastern Europe	100	99	98	-2%
Pacific OECD	50	54	58	16%
Newly independent states	25	36	25	-3%
Sub-Saharan Africa	19	85	51	162%
China	148	209	243	64%
India	25	85	185	641%
Asia (others)	22	40	64	191%
Middle East and North Africa	37	63	85	128%
Latin America and the Caribbean	51	67	81	61%
Total	609	841	1089	79%
Total OECD	281	317	354	26%
% non-OECD	54%	62%	67%	

The energy savings potential from efficient appliances and other products in the developing world is immense. In Latin America and the Caribbean, the Collaborative Labeling and Appliance Standards Program (CLASP) and the United Nations Environment Programme (UNEP) estimate that standards and labeling policies for efficient refrigerators, air conditioners,

and fans would save 138 terawatt-hours (TWh) annually (equivalent to nearly $20 trillion in utility bills savings) and prevent around 44 million tons of carbon dioxide (CO_2) from entering the atmosphere.

Table 1 above shows that energy demand is predicted to increase dramatically in some developing countries. Even if a fraction of the commonly-used appliances in those regions can be replaced with more efficient models, the resulting energy savings, and conserved resources, would be significant. According to the United Nations Development Programme (UNDP), CO_2 emissions from urban residential buildings in developing countries increased 60% between 1970 and 1995. In Asia, energy use in the commercial buildings sector is increasing by up to 8.9% annually.

Minimum Energy Performance Standards (MEPS)

Minimum energy performance standards (MEPS) are a regulatory tool that specifies minimum efficiency levels for products or buildings. At one end of the spectrum, mandatory MEPS can force inefficient products out of the market, while voluntary MEPS can promote emerging technologies that have not yet become commercially adopted. MEPS are essential to any product or building rating scheme because they represent a guarantee to consumers, building owners, and other stakeholders that a given product or building will achieve specified energy savings or energy intensity, and MEPS aid program evaluators in quantifying energy savings over time. Coupled with market penetration data, MEPS can aid program administrators recognize when to develop more stringent MEPS for future adoption (e.g. products rated against a certain voluntary MEPS account for75% of the market.)

Project Example 1:
Impacts of Labeled Products on Emissions Reductions (International)

TARGETED SECTOR:

SUMMARY

In 2012, with support from the Super-efficient Equipment and Appliance Deployment (SEAD) Initiative, CLASP used the policy analysis tool developed by Lawrence Berkeley National Laboratory (LBNL), the Bottom-Up Energy Analysis System (BUENAS), to predict the potential CO2, energy savings, and financial impacts of implementing energy efficiency standards and labeling policies across thirteen developing and developed economies.

The findings, which considered cost-effective potential and best available technologies, suggested that global emissions savings could total 540 million tons and 860 million tons, respectively, by 2020. The projected emissions reductions through implementation of best available technologies across these economies would total 60% of the reduction needed to remain under 450 parts per million CO_2 by 2030.

With energy demand in India projected to grow more than 600% by 2030, the Ministry of Power's Bureau of Energy Efficiency (BEE) has continued to support multiple voluntary standards and mandatory comparative labeling requirements, including an advanced super-efficient label for multiple appliance categories. BEE has plans to continue expanding the scope of these programs. In China, the payback period for investments necessitated by appliance standards, labeling and energy building codes is estimated to be two years.

Standards, rating, and labeling work together by: 1) establishing test procedures and associated energy performance rating methods, which support 2) labeling schemes (voluntary or mandatory) that display energy performance levels to consumers and other market participants. Labeling schemes allow for market-based programs to promote efficient products via education, incentives, and other means. As efficient products take up greater market shares, mandatory Minimum Energy Performance Standards (MPS) can be used to lock in energy savings across the entire market. Rating and labeling also support broader private-public partnerships (PPPs) that can involve collaborations among government agencies, manufacturers, retailers, utilities, and other stakeholders in long-term efforts to transform end-use markets. However, in many countries, inconsistent policy, weak underlying infrastructure, and a lack of enforcement often prevents economies from realizing the full potential of standards, rating, and labeling schemes.

This guide will introduce program administrators to the regulatory conditions that facilitate the development of product standards and building codes. Additionally, this guide will outline key program components that contribute to successful rating, labeling, and standards schemes for products; it will also address building-level rating, labeling, and energy construction codes, which are analogous to product schemes but differ in technical and administrative details. Each topic covered in this guide is separated into two sub-sections: one discusses products standards, rating, and labeling applications, and the other addresses building code applications. The guide will also provide an overview of the regulatory, policy, and private sector considerations that impact the implementation of such schemes.

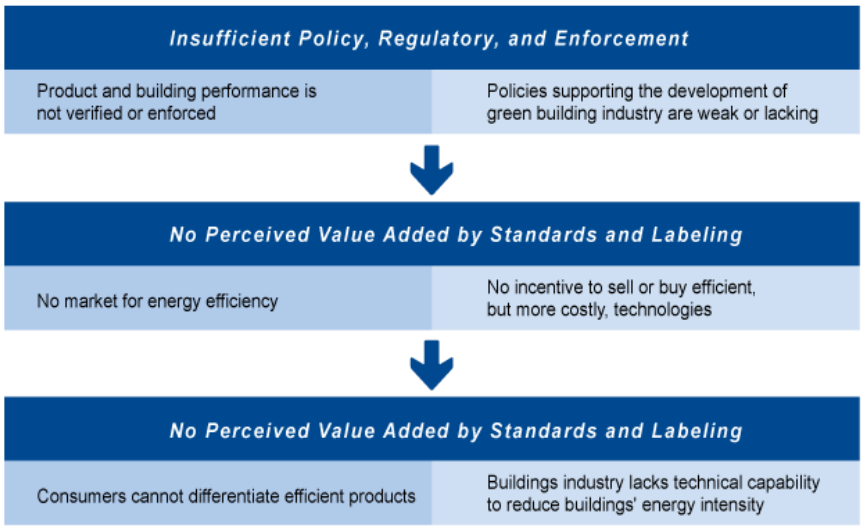


Figure 1: Barriers to Implementing Standards and Labeling Schemes

GUIDING QUESTONS

Listed below are a series of considerations for program developers as they review the feasibility of designing and implementing product standards, labeling, and rating schemes. More information on how to design a standards, rating, and labeling scheme for products can be found in each section of this technical guide.

Regulatory Environment

- Are there laws in place to facilitate the establishment of mandatory or voluntary MEPS?
- Which state agency or agencies are responsible for implementing energy efficiency legislation?
- If MEPS are established, are they enforceable and verifiable? Are there agreed-upon test methods that laboratories can competently perform?
- Which state agency is responsible for overseeing building code development and enforcement by sector?
- Do building safety, construction, health, or other codes exist, and are they enforced?
- Is there a product standards and labeling scheme such that a building code could require the installation of appliances rated against established standards?
- Is program funding available either through legislation or through international agreements? (see the Financing Strategies section of the toolkit)

Market

- Do efficient products exist in the marketplace, and can consumers distinguish an efficient product from an inefficient one?
- Are information and awareness campaigns needed to educate consumers? (see the Information and Education Technical Guide)
- Is there a market for energy service companies (ESCOs)? (E.g. building retrofit upgrades, consulting for new buildings, etc.)
- Which building sectors are the most energy intensive? (E.g. industrial, residential, commercial, etc.)

Information and Expertise

- Are benchmarking studies available that highlight energy savings potential for the developing country?
- Which sectors and/or products consume the most energy? Is market penetration data available?
- To what extent is information and data available on energy consumption and building performance?
- Are consumers aware of the benefits of an efficient building, and are incentives offered by the state? Are awareness campaigns needed?
- Who are the primary stakeholders? (E.g. building managers, non-governmental organizations, real estate developers)

1.0 IMPLEMENTATION APPROACHES

Standards and labeling represent a guaranteed performance capability and can be mandatory or voluntary depending on existing regulatory and enforcement infrastructure. One approach is to begin with a voluntary standard, offer incentives or otherwise promote anything bearing the label representing that standard, and eventually establish mandatory standards. The list below outlines some of the applications for standards and labeling which apply to both products and buildings.

Standards, rating, and labeling schemes can specify:

- Voluntary rating and labeling only;
- Mandatory labeling with voluntary performance requirements;
- Mandatory performance levels established through MEPS & mandatory labels showing energy use; or
- Mandatory MEPS only (no label requirement)

Standards, rating, and labeling schemes apply to:

- Products and materials (e.g. electronics, insulation, roofs)
- Buildings
- Processes and systems (e.g. ISO 50001 energy management certification)
- Individuals (e.g. energy auditors)

1.1 FOR PRODUCTS

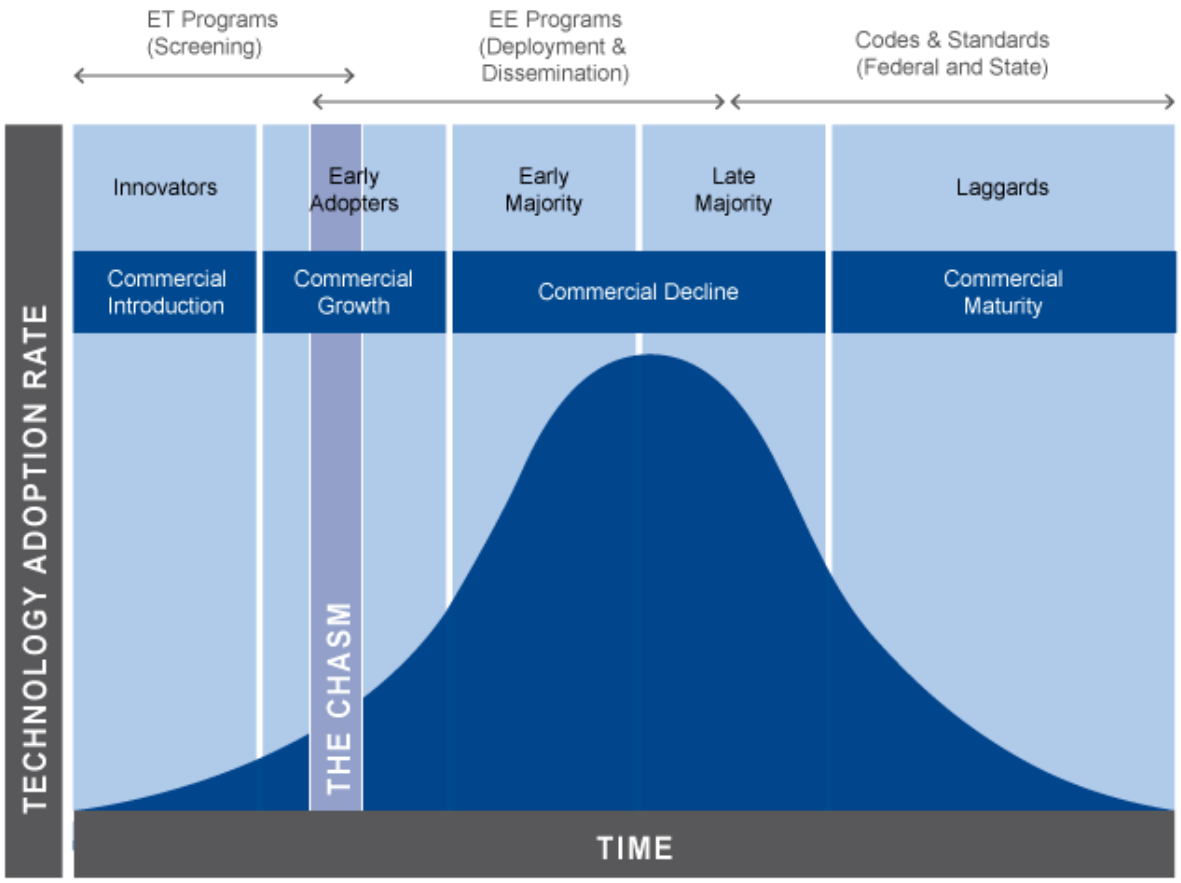
Many countries have established mandatory MEPS that prevent import or manufacture of products below a define efficiency level and that promote labeling schemes which educate consumers on energy efficiency attributes. Examples of current labeling schemes include the China Energy Label, India's BEE STAR Label, and Ghana's Energy Guide Label (Figure 2).

Figure 1: Examples of voluntary and mandatory comparative labeling

Rating, labeling and standards schemes can be voluntary or mandatory; a common pattern is to begin with voluntary rating and labeling, migrating some products to mandatory MEPS over time. This pattern can repeat in a cyclic fashion: voluntary schemes build market share, MEPS are imposed as market shares mature, new voluntary performance levels are promoted via labeling, and MEPS are made more stringent. In the U.S., for example, residential central air conditioners have gone through three cycles: the 1993 federal MEPS (SEER 10) became the baseline for the first voluntary ENERGY STAR models, the 2006 MEPS (SEER 13) became a new ENERGY STAR baseline, and as of 2015 the MEPS level became SEER 14 (for selected warm climate states).

An effective rating and labeling scheme should support the development of efficient technologies and support the widespread adoption of these technologies. Figure 3 depicts this classic market transformation sequence as an overlay of market stages and policy priorities. Rating and labeling policies can help efficient technologies bridge “The Chasm” (also commonly referred to as the “Valley of Death”) between market introduction and market success. MEPS and mandatory energy codes can then lock in savings for the remainder of the market cycle.

Figure 2: Path towards Market Transformation
ET- Emerging Technology, EE- Energy Efficiency (Source: ACEEE)



1.2 FOR BUILDINGS

Voluntary and mandatory building energy standards are also becoming more commonplace, particularly for rapidly developing countries that need to reduce emissions and energy intensity for existing buildings and ensure that new buildings are designed sustainably. Some studies demonstrate that energy efficiency strategies such as building codes are most cost-effective only when enforcement can be secured and financing channels exist. Because enforcement is

such a prevalent challenge in developing countries, implementing building codes is more difficult than implementing product standards, rating, and labeling schemes. However, if existing regulatory components for buildings already exist (e.g. fire protection, structural integrity), efficient products can be incorporated into the existing framework of building requirements. Additionally, if standards and labeling schemes already exist for products, then building upgrades via direct installation or new building construction can take advantage of these standards and labeling programs to identify the most efficient appliances or lighting to incorporate into the building envelope.

Similar to product standards, many energy building codes are initially introduced as voluntary standards and converted to mandatory codes after their effectiveness can be measured, evaluated, and promoted (see Project Example 4). However, the success of a building code or standard relies heavily upon the existing legislative and policy infrastructure. If the developing country's policy infrastructure is weak, the program administrator should shift focus towards relevant stakeholders and awareness efforts that tout the benefits to individuals, building managers, real estate developers, utilities, relevant non-governmental organizations (NGOs), or other country-specific stakeholders while simultaneously seeking out financing opportunities (see the Financing Strategies section of the toolkit for more information on financing opportunities). As the case study on China's green building standards and labeling scheme suggests, the absence of a building efficiency industry due to lack of incentives or financing hinders adoption and awareness of the benefits of building efficiency.

Project Example 2:
Green Building Evaluation and Labelling (GBEL) Programme

TARGETED SECTOR:

SUMMARY

GBEL's three star building rating system for commercial and residential buildings is the Chinese equivalent to the U.S. Green Building Council's LEED® program. The criteria against which buildings are rated under each scheme are similar, although there are variations in how the criteria are weighted. GBEL is scored by criteria whereas LEED assesses aggregate points across all criteria.

GBEL faces many barriers to implementation including a lack of supportive policy, shortage of building professional accreditation, absence of clear funding channels, and poor enforcement capability to ensure buildings meet design requirements during construction.

2.0 DESIGNING STANDARDS, RATING & LABELING PROGRAMS

2.1 FOR PRODUCTS

Efficient products are the cornerstone of energy-efficient buildings policies. Successful standards, rating, and labeling schemes for products have several common characteristics (see Figure 4 below) and often engage industry experts when public-sector technical and market experience is lacking in order to achieve a measurable, recognizable, and enforceable scheme. While program administration is often housed in government agencies or government-sanctioned NGOs whose mission is to promote energy efficiency, successful efforts typically engage stakeholders and technical experts across the entire market supply chain (e.g.

component manufacturers, product manufacturers, trade associations, standards developers, laboratories, and reputable accreditation and certification bodies).

2.2 FOR BUILDINGS

Building code schemes are similar to products standards and labeling schemes in that they require measurable and verifiable minimum performance criteria, a means of recognizing buildings that meet these criteria, and a means of penalizing noncompliant building owners or managers. However, the technical, marketing, and administrative approaches are quite different. For example, promoting building efficiency is better coordinated at the city or regional-level.

Ideally, when designing a building standards and labeling scheme, the program administrator should assess existing building characteristics and efficiency levels by creating building profiles in a given pilot area. The initial review should assess the various building uses (small hotel, small restaurant, medium-sized office building, etc.), establish baseline energy efficiency levels by component (e.g. for roofing, heating and cooling, lighting, etc.), and evaluate the technical and economic potential by component upgrade to project the estimated energy cost and savings potential. If an established building energy evaluation protocol exists, the initial pilot study can apply the existing protocol to conduct the baseline assessment.

Figure 3: Characteristics of a Successful Rating and Labeling Scheme

Measurable	*Recognizable*	*Enforceable*
- There should be specific metrics in place to distinguish efficient products, materials, and buildings from those that are inefficient. - There should be agreed-upon procedures by which to measure a product, material, or building's efficiency.	- An efficient product or building should be recognizable; typically, a label or mark of some sort can be applied to distinguish efficient products, materials, and buildings. - Marketing campaigns should promote products, materials, and buildings bearing this label.	- There should be measures in place that confirm products, materials, and buildings meet claimed efficiencies or performance levels. - If products, materials, or buildings are found to not meet established criteria for recognition, measures must be in place to penalize violators.

3.0 STANDARDS DEVELOPMENT & MEASURABILITY

3.1 FOR PRODUCTS

To rate a product or material's energy performance, there must exist a technical procedure or set of criteria which recognized entities can use to assign energy ratings. Accredited test laboratories or other recognized entities can then be expected to consistently and transparently rate products. Harmonization of such test procedures and laboratory accreditation methods globally or across regions can help countries advance their policy goals by "borrowing" successful methods.

The U.S. Environmental Protection Agency's (EPA) ENERGY STAR® program (voluntary) and European Commission Ecodesign Directive (mandatory with voluntary aspects) both engage stakeholders through a specification development process (e.g. trade associations, utilities, manufacturers). In addition to helping determine the potential energy savings, this process assesses the feasibility and potential impacts of new voluntary and mandatory equipment standards. Through this stakeholder engagement process, EPA and the European Commission (EC) aim to identify enforceable performance criteria and develop or refer to standard evaluation procedures that ensure these products can be compared to one another. As products cross borders, it is essential that their performance can be measured and reported consistently. This makes testing harmonization or energy use evaluation efforts a critical component of standards development.

Project Example 3:
Thailand Energy Efficiency Standards and Labeling

TARGETED SECTOR:

SUMMARY

Per the Energy Conservation Promotion Act of 1992, the Thailand Ministry of Energy's Electricity Generating Authority Thailand (EGAT) implements an energy efficiency standards and labeling scheme featuring a comparative label that is applied to a wide variety of products ranging from imaging equipment to rice cookers. Manufacturers are granted special government-issued tax incentives and subsidies:

Organizations such as the International Organization for Standardization (ISO), the International Electrotechnical Commission (IEC), and the Illuminating Engineering Society (IES), which are devoted to researching and developing standardized testing procedures for electronics and lighting products, offer a dependable starting point as developing countries look to establish testing criteria for their standards and labeling programs. See the Additional Resources section for more information.

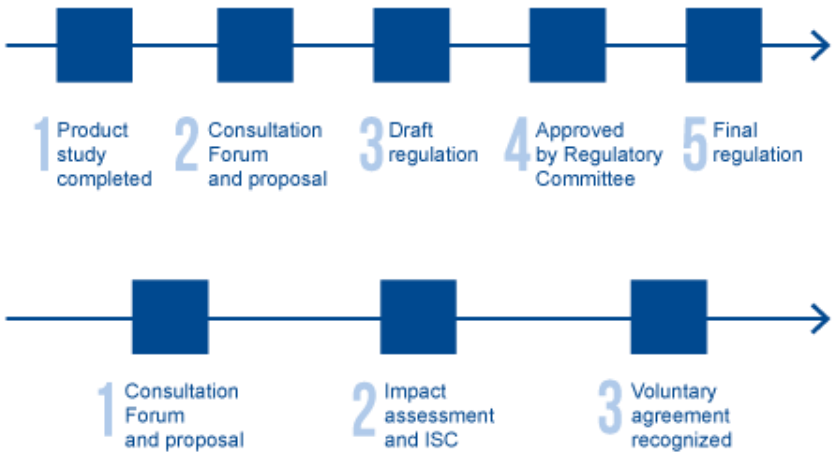
Third-Party Certification and Accreditation

International accreditation bodies, such as the International Accreditation Service (IAS), National Accreditation Board for Testing and Calibration Laboratories (NABL) based in India, or China National Accreditation Service (CNAS), can offer an added layer of assurance for product test results. A third-party accreditation scheme, such as the one employed by EPA for the ENERGY STAR program, may not be feasible initially but can be viewed as a long-term objective. Third-party accreditation is widely utilized in many OECD countries for purposes ranging from safety compliance to efficiency testing procedures and can assure consumers and regulatory bodies alike that products in the market are safe and efficient.

3.2 FOR BUILDINGS

Building energy consumption benchmarking and a literature review of existing energy management methodologies provides program developers with two essential pieces of information addressing: 1) how much energy is consumed in a building and 2) how that consumption is measured and aggregated. Typically, this means an initial evaluation or pilot study should be conducted to establish how much energy buildings are currently consuming in aggregate and by end use. The end-uses can be used to determine the criteria by which a building is evaluated. These criteria, used to develop standards, can speak to efficient land use, energy management, water management, ventilation (air quality), insulation and heat loss, etc., and the program administrator should create an evaluation methodology that scores or rates a building against the desired criteria. The building efficiency standard should also differentiate by building types and possibly even sub-types (e.g. commercial: hospital vs. schools, residential: single family vs. multifamily) to ensure that ratings are comparable.

Figure 4: European Union Ecodesign mandatory (top) and voluntary (bottom) standards and labeling development process (Source: European Commission)



4.0 EVALUATION, MONITORING & VERIFICATION (EM&V)

EM&V procedures ensure that labels and certifications deliver on their energy savings claims. Post- market product verification testing and building code inspections are examples of EM&V methods. For a rating and labeling scheme, there are two evaluation objectives:

1) **Verification testing and post-installation energy inspections** ensure that products that have been sold in the market and buildings that have been registered as "energy-efficient" are evaluated, with under-performers identified and penalized accordingly. Challenge testing products, whereby products are retested by a competitor to verify the conclusion that a product's performance is incorrectly stated, serves a similar verification purpose. In the U.S., competitor challenge testing is a common method of assuring compliance with appliance standards. In Ghana, the refrigerator specification outlines the authority of regulatory personnel to inspect products at any point in the distribution channel, and in India, the energy efficiency labeling guidance provides detailed instructions on how to address verification testing failures and challenge testing (i.e. re-test double the number of samples at the expense of the label user).
2) **Confirming labeling accuracy** can prevent manufacturers from misleading consumers with false advertising. In China, products are required to bear a mandatory energy label and add product information to a national directory. Manufacturers who do not comply are fined between USD $1,600 - $16,000, depending on the discrepancy. In the U.S., the EPA will remove violators' models from its lists of ENERGY STAR qualified products, which may prevent those products from being eligible for incentives. Labeling violations and other false claims can result in a variety of penalties such as the following:

- Fines for the manufacturer, retailer, or other entity that incorrectly states performance characteristics
- Individual or class-action law suits
- Manufacturer name and disqualified model number added to a public list
- Recognition of the building or manufacturer (for all products) is rescinded

Project Example 4:
Green Building Codes in India

TARGETED SECTOR:

SUMMARY

In 2007, the India released a new Energy Conservation Building Code (ECBC), which is based on the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) standard 90:1 that covers a host of energy uses and functions, including airtightness, design, position, and orientation of the building, and daylighting requirements.

This building code is intended for commercial and public buildings and is based on the roadmap developed by USAID and the Government of India through Phase III of the Energy Conservation and Commercialization (ECO) project. The BEE Star Rating System, which is also used for appliances, evaluates energy performance in buildings and is the only energy-specific building label available in India.

ECO-I and ECO-II helped India establish BB as the enforcement body of the Energy Conservation Act (2001) and also begin developing energy efficiency infrastructure (such as ESCOs) through awareness and training efforts. The ECO project agreement ended in 2011.

5.0 POLICY SUPPORT

National policies are important to the effectiveness of rating, labeling, and standards schemes. While local governments, individual companies, or NGOs can and do launch their own schemes, most end-use markets are national in scope. Without national policies in force, the effect of localized schemes is may fall short of national potential. National support for the development and recognition of rating and labeling methods, funding for PPP programs, policies supporting utility programs, and bans on the import of non-compliant products are examples of national policies.

5.1 FOR PRODUCTS

National governments can play a central role in creating product labeling schemes. Brazil introduced a voluntary labeling program for products in 1993 as an outgrowth of the National Electricity Conservation Program (PROCEL), which is operated by the state-owned utility Centrais Electricas Brasileiras S.A (also known as Electrobras). Electrobras was directed by the Brazilian government to invest 7.9 million USD to establish 20 laboratories in research centers and universities to test products and issue the PROCEL label. As of 2011, over 3,700 appliances in 32 categories had earned the PROCEL label and becoming labeled has become mandatory for some products.

Project Example 5:
Retail Engagement in Kazakhstan

TARGETED SECTOR:

SUMMARY

During a two-year project in Kazakhstan from 2011-2013 assessing energy efficiency improvement opportunities, USAID conducted a training aimed at raising awareness about saving energy through energy-efficient labeled products. The targeted trainings took place at three major electronics retail stores to teach sales associates how to promote energy efficiency to consumers.

By educating sales staff on how to market energy-efficient products, consumers are more aware of the potential cost and energy savings benefits for their household.

5.2 FOR BUILDINGS

In India, the Energy Conservation Act (2001) also specifies that energy conservation codes for buildings should be reviewed, accounting for regional and local climatic conditions, and also mentions awareness and information dissemination. Read more about the Energy Conservation Building Code (ECBC) for commercial buildings above and the ECO bilateral agreement between USAID and the Government of India to develop enhanced commercial sector energy performance. In China, the 12th Five Year Plan requires 80% of new large commercial buildings to be evaluated according to the Green Building Evaluation and Labelling (GBEL) Programme standards. For more information on policies supporting energy efficiency programs, see the Policy Technical Guide.

Project Example 6:
Green Buildings in Tanzania

TARGETED SECTOR:

SUMMARY

In 2014, USAID partnered with Tanzania to assess the potential for demand side management and the development of green building codes to reduce electricity consumption in the face of rapid urbanization placing considerable burdens on energy infrastructure that is ill-equipped to handle expected peak loads.

The study team conducted three assessments to inform energy building code development by assessing: 1) the potential for energy savings across a small subset of building types, 2) existing municipal construction policies, practices, and infrastructure, and 3) identifying and conducting outreach to stakeholder groups.

The methodology for the first assessment reviewed several building features such as heating and cooling (HVAC), water heaters, roofing, and lighting to estimate savings potential. Next, the project team reviewed existing policies and agreements that could be leveraged to promote green building standards (e.g. construction requirements, national legislation, international agreements and frameworks). Lack of regulations suggested that the best tools for introducing building standards might be a combination of energy-efficient technologies, public information campaigns, and financial incentives.

KEY PLAYERS

Program Administrators

Administrators, who are often government ministries or NGOs, derive funding from dedicated program funding, grants, or membership fees. India's Bureau on Energy Efficiency (BEE), for example, requires applicants to submit a fee. The US EPA does not require a fee from participating brand owners for its ENERGY STAR program, but manufacturers assume the cost of testing and certification services that are administered by a third party. Non-government scheme owners, such as the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) in the U.S., can require annual membership fees that cover testing and certification activities.

Manufacturers and Construction Companies

Manufacturers, construction workers, and contractors are important stakeholders during the standards development process for products and buildings. They provide technical feedback through surveys, conference calls, official comments, and in-person meetings that help administrators determine the state of the technology (see Figure 3) and how stringent the criteria should be. Under most schemes, manufacturers bear the costs of registration, certification, and verification, but they also benefit from marketing campaigns led by scheme owners and partners promoting manufacturers' superior products.

Retailers play an important role in educating consumers on the merits of efficient technologies by leveraging available incentives for energy-efficient products. If sales associates, realtors, and contractors are well-versed on available efficient technologies and/or labeling schemes that help identify such technologies, they can positively influence adoption of these technologies.

PROJECT EXAMPLE RESOURCES

Project Example 1: Impacts of Labeled Products on Emissions Reductions (International)

"BUENAS Scenarios Estimate Cost-Effective and Technical Savings Potential for MEPS in 13 Major World Economies," CLASP (2012): http://clasp.ngo/en/Resources/Resources/PublicationLibrary/2012/BUENAS-Scenario-BAT-CEP.aspx

Project Example 2: Green Building Evaluation and Labelling (GBEL) Programme

"China," Global Buildings Performance Network (2013): https://www.rolandberger.com/media/pdf/Roland_Berger_Market_Potential_in_Energy_Efficiency_in_Southeast_Asia_20111104.pdf

Project Example 3: Standards and Labeling in Thailand

"Electricity Generating Authority Thailand (EGAT) Appliance Efficiency Improvement Project," EGAT (2015): http://labelno5.egat.co.th/index.php?lang=en

Project Example 4: Green Building Codes in India

"Energy Conservation and Commercialization," USAID (2013): http://www.eco3.org/

Project Example 5: Retail Engagement in Kazakhstan

"Central Asian Energy Efficiency Support Program (CAEESP)," USAID (2014): http://pdf.usaid.gov/pdf_docs/pa00jnwj.pdf

Project Example 6: Green Buildings in Tanzania

"Partnership for Growth: Energy Efficiency in Tanzania – Green Buildings," USAID (2014).

ADDITIONAL RESOURCES

APEC Energy Standards Information System: http://www.apec-esis.org/

Consolidates standards and labeling programs in all APEC countries.

Building Research Establishment's Environmental Assessment Method (BREEAM): http://www.breeam.org/

One of the oldest and largest building efficiency programs with over 500,000 registered certificates since 1993.

CLASP Global Standards & Labeling Database: http://www.clasponline.org/en/Tools/Tools/SL_Search.aspx

Directory of global standards and labeling schemes.

European Commission Ecodesign Directive: http://ec.europa.eu/growth/index_en.htm

Mostly mandatory standards and labeling scheme used in the European Union. Each proposed standard undergoes a mandatory preparatory study phase where all economic, environmental, and societal impacts are considered prior to proposing new standards.

EPA ENERGY STAR Program: http://www.energystar.gov

Example of U.S.-based rating and labeling program spanning over 40 product categories, both residential and commercial, that is internationally-recognized in select partner countries.

Global Buildings Performance Network: www.gbpn.org/

NGO that focuses on regional building efficiency and policy, providing technical assistance to advance building energy performance. There is also an easy-to-use directory of implemented building codes from around the world.

Illuminating Engineering Society: www.ies.org/

Develops test methods for lighting products.

International Organization for Standardization: http://www.iso.org/iso/home.html

Develops international standards for testing and other certifications.

International Electrotechnical Commission: http://www.iec.ch/

Develops test methods for electrical equipment.

Super-Efficient Equipment and Appliance Deployment Initiative: http://www.superefficient.org/

Initiative that promotes appliance test standard harmonization and conducts benchmarking assessments.