Harmonisation of MEPS and energy labelling in Latin America and the Caribbean – opportunities and challenges

Sibylle Braungardt
Fraunhofer Institut for Systems and Innovation Research ISI
Breslauer Strasse 48
76139 Karlsruhe
Germany
sibylle.braungardt@isi.fraunhofer.de

Karl-Christian Göthner
Senior Consultant
Physikalisch-Technische Bundesanstalt (PTB)
Bundesallee 100
38116 Braunschweig
Germany
christian.goethner@gmx.net

Keywords

domestic appliances, abatement, harmonisation, energy labelling, developing countries, standardisation, product policy

Abstract

As in most developing countries and emerging economies, the demand for electricity is increasing rapidly in Latin America and the Caribbean (LAC), and energy efficiency (EE) potentials are large. Besides climate change mitigation, EE can contribute to meeting diverse development goals in the region, including enhanced energy security and social improvements. Minimum energy performance standards (MEPS) and energy labelling have been recognized as two of the most effective and efficient policy measures to address product EE, and programs have been introduced by most countries in the LAC region. However, unlike the EU regulations, MEPS and labelling programs in the LAC region are national and largely lack harmonisation between the various countries. In particular, a lack of availability of competent services and alignment in quality infrastructure, needed for measuring the energy output of products, testing their performance as well as assuring and certifying their quality, hampers an effective implementation of EE programs. The lack of harmonisation poses considerable challenges for product manufacturers, importers, retailers and end consumers and largely reduces the effectiveness of the programs. This paper describes how strengthening the national and regional standardization bodies, metrology institutes, conformity assessment bodies and regulatory agencies and supporting interaction between them can help to make EE programs more effective. The results draw upon a project funded by the German International Cooperation and executed by the German National Metrology Institute PTB, in which a variety of capacity building activities, including workshops, training measures and interlaboratory comparisons were conducted in the region between 2011 and 2015. We analyse how these activities can contribute to a harmonisation of MEPS and labelling in the LAC region. We conclude by providing recommendations for further interventions to support effective EE policy.

Introduction

Improving energy efficiency globally is essential for meeting the objectives of the Paris Agreement. Out of the 189 countries that submitted Intended Nationally Determined Contributions (INDCs), 168 countries included energy efficiency as one of their priorities (UNEP, 2016). Energy production and use account for two thirds of the world's greenhouse-gas (GHG) emissions (IEA, 2015a) and energy efficiency is essential for reducing these emissions, while sustaining the growth of the world economy. Especially in developing countries, where energy consumption is growing faster than in developed countries, energy efficiency can provide greater opportunity for economic growth while also providing broader access to energy (IEA, 2012).

The Paris Agreement's central aim of keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius requires greater emissions cuts than countries have pledged (UNEP, 2016). Increasing energy efficiency, in particular in developing countries and emerging economies, may play a major role in bridging the gap between the emission reduction resulting from full implementation of INDCs and the 2-degree target.

In Latin America and the Caribbean, the main source of emissions is the energy sector accounting for 42 % of the region's total emissions, followed by agriculture (28 %) and changes in soil use and forestry activities (21 %), and the energy-related emissions continue to increase (ECLAC, 2015). The demand for electricity has increased by approximately 5.4 % annually between 1971 and 2013 and is expected to continue to grow (Inter-American Development Bank, 2015).

Despite the growing interest that governments in the LAC region have shown in promoting energy efficiency in recent years, there remain large untapped potentials (UNEP, 2015). Estimated 15 % to 20 % of energy consumption could be avoided through the deployment of best practices (without a loss of comfort) with a quick payback time.(ECLAC, 2014; UNEP, 2015). For example, UNEP (2014) finds that the introduction of standards and a transition to best available technologies for refrigerators, air conditioners and electric fans in the residential sector in the region could result in annual energy savings of 138 TWh. Energy efficiency measures implemented in a strategic manner offer the opportunity to advance societal objectives by transforming the productivity and resilience of country energy systems (ECLAC, 2014).

A number of LAC countries are engaged in a range of regional and sub-regional initiatives and networks to promote energy efficiency. The Latin American Energy Organization OLADE has been organising the Latin American and Caribbean Network for Energy Efficiency (LAC-EE Network) since 2011 with the aim of contributing to the development of energy efficiency in the region by facilitating the exchange and dissemination of technical, legal and regulatory information between institutions and interested professionals (UNEP, 2015). With support of the GIZ, the Economic Commission for Latin America and Caribbean (ECLAC) launched a project on Base Indicators for Energy Efficiency (BIEE) to improve the quality of statistics and performance indicators to quantify the results of national energy efficiency programs in 2011, with 19 LAC countries being represented by a country focal point (ECLAC, 2016). Another regional initiative incorporating the issue of energy efficiency is the Energy and Climate Partnership of the Americas (ECPA) coordinated by the Organisation of American States (OAS). The United Nations Environment Program (UNEP)-Global Environment Facility (GEF) en.lighten initiative was established in 2009 to accelerate a global market transformation to environmentally sustainable, energy efficient lighting technologies, as well as to develop strategies to phase-out inefficient incandescent lamps to reduce CO_2 emissions and the release of mercury from fossil fuel combustion. Building on the en.lighten initiative, the United for Efficiency (U4E) initiative is a global effort supporting developing countries and emerging economies to move their markets to energy-efficient appliances and equipment. The Super-efficient Equipment and Appliance Deployment (SEAD) Initiative of the Clean Energy Ministerial and the International Partnership for Energy Efficiency Cooperation is a voluntary multinational collaboration whose primary objective is to advance global market transformation for energy efficient products. The sustainable Energy for All (SE4All) initiative launched by the UN Secretary-General and the President of the World Bank has amongst its three objectives the goal of doubling the global rate of energy efficiency improvements by 2030. Since its inception in October 2013, the Copenhagen Centre on Energy Efficiency (C2E2), which serves as SE4ALL's Energy Efficiency Hub, has been analysing and promoting opportunities for accelerating energy efficiency uptake globally. The United Nations Development Program (UNDP) has supported the development of labelling programs and first steps of their implementation (for instance in Colombia and Peru).

Standards and labelling (S&L) programs have been recognized as two of the most effective and efficient policy measures to address product energy efficiency, and programs have been introduced by most countries in Latin America. S&L programs provide the cornerstone of most national energy efficiency and climate change mitigation programs and operate in more than 80 countries around the world, covering more than 50 different types of appliances and equipment in the commercial, industrial and residential sectors (IEA-4E, 2016). Based on evidence from a wide cross-section of countries with S&L programs, the energy efficiency of major appliances have increased at more than three times the underlying rate of technology improvement and have shown a 300 per cent return on investments from national benefits in appliance standards and labelling programs (IEA-4E, 2016).

Beside climate change mitigation, well designed S&L programs can contribute to meeting diverse development goals in the LAC region, including reducing capital investment in energy supply infrastructure, enhancing national economic efficiency by reducing energy bills, enhancing consumer welfare, strengthening competitive markets, and averting urban/regional pollution (UNEP, 2015). Further co-benefits include positive effects on employment, health and energy security.

While there has been increased action and interest to establish S&L programs for equipment and appliances in the LAC region, the region faces a lack of adequate testing laboratories (UNEP, 2015). An energy test procedure is the technical foundation of all energy efficiency standards, energy labels, and other related programs (Meier and Hill, 1997). In order to ensure that all products are evaluated in the same way, standard metrics (e.g. kilowatt-hours per year), standard test facilities, a standard test procedure and a process for assuring compliance with testing requirements is needed (Wiel and McMahon, 2003). Small differences in testing procedures can have a large impact on energy use, the environment, and the international economy (Meier and Hill, 1997). Furthermore, it is necessary to develop a procedure for conformity certification, or accreditation, to ensure that testing facilities correctly perform tests with properly calibrated equipment. Here, an important aspect in less-developed countries concerns capacity building, including regular testing using interlaboratory comparisons (Wiel and McMahon, 2005). The quality infrastructure (QI), i.e. the infrastructure for standardization, measurement, accreditation and conformity assessment (Sanetra and Marbán, 2008), can be created within the country, shared among several countries or can be purchased from outside the country.

For countries that introduce new S&L programs, the adoption of existing test protocols for assessing product energy efficiency is strongly preferable to creation of a new protocol (Wiel and McMahon, 2003). At the national level, adopting existing protocols provides the benefits of known repeatability and reproducibility along with known facility needs and defined benefits and issues. At the level of manufacturers and importers,

harmonisation or alignment among regional areas of trade provides large benefits avoiding costs by minimizing investments in testing facilities and test resources and allowing for economy of scale in manufacturing.

Unlike Europe, in Latin America, S&L programs have been introduced nationally and largely lack harmonisation between the countries (Lutz, 2015). In the EU, the conversion from individual country standards to a unified EU-wide program was achieved in the Ecodesign directive (2009/125/EC) and the Labelling directive (2010/30/EC), including harmonisation of testing procedures, label designs and standard setting. By contrast, Latin America shows a heterogeneous picture, with varying degrees of alignment and harmonisation among national schemes, and a notable lagging behind recent international developments, which involve more stringent energy efficiency requirements both with regard to MEPS and energy labelling (Lutz, 2015). As highlighted by the IEA (IEA, 2015b), the region could benefit from greater regional collaboration on standards and labels. In particular, the IEA recommends regular collaboration and harmonisation of standards between the countries in the region in order to reduce compliance and testing costs (IEA, 2015b).

The lack of harmonisation between the programs in different countries poses considerable challenges for product manufacturers, importers, retailers and end consumers and largely reduces the effectiveness of the programs. Increasing engagement between national standardisation agencies and relevant government stakeholders with other neighbouring countries in the region to establish co-ordinated policies could increase the demand for efficient appliances and equipment, and remove non-tariff barriers to trade within the region (IEA, 2015b).

Increasing alignment and harmonisation of S&L programs provides a variety of benefits including improved effectiveness and efficiency of the programs, promoting greater efficiency in consumer appliances, increasing market efficiency and reducing trade barriers. These benefits can be achieved through unilateral *alignment* of elements of standards-setting and labelling programs with those of trade partners, or by *harmonisation* of these program elements in multilateral forums and compacts. Harmonisation and alignment of S&L programs can avoid the costs of duplicative testing and non-comparable performance information, while benefiting from a reduction in non-tariff trade barriers and access to a wider market of goods (Fridley and Wiel, 2004). A harmonised framework thus increases market transparency, reduces costs for product testing and design, enhances prospects for trade and technology transfer, reduces costs for developing government and utility efficiency programs, and enhances international procurement (Wiel et al., 2006).

With increasing adoption of S&L programs across regions, harmonisation can significantly reduce the resources needed for developing these programs, and a lack of harmonisation results in increasing costs of testing and qualifying for manufacturers of regulated and traded products (Fridley and Wiel, 2004). At the same time, the strategic interest in alignment and harmonisation of S&L programs with neighbouring countries depends on each country's role in the trade relations for the regulated products. For exporting countries, alignment of S&L programs with the most relevant trade partners is of particular importance, as additional costs for national manufacturers for multiple testing procedures are avoided. For countries with national production with low export shares, the benefits of harmonisation do not necessarily outweigh its costs. For countries that are mainly importers of the regulated products, harmonisation with neighbouring countries facilitates market surveillance, as testing procedures and testing infrastructures may be adopted or shared.

The IEA identifies various strategies that countries can adopt for increasing alignment between national S&L programs: 1) collaboration in the design of tests, labels and standards; 2) harmonisation of the test procedures and the energy set points used in labels and standards; and 3) coordination of program implementation and monitoring efforts. More specifically, countries and regions may increase alignment by harmonising testing procedures, mutual recognition of test results from accredited testing laboratories as well as harmonising the performance standard levels and energy labelling criteria (Lin and Fridley, 2006).

This paper presents an analysis of various seminars and capacity building activities in the LAC region conducted between 2011 and 2015 within the action line "Strengthening the Energy Efficiency in Household Appliances" of the project "Quality Infrastructure for Renewable Energy Sources and Energy Efficiency"[1]. The aim of the project is to strengthen the capabilities of the QI organizations in the region along with their national members in providing services for the fields of energy efficiency and to promote mutual coordination in order to support the implementation of the respective national energy policies. The project is funded by the German International Cooperation[2] with the Organization of American States (OAS) as the political partner. It is jointly implemented by the National Metrology Institute of Germany (PTB) and the regional QI organizations of the LAC region, namely the Inter-American Accreditation Cooperation (IAAC), the Inter-American Metrology System (SIM) and the Pan American Standards Commission (COPANT). It is further supported by the International Renewable Energy Agency (IRENA) and OLADE. In connection with the regional project on renewable energies and energy efficiency, PTB has developed various other activities which are linked to it: sub-regional projects with the regional standards body for the Caribbean Community CARICOM bloc (CROSQ) and South America´s trading bloc MERCOSUR and bilateral projects with Mexico and Colombia. Others with Brazil and Bolivia are in preparation. The regional project itself has now also an additional Central American and Andean component. In all of these activities, an important element represents the strengthening of the technical base for energies policies oriented at improving energy efficiency in the LAC region by implementing MEPS and labelling programs. Another important objective is to promote the cooperation between policy makers, regulatory agencies and the QI institutions which is essential for the success of such a policy.

The aim of the activities was to assess barriers to the implementation of S&L programs, to identify strategies to overcome these barriers, and to enhance the technical capacity of the QI

1. https://www.ptb.de/tc/index.php?id=energy_efficiency_and_renewables.

2. The project is partially co-financed by the three regional QI organizations and their national members.

institutions in the field of product energy efficiency. The activities included three large workshops bringing together practitioners from various countries in the LAC region, as well as capacity building activities such as a proficiency test for refrigerators, and undertaking of impact studies. For the upcoming project phase, training activities for a selection of testing labs are currently being prepared. The first event „Energy Efficiency in Household Appliances - Challenges for Upgrading the Quality Infrastructure" was held jointly with COPANT's Annual Assembly in 2012 and provided a first analysis of barriers and identified opportunities to improve the situation. The second event "Labelling programs for energy efficiency in Latin America and the Caribbean: Experiences and best practices" provided a forum for an exchange of experiences about best practices, to get an overview in which countries labelling programs are existing or in preparation and what are the responsible governmental institutions, their objectives, instruments and results, to improve the relationship between the Standardizations Bodies, the Regulatory Agencies, and the other stakeholders, and to verify to which extent the labelling programs are based on international standards and internationally reliable measurement and testing methods. The third event "Labelling programs in Latin America and the Caribbean: Label designs, their technical fundaments and surveillance" aimed at deepening the knowledge on the labelling programs and their necessary political, economic, and technical fundaments, distribution national and international experience, promoting the exchange between regulatory agencies, QI institutions and other stakeholders, and to develop recommendations for approximation and harmonisation of labelling programs in the LAC region.

The remaining part of the article presents insights derived from the workshops and capacity building activities:

- The next section provides an overview of S&L programs in Latin America and their alignment with international S&L programs and testing procedures.
- The subsequent section presents the barriers the region is facing regarding the implementation and harmonisation of S&L programs, and discusses opportunities to reduce these barriers.
- The last section presents conclusions from the analysis and outlines recommendations for further interventions.

Achievements and challenges for S&L programs in Latin America

According to a study commissioned by the Australian Department of Industry, a total of 147 individual measures for MEPS and labelling had been established in Latin America until 2013 (Energy Efficient Strategies, 2014). Brazil pioneered the development of S&L programs in the region with the introduction of a voluntary endorsement scheme of refrigerators in 1984, which was expanded to other products and became a mandatory scheme with the introduction of the Energy Efficiency Act of 2001 (Energy Efficient Strategies, 2014). Mexico developed energy efficiency standards in 1995 and has subsequently developed further programs, where requirements in Mexico broadly align with those in Canada and the USA (test procedures and regulatory levels under the North American Free Trade Agreement NAFTA) although the product coverage and timing differs (Energy Efficient Strategies, 2014). Following Brazil and Mexico, other countries have followed since the 1990's, although with different degrees of ambition and rigour. In particular, Colombia, Costa Rica, Chile, Uruguay and Ecuador have developed well-established S&L programs. Supported by UNDP projects, Colombia and Peru have recently developed labelling programs for different product groups. Table 1 provides an overview of S&L programs that are currently implemented in Latin America and the Caribbean (information based on direct engagement with the individual programs).

Table 1 shows that, despite of several efforts over the past decades to create harmonised standards and labelling schemes, the LAC region presents a heterogeneous picture. Differences are particularly apparent between Mexico and Central America on the one hand and the South American countries on the other hand. Whereas the S&L programs in Mexico and Central America are largely aligned with those of the USA, the programs in most countries in South America show at least some degree of alignment with the EU programs. However, especially within the Andean region, the national programs largely lack inter-regional alignment. Many importing countries are required to work with both ISO/IEC and ASTM norms. Due to the differing testing procedures, the technical staff is required to know and apply the differing testing and certification standards, leading to additional costs as the procedures have to be adopted to the destination countries.

Harmonisation of S&L programs in the LAC region is a difficult process due to the differing economic structures of the countries, with the majority of countries being mainly importers of electric appliances and related products. Only big countries like Brazil, Argentina, Mexico, and Colombia have an important national production, mostly in the hands of international consortias like Mabe, Bosch, Siemens, LG, or Electrolux. Other countries such as Chile, Ecuador, Dominican Republic, and Guatemala also have a certain level of national production (mostly design and assembling). All of them are parts of international value chains at various levels including component suppliers, manufacturers and retailers.

A second important barrier to harmonisation arises from the different commercial linkages. Especially countries like Brazil, Argentina, Uruguay and Chile are oriented more to the European Union and Asia applying the ISO/IEC standards if existing. Mexico as part of NAFTA and the Central American countries are obliged to use the US standards (ASTM, ANSI). There is also a lot of resistance to apply directly the international ISO/IEC standards within some countries arguing that the climatic conditions in the region are very different to those of Europe and Asia so that it is necessary to develop „regional standards" within COPANT on the basis of the ISO/IEC standards (e.g. adaption to tropical climate, also referred to as "tropicalization").

Last but not least, there are numerous conflicting national interests between the different Latin American and Caribbean countries. Thus, intentions to harmonise the standards, national technical regulations and labels are met with great resistance.

Among the current processes that address harmonisation at a sub-regional level, the most compromising project is the development of a Regional Central American Technical Regu-

Table 1. Overview of MEPS and labelling programs in Latin America and the Caribbean (March 2017).

Country	MEPS	Labelling	Alignment with international/national standards	Alignment with existing labelling programs
Cono Sur/Mercosur				
Argentina	Refrigerators and freezers, room AC, household washing machines	Refrigerators and freezers, household washing machines, AC, fluorescent lamps. Labelling standards published for: 3 phase induction motors, fluorescent ballasts, standby power consumption, centrifugal pumps, electric storage water heaters, TV receivers, thermal characteristics of buildings	ISO/IEC (C)	EU
Brazil	Three-phase electric motors; Compact fluorescent lamps; Household refrigerators and freezers; Air conditioners; Gas stoves and ovens; Instantaneous and storage gas water heaters; various types of lamps and ballasts	Mandatory for 27 products incl. several household appliances, lamps, AC, fans, water heaters, TV, RE systems and equipment, computers and peripherals, stoves and ovens, electric motors, pumps, distribution transformers and car tyres.	ISO/IEC (C)	EU
Chile	Lamps, refrigerators, electric motors	Refrigerators/freezers, incandescent and fluorescent lamps, ballasts for fluorescent lamps, household washing machines, room air conditioners, three-phase electric induction motors and standby power for various electric and electronic devices, including microwave ovens, TV decoders, audio and video equipment, and printers.	ISO/IEC (C)	EU
Paraguay		Draft labelling standards for incandescent and fluorescent lamps are under discussion	ISO/ IEC (C)	EU, Colombia, Argentina and Chile
Uruguay		Household refrigerating appliances, household washing machines, household tumble driers, gas cooking appliances, electric and gas storage water heaters, gas wall-mounted combined water heaters, air conditioners and heat pumps, incandescent and fluorescent lamps and electric three-phase induction motors, LEDs Labelling is mandatory for compact fluorescent lamps, electric storage water heaters and household refrigerating appliances	ISO/ IEC (C)	EU

The table continues on the next page. →

Country	MEPS	Labelling	Alignment with international/national standards	Alignment with existing labelling programs
Andean Region				
Bolivia		incandescent and fluorescent lamps and for refrigerators (P)	NOM (C)	EU
Colombia	Air conditioners, fluorescent lamps, motors, refrigerators, water heaters,	Approx. 30 energy labelling programs including refrigerators, freezers, room AC, gas and electric water heaters, household washing machines and various gas appliances, lighting equipment and electric motors.	ISO/IEC (C) ASTM, NOM and others (E)	EU (EE classes and algorithms), US and Mexico (New label design)
Ecuador	Household refrigerating appliances, room AC, household washing machines, CFLs, standby power for TV, storage and instantaneous gas water heaters, ventilators with integrated electric motors	Household refrigerators, freezers, CFLs, room AC, household washing machines, electric appliances for induction cooking, clothes driers, ventilators with integrated electric motors, TV, electric ovens, microwave ovens, cloth washer – driers and dishwashers.	ISO/IEC, CIE (lamps)	EU
Peru	CFL	Motors, vessels, household refrigerating appliances, electric storage water heaters, instantaneous gas water heaters, washing machines, drying machines, and household lamps.	ISO-EN/IEC (C)	EU (2009 label)
Venezuela		Refrigerators and freezers, room AC		US, EU (New label)
Central America				
Costa Rica	Household refrigerators and freezers, commercial refrigerators, various types of air conditioners, three-phase electric induction motors, incandescent lamps and CFLs	Household refrigerators and freezers, commercial refrigerators, various types of air conditioners, three-phase electric induction motors, incandescent lamps and CFLs Other motors, other types of lamps, other types of refrigerators, induction cookers and ovens (P),	NOM (C)	Mexico
El Salvador	Domestic refrigerators	incandescent and fluorescent lamps, household and commercial refrigerators, washing machines, electric three-phase induction motors (P)	Partially ISO (C) MEPS based on NOM (C)	
Nicaragua	CFL	Refrigerators (obligatory)		
Panama	CFL	CFL	NOM (C)	Mexico

The table continues on the next page. →

Country	MEPS	Labelling	Alignment with international/national standards	Alignment with existing labelling programs
North America				
Mexico	Refrigerators and freezers, various AC categories, cloth washers, fluorescent ballasts (voluntary), fluorescent lamps, boilers, water heaters, motors. Centrifugal Residential Pumps, commercial refrigerators.	Refrigerators, various AC categories, clothes Washers, fluorescent lamps and ballasts, TV, water heaters, motors, centrifugal Residential Pumps, commercial refrigerators.	ISO/IEC, ASTM	USA
Caribbean				
Barbados		Air-Conditioners, Clothes Washers, Clothes Dryers, DVD players, Electric Cookers and Ovens Refrigerators, Electric Water Heaters, Dishwashers, Freezers, Evaporative Coolers, Fans, Light Bulbs, Pumps and Motors, Radio and Audio sets, Televisions, and VCR Players.		
Cuba		Refrigerators, (Air Condition, Washing machines, motor pumps, and others)	ISO	EU
Dominican Republic	LFC	LFC, domestic refrigerators (P), LED (P)		EU
St. Lucia		Fluorescent and incandescent lamps (Voluntary), Refrigerators, Air Condition, Washing machines	COPANT (based on ISO)	EU

Explanations:

(C): Corresponding international or national standards on which the technical regulations and labels are based

(E): Equivalent Standards, i.e. national standards which are also recognized

(P): Labelling programs in progress but not yet implemented

NOM: Norma Obligatoria Mexicana

lation (RTCA) for illumination, air conditioning, refrigerators, and some types of motors by the Central American Integration System SICA. SICA includes the six Central American countries Panama, Costa Rica, El Salvador, Nicaragua, Guatemala y Belize and the Dominican Republic. The draft of the document is already developed but a very important element is missing: the chapter on conformity assessment.

Further initiatives for sub-regional harmonisation include efforts by MERCOSUR (Argentina, Brazil, Paraguay, Uruguay), concentrating on harmonising the testing and certification procedures, but not the labelling programs and a newly established initiative in the Caribbean region under the direction of the CARICOM Regional Organisation for Standards and Quality, CROSQ.

Barriers and opportunities to support S&L programs in the LAC region

Despite the notable achievements in developing S&L programs in the LAC region (see Table 1), the region faces a variety of challenges and barriers and presents considerable opportunities to increase the effectiveness of the programs.

Reflecting the heterogeneity of countries in the region, the barriers that hamper an effective design, implementation and enforcement of S&L programs vary among the countries. In the big countries with important national production of household appliances and equipment such as Brazil, Mexico, Argentina and Colombia, S&L programs are well-established and rely on a more or less institutionalised cooperation between the relevant stakeholders including regulators, QI institutions and trade organisations. By contrast, the smaller countries face a variety of barriers hampering effective implementation of their programs. The following subsections outline the main political, structural and institutional barriers, the main technical barriers, as well as barriers in the implementation process. The analysis is based

on activities conducted within the project "Quality Infrastructure for Renewable Energy Sources and Energy Efficiency", in particular the workshops held in Itaipava 2013 (PTB, 2013) and in Quito 2015 (PTB, 2015).

POLITICAL, STRUCTURAL AND INSTITUTIONAL BARRIERS

S&L programs can only be effective if the regulations are properly mandated and well implemented. S&L programs need a legal basis and the presence of a functioning government institution with sufficient resources to formulate, implement and enforce the regulation, including procedures for compliance control.

In the LAC region, energy policy, and in particular energy efficiency policy, has a tradition only in some countries and has not been a priority until recently. Energy is linked to mining in many countries, and energy policy is in many countries addressed by the Ministry of Mining and Energy. In Chile, for instance, the Ministry for Energy was founded in 2009. To date, in some cases, the communication channels between the regulatory agencies and the ministries could be improved.

In some countries energy efficiency is a new subject partially forced from outside. In many countries, low or subsidized energy prices (e.g. Venezuela; Argentina under the last administrations) discourage energy efficiency. Despite the considerable energy saving potential, energy efficiency plans have been developed rather recently in many countries, and there are some countries which do not yet have energy efficiency plans (e.g. Belize).

The region shows a lack of continuity in institutions concerned with the development, promotion and enforcement of energy efficiency policies. This results in instability and increased uncertainty for stakeholders. The difficulty in providing continuity of qualified personnel in the institutions presents a challenge for the effective implementation of S&L policies.

Many countries in the region report a lack of awareness by the government, the private sector, and other stakeholders regarding energy efficiency issues. This barrier is especially important for the smaller countries with little or no national production of appliances. For the large countries with national production of the regulated products, this barrier is less relevant, as the national manufacturers as well as the economy as a whole may profit from well-implemented regulations.

In many countries, the regulating agencies responsible for S&L programs do not interact sufficiently (or at all) with the QI institutions. This missing interaction has lead to implementation of MEPS and labelling programs without considering the missing technical QI base.

Another obstacle consists in the low active participation of Latin American standardization bodies in the international standardization work (ISO, IEC). Thus, the interests and conditions of Latin American countries are not sufficiently reflected in the international standards. Smaller countries do not use the electronic access which, for instance IEC offers as a way of participating in its work. Information exchange within COPANT is only slowly developing.

TECHNICAL BARRIERS

The most important bottleneck for the implementation of MEPS and labelling programs is the lack of sufficiently competent and preferably accredited laboratories, working according to the international standards and best practices. This holds true with regard to the equipment and the environmental conditions, but the main difficulty is the lack of sufficiently qualified and experienced personnel. Frequently, staff is not proficient in the different testing standards, which are not harmonised (ISO/IEC vs. ASTM or ANSI). Not only the smaller and less developed countries are confronted with this problem but also the bigger ones (Mexico, Colombia). Thus, in many cases the testing results are not reliable and comparable and therefore the energy consumption of the regulated products cannot be verified. This hampers the effective implementation and enforcement of S&L programs.

The problem of providing the traceability chain of measurements, securing the accurateness and comparability of the measurements and tests is only partially resolved. Frequently, neither the testing labs nor the producers of electrical products are aware of the need to calibrate their instruments. In particular, in smaller countries calibration has to be performed outside the country and outside the region, thus leading to higher costs.

Furthermore, the region faces a lack of sufficiently qualified certification bodies, accreditation schemes and qualified auditors in the national accreditation bodies. Sometimes the product certificates are not developed according to international rules and cannot be recognized outside the country.

BARRIERS IN THE IMPLEMENTATION PROCESS

Apart from Brazil and Mexico, the countries in the region lack programs for market surveillance. Market surveillance and enforcement is a requirement for effective implementation of the programs with respect to energy savings, and to ensure a competitive advantage for manufacturers of energy efficient products with respect to low efficiency appliances.

Most countries in the LAC region do not have a consistent approach for monitoring and evaluation of S&L programs. This in turn leads to a lack of confidence in the effectiveness of the programs in reducing energy demand. Monitoring and evaluation requires procedures to collect the necessary data and to define a working plan for regular evaluation activities.

The implementation of labelling programs involves many actors such as regulatory and supervisory agencies, testing labs and certification bodies, customs, importers, and retailers. If the various stakeholders are not sufficiently informed, trained, and included in this process severe problems will arise. As most of the LAC countries are mainly importers, the first institution which is confronted with the documents and certificates is usually the customs authority. But importers, retailers, and sellers also have to be informed about the labels.

Furthermore, it is important to provide efficient information to the consumers on the advantages of the labels. LAC markets are mostly driven by price. The main aim of energy labelling, i.e. to provide information to consumers and to help them to make informed decisions including life-cycle-costs, can only be achieved if consumers know and trust the label and use it in their purchase decisions.

The experience with voluntary labelling schemes shows that these are not adopted by enough producers and retailers. Thus, at the moment it is common to begin with a voluntary program but then transform it into a mandatory program. In some cases the transition phase for implementing the S&L programs is too short in particular considering that the technical base for prod-

uct conformity assessment is frequently insufficient and needs upgrading and strengthening. Implementation periods and action plans should be scheduled for three to five years and should be developed and monitored together with stakeholders.

Conclusions and policy recommendations

S&L programs play a prominent role in energy efficiency policy in the LAC region, however large variations between the countries are observed regarding the coverage of products, the technical foundations underlying the programs, and their design and implementation. While countries like Brazil and Mexico have a long history of S&L programs including a large number of products and based on mature technical foundations, many other countries face a variety of challenges.

The heterogeneity among countries regarding their institutional and technical capacities to implement S&L programs provides significant opportunities for enhancing the proliferation of these programs by facilitating exchange of experience between the countries. Countries with existing but less developed facilities can benefit greatly from exchanges with countries with similar cultural and economic conditions. In particular, it is necessary that regulators are aware of the technical requirements for S&L programs and that there is sufficient interaction with QI institutions. Furthermore, regulatory processes have to take into account the time needed for setting up the necessary technical infrastructure.

For smaller countries and countries with a lower level of economic development, S&L programs and their technical foundations have to be adapted to the financial, technical and personnel resources of the countries. For small importing countries (for instance the Caribbean islands), it is neither feasible nor necessary to develop anational QI for energy efficiency. However, it is essential that there are sufficiently qualified personnel who know the standards and procedures and who are familiar with trustworthy testing labs and certification bodies and can interpret the product certificates to assure that the imported products comply with international requirements.

One of the main challenges for the effective implementation of S&L programs in the region is the lack of interaction between the stakeholders involved in the process. In particular, improving interaction between regulators and QI institution is essential, as S&L programs cannot work effectively without reliable and comparable testing procedures for the energy use of products. Two of the smaller countries, Uruguay and Costa Rica, have been successful in advancing effective S&L programs by establishing ambitious policy programs and increasing cooperation between the governments, the QI institutions and – partially – the private sector. A big step forward was also achieved in Colombia, supported by projects realized by UNDP and PTB. The implementation of the *Reglamento Técnico de Etiquetado* RETIQ (Minminas 2015), a technical regulation and labelling program for different product groups is now combined with a program for improving the testing and certification facilities of the country, allowing for comparable and reliable product certifications in the future. The program is supported by the National Quality System SICAL and the National Industry Association ANDI.

The LAC region benefits from participation in activities focused on enhancing institutional and technical capacity for developing S&L programs, ensuring compliance, and evaluating the impact of such programs. It is essential that the various programs and initiatives addressing the variety of challenges related to S&L programs coordinate their activities in order to exploit synergies and avoid overlaps. Furthermore, it is vital that knowledge is transferred within participating institutions, in particular when personnel are subject to rapid change due to a lack of institutional stability.

While alignment and harmonisation between S&L programs provides important opportunities in many aspects, full harmonising of S&L programs across the region is neither practicable nor feasible. While some differences between the programs arise merely from the fact that national regulatory processes developed independently, others reflect genuine economic, geographical or cultural differences between the countries. Differences between testing procedures are justified and necessary when cultural or climatic conditions differ, however, national standards have to be in accordance with the corresponding international standards. Furthermore, the varying financial and technical capacities have to be taken into account. More importantly, as S&L programs potentially have a strong impact on trade with the regulated products, the heterogeneity of trade relations between the countries limits the opportunities for harmonisation as strategic interests between the countries differ. Especially for importing countries, the benefits of harmonisation do not necessarily outweigh its institutional and financial costs. However generally exploiting the opportunities for alignment and harmonisation between sub-regions provides benefits for the effectiveness of the programs as well as the trade with regulated products.

References

ECLAC, 2014. Energy efficiency in Latin America and the Caribbean: progress and challenges of the past five years.

ECLAC, 2015. The economics of climate change in Latin America and the Caribbean – Paradoxes and challenges of sustainable development.

ECLAC, 2016. Monitoring energy efficiency in Latin America.

Energy Efficient Strategies, 2014. International study on energy Labelling and MEPS.

Fridley, D., Wiel, S., 2004. Trade Flow Analysis Helps Define Opportunities For Regional Harmonisation of Standards and Labelling. proceedings of the aceee summer study 2006.

IEA, 2012. Plugging the Energy Efficiency Gap with Climate Finance.

IEA, 2015a. Energy and Climate Change – World Energy Outlook Special Report.

IEA, 2015b. Regional energy efficiency policy recommendations – Latin America and the Caribbean.

IEA-4E, 2016. Achievements of appliance energy efficiency standards and labelling programs.

Inter-American Development Bank, 2015. Lights on – Energy Needs in Latin America and the Caribbean to 2014.

Lin, J., Fridley, D., 2006. Harmonisation of Energy Efficiency Standards: Searching for the Common Ground. proceedings of the eceee summer study 2006.

Lutz, W., 2015. Energy efficiency standards and labelling in Latin America – the issue of alignment and harmonisation. Proceedings of the EEDAL conference 2015.

Meier, A.K., Hill, J.E., 1997. Energy test procedures for appliances. Energy and Buildings 26 (1), 23–33. 10.1016/S0378-7788(96)01022-5.

PTB, 2013. Labelling programs for energy efficiency in Latin America and the Caribbean. Experiences and best practices. Workshop documentation, Itaipava.

PTB, 2015. Labelling programs in Latin America and the Caribbean: Label designs, their technical fundaments and surveillance. Workshop documentation, Quito.

Sanetra, C., Marbán, R.M., 2008. The answer to the global quality challenge: A national quality infrastructure. PTB, OAS, SIM.

UNEP, 2015. Accelerating energy efficiency initiatives and opportunities in Latin America and Carribbean.

UNEP, 2016. The Emissions Gap Report 2016.

Wiel, S., Egan, C., delta Cava, M., 2006. Energy efficiency standards and labels provide a solid foundation for economic growth, climate change mitigation, and regional trade. Energy for Sustainable Development 10 (3), 54–63. 10.1016/S0973-0826(08)60544-X.

Wiel, S., McMahon, J.E., 2003. Governments should implement energy-efficiency standards and labels – cautiously. Energy Policy 31 (13), 1,403–1,415. 10.1016/S0301-4215(02)00199-4.

Wiel, S., McMahon, J.E., 2005. Energy Efficiency Labels and Standards: A Guidebook for Appliances, Equipment and Lighting: 2nd edition.