Background Documents

Cooling for All

Policy Review

MARCH 2018

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ADDRESSING DATA LIMITATIONS

Access to cooling is a new area of investigation and, inevitably, when piloting a new approach not all the data one would wish to examine is neatly lined up, especially when it comes to looking for disaggregated data on vulnerability based on gender, health, and education level.

To support this publication, an extensive data gathering exercise and literature review was undertaken, including a call for data to organizations that may have access to enhanced levels of granularity. The data expressed herein draws on a model produced by SEforALL that is based on data received through that process and data which is publicly available, and given limitations is subject to assumptions and margins of error.

In a nascent field such as access to cooling, it is crucial that organizations be empowered to put concerted efforts in the collection of a more extensive set of **granular and verified data at country level**, as well encouraging organizations with significant non- public datasets to make them available to KCEP and selected partners. This would allow for more detailed access gap quantifications with a lower error margin, in order to inform both discussions with key stakeholders as well as future policy and program design. Organizations that may have the knowledge and capacity to undertake such an effort include: GIZ, CLASP, GAVI, Global Cold Chain Alliance, the Global Food Cold Chain Council, UN Habitat, and the IEA,

POLICY REVIEW

1. AIR CONDITIONER MEPS

As discussed in more detail in section E.2, a number of countries have Minimum Energy Performance Standards (MEPS) in place for common types of ACs in order to set a minimum level for the expected energy performance of such units. Nonetheless, many countries lack MEPS and where they are available, they often still have considerable room for improvement, with the global market already offering many models that outperform even the most stringent MEPS. Low-stringency MEPS instead fail to create consumer demand for more energy efficient models, which may come with a higher initial price tag.

Furthermore, in many countries labels exist which either allow consumers to compare the energy performance of different AC models, or which confirm to consumers that a certain model does indeed meet a specified energy performance level. Manufacturers or distributors may thus be required to get a certification or registration of their AC products prior to their distribution on the market.

The following overview of October 2017 shows for 46 countries, together making up 80% of the world population, whether they have comparative labels, endorsement labels, and/or MEPS in place for room AC units.[i]

	ROOM AC		
Country	**COMPARATIVE LABELS**	**ENDORSEMENT LABELS**	**MEPS**
Algeria	X		
Argentina	X		X
Australia	X		X
Bangladesh	X		
Brazil	X	X	X
Canada	X	X	X
Chile	X		
China (PRC)	X	X	X
Taiwan	X	X	X
Costa Rica	X		X
Egypt	X		X
European Union	X	X	X
Fiji			
Germany			
Ghana	X		X
Hong Kong	X		
India	X		X
Iran	X		X
Israel	X		X
Jamaica			
Japan	X		X
Jordan			
Kingdom of Saudi Arabia	X		X
Korea (ROK)		X	X
Malaysia	X	X	X
Mexico	X	X	X
New Zealand	X		X

Pakistan	X		X
Peru			
Philippines	X		X
Russia	X		X
Singapore	X		X
Solomon Islands	X		X
South Africa			
Sweden			
Switzerland	X	X	
Thailand	X	X	X
Tunisia	X		X
Turkey	X		X
Tuvalu	X		X
Ukraine			
United Arab Emirates	X		X
United States	X	X	X
Uruguay			
Venezuela	X		X
Vietnam	X	X	X

Table 1 Overview of the presence of labels and MEPS for room ACs in select countries (2017)

At the same time, a large number of countries still lack (mandatory) MEPS. In Africa for instance, only a few countries have MEPS in place, planned or under development for AC, refrigerators or both, as shown on the map in Figure 2[ii] and 2[iii]. One likely reason for this is the low uptake of AC for in particular residential cooling, with such cooling solutions still being out of reach for most African households, either due to financial barriers or simply by not or only having limited access to grid electricity.

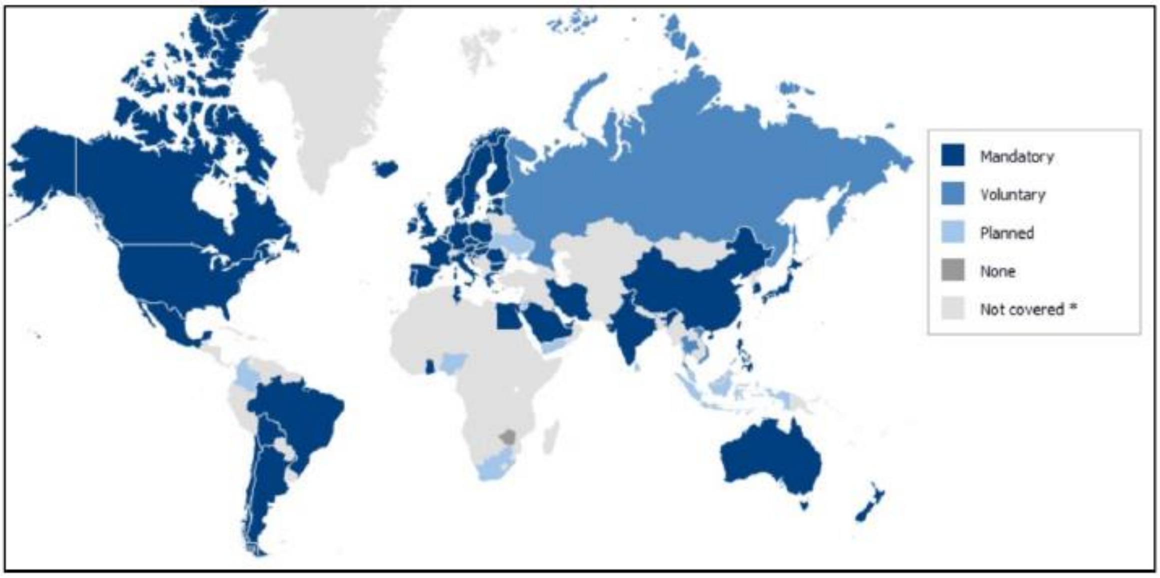

Figure 1: Diffusion of mandatory, voluntary or planned MEPS for residential ACs (2013)

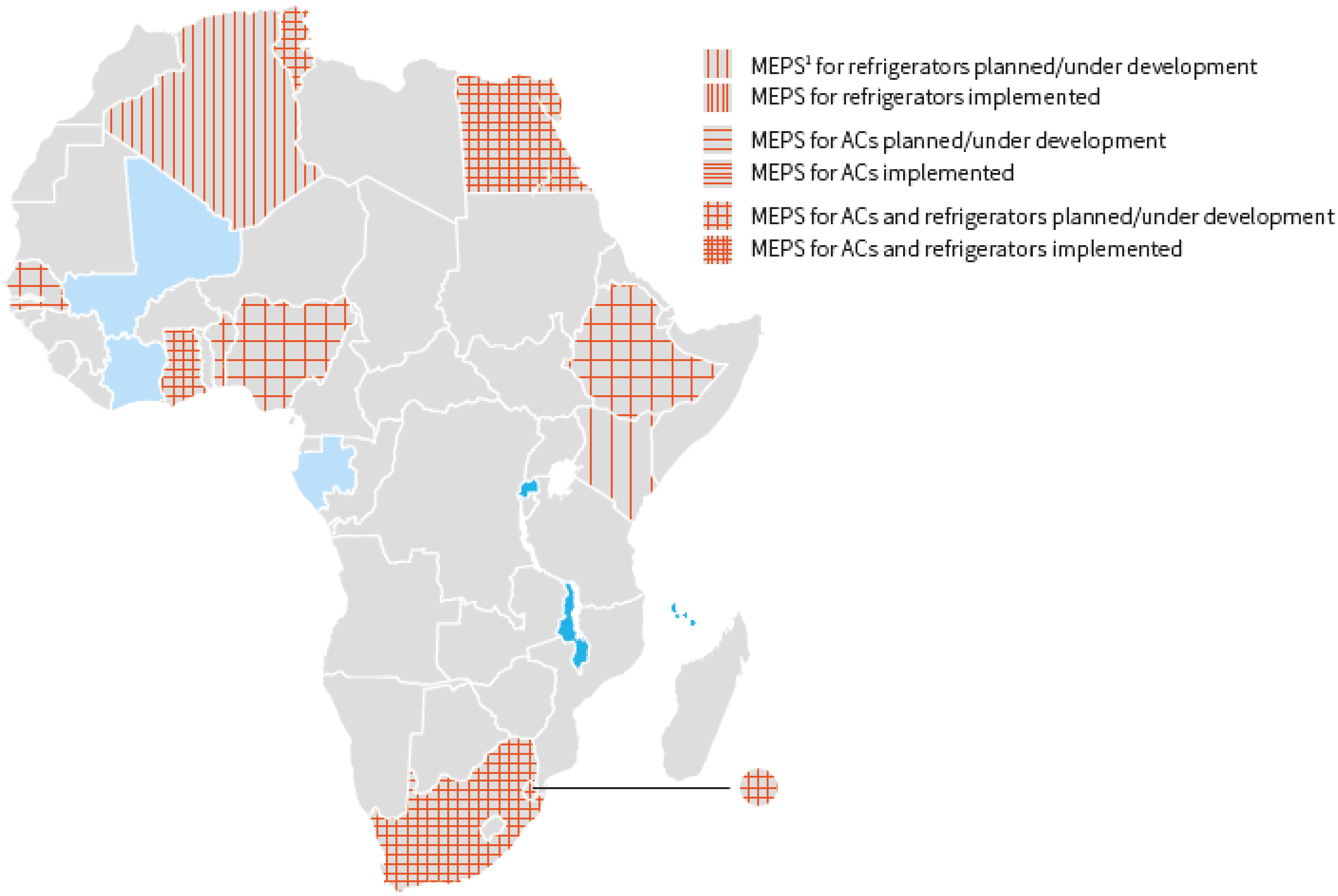

Figure 2 Overview of the presence of MEPS (in place, or planned/under development) in Africa for ACs and refrigerators (2017)

Having a MEPS in place for AC units doesn't necessarily suffice. MEPS that lack stringency fail to set a high bar and create a market for more efficient models. As per Figure 3, a comparison of MEPS stringency on the basis of their Energy Efficiency Ratio (EER) in select economies shows considerable differences in the minimum energy performance split room AC units in these markets have had to comply with in recent years.[iv]

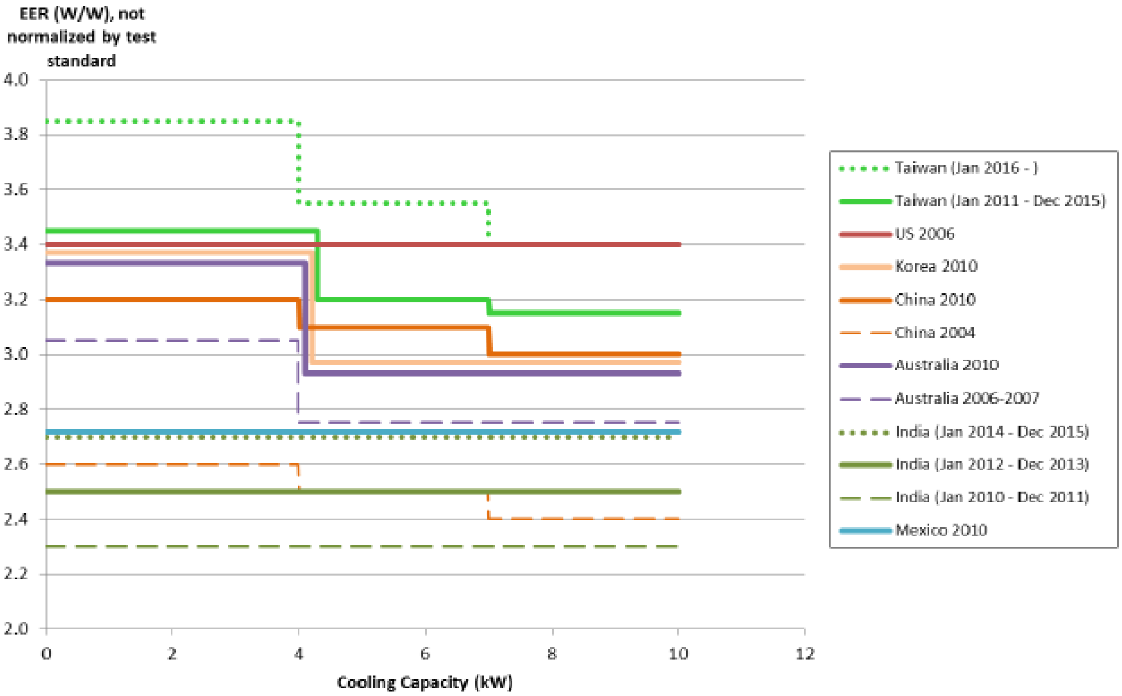

Figure 3 MEPS stringency for split room ACs in selected economies (2017)

To get a first order idea of the potential for efficiency improvement, United4Efficiency has compared the (1) average current (Business As Usual) energy consumption of a room AC in a particular country, versus (2) the energy performance of that same unit in case the globally, best currently available MEPS would be in place, versus (3) the energy performance of that unit if it were to perform in line with Best Available Technologies (BAT).

The next table shows the performance for these 3 parameters - BAU, best currently available global MEPS and BAT - for a room AC (3.5 kW cooling capacity) in select economies based on 2017 data.[v] From this overview, it can be concluded that roughly a 50% improvement for the energy performance of these room AC units could be feasible if country MEPS would be implemented or strengthened to align with the current state of BAT. It also shows the total estimated number of room AC units in place in each country as per 2011 data, not taking into account the expected near-future rapid growth in AC ownership in economies with a warmer climate.[vi]

	Unit Energy Consumption (kWh/year)			**Room Air Conditioners in Use**
	BAU	**Best global MEPS**	**BAT**	
Africa				
Dem. Rep. of Congo	3252	2653	1738	1.18 million
Egypt	1897	1547	1014	4.32 million
Ethiopia	1626	1326	869	1.03 million
Kenya	1084	884	579	0.74 million
Nigeria	3252	2653	1738	4.78 million
South-Africa	542	442	290	3.09 million
Tanzania	3252	2653	1738	0.75 million
Asia				
Bangladesh	2981	2432	1593	2.93 million
China	777	709	390	291 million
India	2607	1990	1304	17.7 million
Indonesia	2304	2003	1309	10.5 million

	Unit Energy Consumption (kWh/year)			Room Air Conditioners in Use
	BAU	Best global MEPS	BAT	
Pakistan	1897	1547	1014	3.65 million
Philippines	2534	1995	1313	4.91 million
Latin-America				
Brazil	2897	2211	1449	22.2 million
Argentina	1355	1105	724	2.35 million
Colombia	1335	1105	724	3.3 million
Mexico	3252	2653	1738	20.5 million
Peru	813	663	434	2.4 million

Table 2 Energy performance of room ACs under BAU, best global MEPS (policy scenario), and BAT in select countries

In addition to MEPS and supporting labelling schemes for appliances such as ACs as well as refrigerators, countries also need to consider the financial delivery mechanisms to address the incremental cost of more efficient appliances; effective monitoring (verifying product efficiency), verification (verifying declarations of conformance), and enforcement of the MEPS; capacity building with stakeholders; and environmentally sound management and phase-down of HFCs and other hazardous substances.

Although very limited comparative data exist that provide an insight in the uptake and effectiveness of implementation of these policies, 2011 data suggest that in some of the world's largest markets for air conditioners, compliance check testing is fairly rigorous and the consequences of non-compliance are such that they may be sufficient in several countries to help deter non-compliance.[vii]

	Australia	China	EU	India	Japan	Korea	Taiwan	US
Check Testing for Compliance	Accredited laboratories paid by compliance agency	Accredited laboratories paid by compliance agency	Accredited laboratories paid by compliance agency	Accredited laboratories paid by compliance agency	Manufacturers	Accredited laboratories paid by compliance agency	Accredited laboratories paid by compliance agency	Accredited laboratories paid by compliance agency (DOE)
Consequences of Non-Compliance to Manufacturer/Importer	Registration cancellation and liability for costs for testing in case of non-compliance	High financial penalty and product recalls (if possible revoke the business license based on the seriousness of the situation)	Products removed from website of Eurovent certified list	Registration cancellation and product recalls	Public disclosure ("Name and Shame" approach). Approach consisting of four phases: (i) recommendation, (ii) publication of the name of the company, (iii) order and (iv) penalty up to one million yen	Products prohibited from being produced and sold. In case of non-observance of the rules, a fine up to US $18,000	High financial penalty	Certification cancellation

Table 3 Check-testing for compliance and consequences of non-compliance in 7 economies with major AC uptake

2. REFRIGERATOR MEPS

Most countries which have MEPS and labels for room AC units in place also have MEPS and labels for refrigerators, as the below overview shows, representing the same set of 46 countries together making up 80% of the world population.[viii]

	REFRIGERATORS		
Country	**COMPARATIVE LABELS**	**ENDORSEMENT LABELS**	**MEPS**
Algeria	X		
Argentina	X		X
Australia	X		X
Bangladesh			
Brazil	X	X	X
Canada	X	X	X

Chile	X		
China (PRC)	X	X	X
Taiwan	X	X	X
Costa Rica	X		X
Egypt	X		X
European Union	X		X
Fiji	X		X
Germany		X	
Ghana	X		X
Hong Kong	X		
India	X		X
Iran	X		X
Israel	X		X
Jamaica	X		
Japan	X		X
Jordan	X		
Kingdom of Saudi Arabia	X		
Korea (ROK)	X	X	X
Malaysia	X		X
Mexico	X	X	X
New Zealand	X		X
Pakistan			
Peru			X
Philippines	X		
Russia	X		X
Singapore	X	X	X
Solomon Islands	X		X
South Africa	X		
Sweden		X	
Switzerland	X		X
Thailand	X	X	X
Tunisia	X		X
Turkey	X		X
Tuvalu	X		X
Ukraine	X		X
United Arab Emirates			
United States	X	X	X
Uruguay	X		
Venezuela	X		X
Vietnam	X	X	

Table 4 Overview of the presence of labels and MEPS for refrigerators in select countries (2017)

Nonetheless, a large number of (rapidly) developing or emerging countries still lack MEPS as exemplified by Figure 2, displaying MEPS uptake for ACs and refrigerators for countries in Africa. At the same time, for refrigerators as well the energy savings potential from more stringent MEPS is considerable, suggesting a 55 to 65% improvement potential (2017 data) versus BAU if MEPS in line with BAT were to be adopted. Interestingly, the data appear to suggest that countries with larger, estimated, absolute volumes of domestic refrigerators – based on 2008 penetration rates – have not been more pro-active in getting (more stringent) MEPS in place, showing quite uniform modelled BAU performance for countries with both larger and smaller volumes of refrigerators. ix

	Unit Energy Consumption (kWh/year)			Domestic Refrigerators in Use
	BAU	Best global MEPS	BAT	
Africa				
Dem. Rep. of Congo	325	191	134	3.60 million
Egypt	500	231	167	13.20 million
Ethiopia	350	191	134	2.96 million
Kenya	350	191	134	2.08 million
Nigeria	325	191	134	18.3 million
South-Africa	325	191	134	10.1 million
Tanzania	325	191	134	2.14 million
Asia				
Bangladesh	352	207	159	10.2 million
China	235	200	139	276 million
India	352	207	159	145 million
Indonesia	352	207	159	32.7 million
Pakistan	352	207	159	17.2 million
Philippines	352	207	159	14.6 million
Latin-America				
Brazil	485	212	163	48.8 million
Argentina	485	212	163	10.7 million
Colombia	485	212	163	10.6 million
Mexico	485	212	163	31.1 million
Peru	485	212	163	6.4 million

Table 5 Energy performance of domestic refrigerators under BAU, best global MEPS (policy scenario), and BAT in select countries

Once more stringent MEPS are in place, governments can encourage their citizens to more rapidly phase out old inefficient models through the use of incentives. Brazil, Ecuador, Ghana, Kenya, South-Korea, and Tunisia provide or have provided rebates for the replacement of inefficient for more efficient refrigerators.[x]

3. BUILDING EFFICIENCY CODES

Section E.2. showed how passive building cooling solutions, in particular through building energy efficiency codes, can greatly reduce the demand for active cooling by providing more comfortable conditions for building occupants. At the same time, many countries do not have building codes in places for some or all segments of the building market, or only have voluntary codes. Table 6 provides an overview of select developing and emerging countries with a mandatory building energy efficiency code for public and commercial and/or residential buildings in place at the national level, and the current version of the code as per the year of the most recent update, as well as where relevant the presence of mandatory, voluntary, or planned codes at the subnational level.[xi]

Country	Public & commercial building codes	Country	Residential building codes
Algeria	M (2005)	Algeria	M (2005)

Argentina	M (V)
Benin	M (P)
Bolivia	M (P,2014)
Botswana	M (P)
Brazil	M ()
China	M (M,2010)
Colombia	M (V)
Ecuador	M (M,2011)
El Salvador	M (P,2017)
Ghana	M (P)
India	M (2009)
Israel	M
Japan	M (V,2009)
Jordan	M
Lebanon	M (P,2017)
Mexico	M (M,2001)
Pakistan	M (P)
Philippines	M (2005)
Republic of Korea	M (2008)
Saudi Arabia	M (V,2009)
Senegal	M (P)
Singapore	M (2008)
South Africa	M (M,2011)
Sri lanka	M (V,2008)
Swaziland	M (P)
Taiwan	M (2002)
Thailand	M (2009)
Tunisia	M (2010,2008)
Ukraine	M (P)
United Arab Emirates	M (M,2008)
Vietnam	M (2005,2013)

Argentina	M (V)
Botswana	M (P)
Brazil	M ()
Chile	M (M,2007)
China	M (M,2010)
Ghana	M (P)
India	M (2009)
Japan	M (V,2009)
Jordan	M
Republic of Korea	M (2008)
South Africa	M (M,2011)
Swaziland	M (P)
Tunisia	M (2009)
Ukraine	M (P)
Uruguay	M (M)

M = Mandatory
V = Voluntary
P = Planned
(20XX) = most recent year updated
M (X) = national / subnational level

Table 6 Select countries with a building code in place for public & commercial and/or residential buildings

Similar to MEPS, having a building energy efficiency code in place doesn’t mean that the building code actually stipulates high energy performance and/or encompasses requirements which encourage better passive design for cooling, A 2013 overview of the technical requirements in residential building energy codes in 15 countries shows how those countries covered which are rapidly developing and still adding considerable volumes of new buildings to their stock still have major gaps in their (mandatory or voluntary) codes when it comes to addressing passive and active (heating and) cooling. Examples are heating and cooling requirements; insulation; window U-factor and shading/solar heat gain coefficient; design, position, and orientation.[xii]

	Heating and Cooling Requirements	Insulation in Walls and Ceiling	Window U-Factor and Shading/Solar Heat Gain Coefficient	Air Sealing	Lighting Efficiency	Technical Installations	Design, Position, and Orientation	Points
Australia	X	X	X	X	X	X	X	1.75
Brazil	–	–	–	–	–	–	–	0
Canada	X	X	X	X	X	–	X	1.5
China	X	X	X	X	X	–	X	1.5
France	X	X	X	X	X	–	X	1.5
Germany	X	X	X	X	X	X	X	1.75
India	–	–	–	–	–	–	–	0
Italy	X	X	X	X	X	X	X	1.75
Japan	X	X	X	X	–	–	X	1.25
Mexico	–	–	–	–	–	–	–	0
Russia	X	X	–	–	X	X	–	1
South Korea	X	X	X	X	X	X	X	1.75
Spain	X	X	X	X	X	X	X	1.75
United Kingdom	X	X	X	X	X	X	X	1.75
United States	X	X	X	X	X	–	–	1.25

Table 7 Residential building code technical requirements for select countries (2013)

Even having good codes doesn't mean equal implementation. Systematic surveys on the compliance situation of building codes are rare and results are difficult to compare. The limited data available do however do suggest that compliance and quality of enforcement is less than perfect in many countries, and often particularly poor in developing and emerging countries – with some clear exceptions. Experience from China for instance suggests compliance in large Chinese cities to be as high as 80%.[xiii]

The findings in this sector are further confirmed by the RISE portal, a collaboration between the World Bank and SEforAll, which scores countries on the basis of a range of indicators and sub-indicators linked to energy access, energy efficiency, and renewable energy. For building efficiency codes, RISE scores countries on a scale of 1 to 100 on the basis of sub-indicators (using 2016 data) linked to code design, implementation, and enforcement across the categories new residential / commercial buildings, building renovation, the compliance system, building energy information, and building efficiency incentives. Globally, almost two-thirds of countries fall in the lowest scoring category of 33 points or less.[xiv]

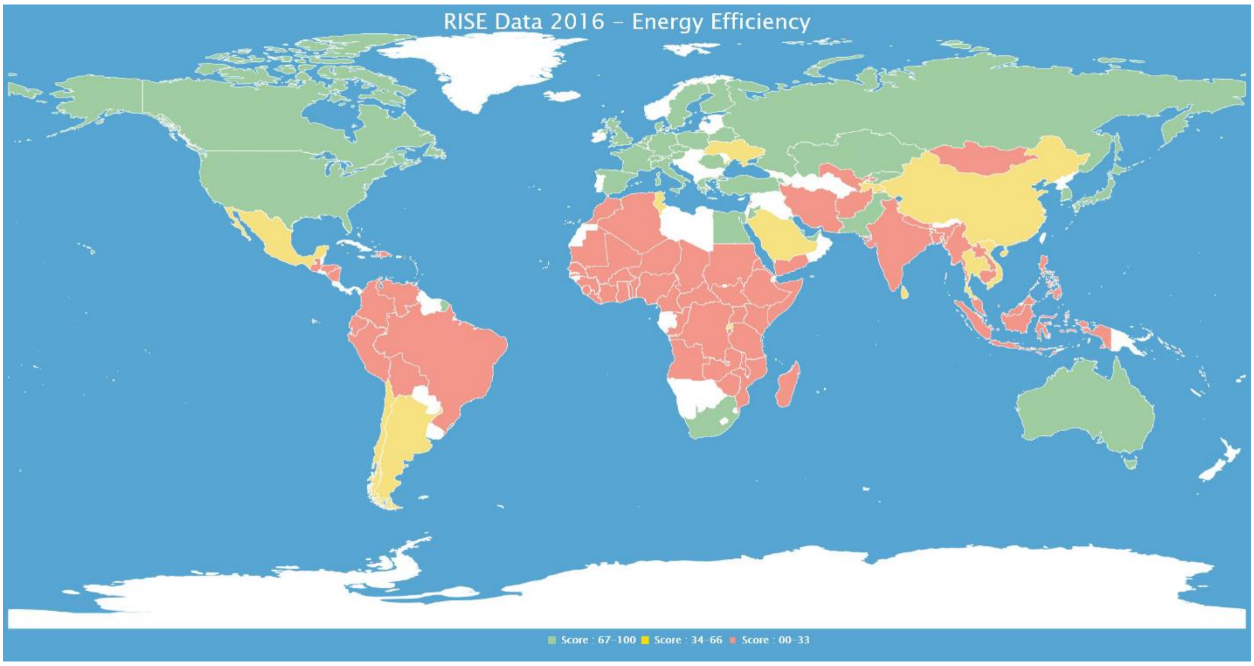

Figure 4 RISE country scores for building energy efficiency codes (red: score 0-33 points; yellow: score 34-66 points; green: score 67 – 100 points; white: no score)

4. URBAN HEAT ISLAND POLICY

Heat action plans

Cool roofs

The policy is pretty standard, but adoption is lacking in many places for a variety of reasons:

1. lack of awareness of cool surfaces and the broad benefits of heat mitigation
2. lack of market (no products to sell, target audience cannot afford)
3. large cool roof projects may not be a perfect fit for existing climate/resiliency funding mechanisms

Urban planning regulations

5. COLD CHAIN

Since the 2003 Maputo declaration, many Sub-Saharan African governments have been moving towards (or exceeding) their commitment to allocate at least 10% of their national budgets to agriculture.

While governments have historically focused on increasing agricultural production, some African countries, including Kenya and Tanzania, have begun to emphasize the issue of postharvest loss, and appointed officials to address the problem from a market perspective. Several regional networks and governing bodies (e.g., Comprehensive Africa Agriculture Development Programme, New Partnership for Africa’s Development) are involved in strengthening agricultural supply chains.

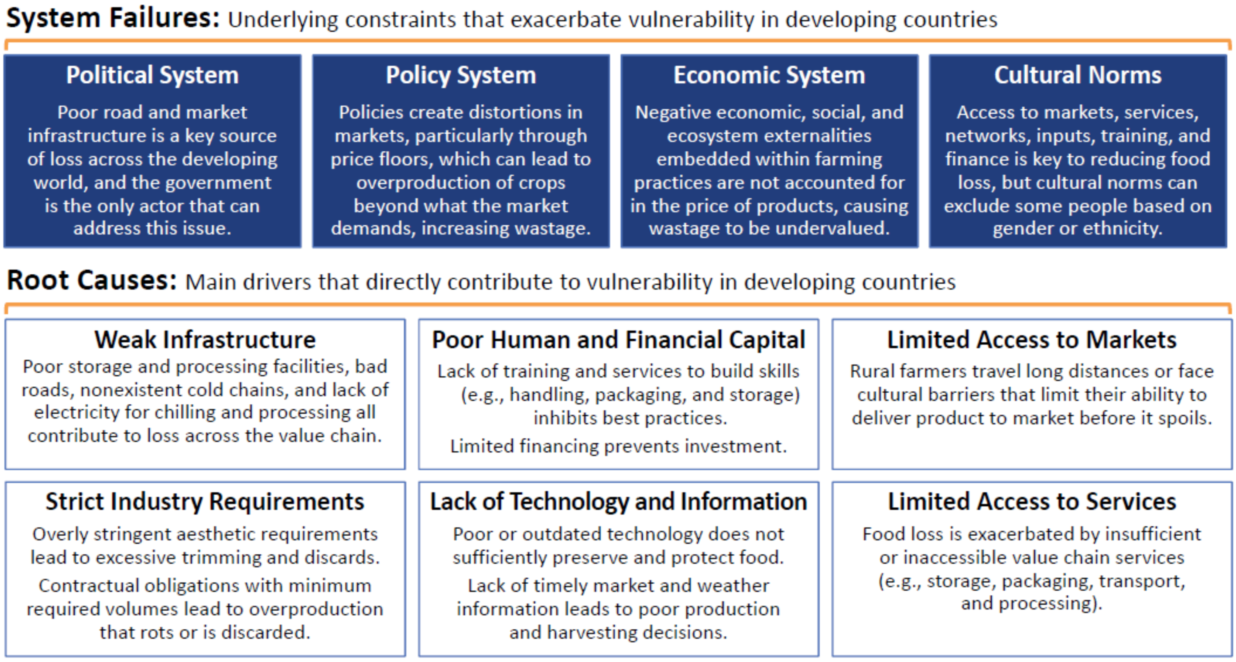

Figure 5 Key reasons and the role of policy in (preventing) high food losses in developing countries

[i] CLASP (2017). Cooling MEPS
[ii] Nogueira, L. (2013). Package of measures to promote efficient air conditioning.
[iii] KCEO, Ecofys (2018). Africa Cooling Map
[iv] International Copper Association (2017). Promotion of higher efficiency air conditioners in asean: a regional policy roadmap
[v] U4E (2017). Country Assessments. Available at http://united4efficiency.org/countries/country-assessments/
[vi] GIZ (n.d.), Green Cooling Initiative – Country Data, Available at http://www.green-cooling-initiative.org/country-data/
[vii] CLASP, Econoler, Navigant, CEIS and ACEEE (2011). Cooling benchmarking study report. Available at https://s3.amazonaws.com/clasp-siteattachments/RAC-benchmarking-Report.pdf
[viii] CLASP (2017). Cooling MEPS
[ix] GIZ (n.d.), Green Cooling Initiative – Country Data, Available at http://www.green-cooling-initiative.org/country-data/
[x] World Energy Council (2015). Energy Efficiency Policy and Measures. Available at https://wec-policies.enerdata.net/world-overview.php#MEPS-AC
[xi] World Energy Council (2015). Energy Efficiency Policy and Measures. Available at https://wec-policies.enerdata.net/world-overview.php#MEPS-AC
[xii] Young, R.., ACEEE (2014). Global Approaches: A Comparison of Building Energy Codes in 15 Countries
[xiii] World Bank (2010). Mainstreaming Building Energy Efficiency Codes in Developing Countries
[xiv] World Bank (2017). RISE – Regulatory Indicators for Sustainable Energy. Available at http://rise.worldbank.org/